Case No. 84739

IN THE SUPREME COURT OF THE STATE OF NEVADA

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ADAM SULLIVAN, P.E., NEVADA STATE ENGINEER, et al.

Appellants,

vs.

LINCOLN COUNTY WATER DISTRICT, et al.

JOINT APPENDIX

VOLUME 48 OF 49

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DYLAN V. FREHNER, ESQ.
Nevada State Bar No. 9020
LINCOLN COUNTY DISTRICT ATTORNEY
181 North Main Street, Suite 205
P.O. Box 60
Pioche, Nevada 89043
Telephone: (775) 962-8073
Email: dfrehner@lincolncountynv.gov

WAYNE O. KLOMP, ESQ.
Nevada State Bar No. 10109
GREAT BASIN LAW
1783 Trek Trail
Reno, Nevada 89521
Telephone: (775) 770-0386
Email: wayne@greatbasinlawyer.com

KAREN A. PETERSON, ESQ.
Nevada State Bar No. 366
ALLISON MacKENZIE, LTD.
402 North Division Street
Carson City, Nevada 89703
Telephone: (775) 687-0202
Email: kpeterson@allisonmackenzie.com

Attorneys for Petitioners, LINCOLN COUNTY WATER DISTRICT and VIDLER WATER COMPANY, INC.

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

DISTRICT COURT

CLARK COUNTY, NEVADA

LAS VEGAS VALLEY WATER DISTRICT, and SOUTHERN NEVADA WATER AUTHORITY, et al., Petitioners, vs. ADAM SULLIVAN, P.E., Acting Nevada State Engineer, et al., Respondent. _______________________________/	Case No. A-20-816761-C Dept. No. 1 Consolidated with Cases: A-20-817765-P A-20-818015-P A-20-817977-P A-20-818069-P A-20-817840-P A-20-817876-P A-21-833572-J

LINCOLN COUNTY WATER DISTRICT AND VIDLER WATER COMPANY, INC.'S REPLY BRIEF

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ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

TABLE OF AUTHORITIES

Cases:

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

Rules:

Statutes:

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

NRAP 26.1 DISCLOSURE

The undersigned counsel of record certify that the following are persons and entities as described in NRAP 26.1(a) and must be disclosed. These representations are made in order that the Court may evaluate possible disqualification or recusal.

1. Petitioner, LINCOLN COUNTY WATER DISTRICT, is a political subdivision of the State of Nevada, created for the purpose of providing adequate and efficient water service within Lincoln County, Nevada.

2. Petitioner, VIDLER WATER COMPANY, INC., is a Nevada corporation authorized to conduct business in the state of Nevada.

3. All parent corporations and publicly-held companies owning 10 percent or more of any of Petitioners' stock:

Vidler Water Company, Inc.'s parent company is Vidler Water Resources, Inc. There is no publicly held company that owns 10% or more of Vidler Water Company, Inc.'s stock.

4. Names of all law firms whose attorneys have appeared for Petitioners in this case:

Lincoln County District Attorney, Snell & Wilmer, L.L.P., Great Basin Law and Allison MacKenzie, Ltd. Snell & Wilmer, L.L.P. has been substituted out of this case and no longer represents any of the Petitioners.

5. If any litigant is using a pseudonym, the litigant's true name:

Not applicable.

DATED this 11th day of January, 2022.

LINCOLN COUNTY DISTRICT ATTORNEY
181 North Main Street, Suite 205
P.O. Box 60
Pioche, Nevada 89043
Telephone: (775) 962-8073

/s/ Dylan V. Frehner
DYLAN V. FREHNER, ESQ.
Nevada State Bar No. 9020
Email: dfrehner@lincolncountynv.gov

~ and ~

GREAT BASIN LAW
1783 Trek Trail
Reno, Nevada 89521
Telephone: (775) 770-0386

/s/ Wayne O. Klomp
WAYNE O. KLOMP, ESQ.
Nevada State Bar No. 10109
Email: wayne@greatbasinlawyer.com

Attorneys for Petitioner, **LINCOLN COUNTY WATER DISTRICT**

ALLISON MacKENZIE, LTD.
402 North Division Street
Carson City, NV 89703
Telephone: (775) 687-0202

/s/ Karen A. Peterson
KAREN A. PETERSON, ESQ.
Nevada State Bar No. 366
Email: kpeterson@allisonmackenzie.com

Attorneys for Petitioner **VIDLER WATER COMPANY, INC.**

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

Petitioners, LINCOLN COUNTY WATER DISTRICT ("Lincoln") and VIDLER WATER COMPANY, INC. ("Vidler"), hereby file this Reply Brief in response to the Answering Briefs or Briefs in Intervention of the Nevada State Engineer ("NSE" or "State Engineer"), Southern Nevada Water Authority ("SNWA") and Las Vegas Valley Water District ("LVVWD"), Muddy Valley Irrigation Company ("MVIC"), Moapa Valley Water District ("MVWD"), The Church of Jesus Christ of Latter-day Saints (the "Church"), Sierra Pacific Power Company dba NV Energy and Nevada Power Company dba NV Energy (jointly "NV Energy"), and the Center for Biological Diversity ("CBD").

ARGUMENT

I. Introduction

When the Nevada State Engineer issued Order 1309, he grossly exceeded his statutory authority granted and defined by the Nevada Legislature. He created new rules based on evidence presented rather than any rule of law and without notice, reprioritized already-adjudicated water rights in individual basins, and combined separately-administered basins into a single super-basin. Moreover, the State Engineer left all water users in limbo by indicating there would be a "next phase of proceedings" to determine how to manage the Lower White River Flow System ("LWRFS") and define the new-but-not-released criteria for moving water rights within the new super-basin. In Order 1309 and now in this proceeding, the State Engineer has hinted at (but not released) new rules, regulations, and laws which will govern permitted rights in the LWRFS. The State Engineer has ignored the Supreme Court's guidance that "[c]ertainty of rights is particularly important with respect to water rights in the Western United States," and "[t]he doctrine of prior appropriation . . . is itself largely a product of the compelling need for certainty in the holding and use of water rights." *Mineral Cnty. v. Lyon Cnty.*, 473 P.3d 418 (Nev. 2020), *quoting Arizona v. California*, 460 U.S. 605, 620 (1983).

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

The State Engineer has created new regulations not subject to the process and procedures of a democratic government; he has created uncertainty by failing to define his newly minted "multi-tiered process" for conjunctive management of super-basins; and he has ignored the process and procedures for designating basins and curtailing pumping as provided by the Nevada Legislature, instead formulating an incomplete process not subject to stakeholder input or public scrutiny. The issues raised in this Consolidated Action are exemplified by the State Engineer's Answering Brief where he asserts that the "State Engineer was not obligated to follow Ruling 5712." NSE Answering Brief at 22:26-27. The State Engineer blatantly disregarded the rule of law by ignoring prior state engineer's Rulings and Orders, Legislative processes, and rule-making procedures. From this unlawful conduct Petitioners seek relief. The State Engineer is bound by the rule of law, and he cannot simply make new law without legislative mandate, public notice, and appropriate hearings. This violates fundamental principles of due process.

Thus, as a matter of law, the State Engineer lacked authority to: (1) create new regulations; (2) ignore prior Rulings and Orders granting property rights; (3) reprioritize water rights in a newly-minted super-basin; and (4) create an incomplete regulatory scheme. For those reasons, Order 1309 should be vacated as a matter of law. The State Engineer created a problem by over-appropriating other basins within the LWRFS contrasted with Kane Springs Valley ("Kane Springs") which has only one appropriation granted to Petitioners. Now he seeks to mitigate the problem he created in the over-appropriated basins by lumping those basins into a super-basin and taking water rights granted to Lincoln and Vidler in Kane Springs and transferring the right to pump that water to others. These actions are inconsistent with and ignore the statutory scheme created by the Legislature for designating and curtailing pumping in over-appropriated basins.

Moreover, the State Engineer failed to base his decisions in Order 1309 on substantial evidence or failed entirely to identify in the Order the evidence upon which

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

he included Kane Springs in the LWRFS. Contrary to the State Engineer's present assertions, substantial evidence does not warrant including Kane Springs in the LWRFS. First, the State Engineer ignored the substantial evidence that Kane Springs should be treated separately from the LWRFS because: (1) a geologic structure, i.e., a fault,[1] separates Kane Springs from the rest of the LWRFS; (2) climate data and other evidence explains the inconsistent water table drop in Kane Springs; (3) an "attenuated" connection between Kane Springs and the LWRFS is inconsistent with an "uniquely close connection" cited by the State Engineer; and (4) there has been no pumping in Kane Springs, and therefore no possible impacts to the springs or the Moapa dace from Kane Springs. Second, Order 1309 is based on a scientific impossibility—that pumping anywhere in an 1,100 square mile area affects spring flows the same as if the pumping occurred proximate to Muddy River flows. The State Engineer ignores the fact that the main production well for municipal use in Moapa Valley is located adjacent to the Muddy River Springs and harms flows more than a well that would be pumping over 20 miles from the Muddy River.

For those reasons, Order 1309 should be vacated.

II. The State Engineer Lacked Statutory Authority to Create a Super-Basin and Issue Order 1309.[2]

In response to comprehensive discussion that he lacks statutory authority to issue Order 1309, the State Engineer claims "plain" statutory authority to do so. NSE Answering Brief at 30-32. But the State Engineer's tortured reading of the statutory scheme is hardly clear. He fails to identify with any particularity the authority for issuing Order 1309. Instead, he relies on inapplicable statutes, ignores the comprehensive statutory scheme for this situation, and dismisses his own prior rulings

[1] The geophysical data Lincoln/Vidler presented showed a series of faulting occurring in southern Kane Springs Valley and northern Coyote Spring Valley. ROA 36202.

[2] The arguments in this Section apply equally to the following sections in answering briefs: CBD Answering Brief at § VI.A; LDS Church Answering Brief at § VII.A.1-2; MVWD Answering Brief at § VI.A; MVIC Answering Brief at § II; NSE Answering Brief at § II.A-B; NV Energy Answering Brief at § IV.a; and SNWA Answering Brief at § I.A-B.

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

and statutory interpretation. Not only does Order 1309 exceed statutory authority, but it also creates significant uncertainty in how the State Engineer will manage super-basins, especially if he is permitted to ignore legislative directive, prior orders, rulings, and adjudications.

A. The Statutes Cited by the State Engineer Do Not Provide Authority to Combine and Manage a Super-Basin.

The State Engineer's authority must be viewed under the lens that "no administrative body may arbitrarily select a statutory basis for its decision." *Desert Irrigation, Ltd. v. State*, 113 Nev. 1049, 1055, 944 P.2d 835, 839 (1997). But that is exactly what occurred here. The State Engineer first cites NRS 533.0245 as authority for Order 1309. Answering Brief at 30. But that section is a limit on authority, not an affirmative delegation by the Legislature. That section prohibits him from carrying out his duties in a manner inconsistent with court orders or interstate compacts. He then cites to a statute requiring him to consider the "best available science," but provides no basis for joining previously-separately administered hydrographic basins or any other element of Order 1309, including creation of new regulations after the evidentiary hearing has concluded. *Id.* citing NRS 533.0241(1)(c). Rather, that section is, again, a limit on the State Engineer's authority, requiring him to consider the best science in carrying out his statutory duties—it does not on its face reveal any authority for Order 1309.

The State Engineer next cites NRS 534.110(6) as authority. But on its face that statute authorizes investigations "in any basin or portion thereof where it appears that the average annual replenishment of the groundwater supply may not be adequate for the needs of all permittees . . . ." Nowhere in that section does it authorize the combining of basins into a super-basin and redesignation of previously separate basins into sub-basins.

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ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

B. The Nevada Legislature Provided a Comprehensive Statutory Scheme for Over-Appropriated Basins, a Statutory Scheme Ignored by the State Engineer.

Interestingly, the State Engineer fails to cite as authority any statutes which actually provide his authority to manage over-appropriated or insufficient water supply despite the fact that the requirement to utilize those statutes is mandatory—"The State Engineer **shall administer** this chapter and **shall prescribe** all necessary regulations within the terms of this chapter for its administration." NRS 534.110(1). In fact, the State Engineer never addresses his actual authority to designate and administer an over-appropriated basin as adopted by the Legislature in the current statutory scheme. Instead, he alleges that he has not violated any statute. NSE Answering Brief at 34:22-23. This statement illustrates the problem—the State Engineer is not looking for legislative authority to act but a prohibition against acting. In other portions of his brief, the State Engineer affirmatively states that "NRS Chapters 533 and 534 establish a comprehensive scheme for the regulation of water in this State. They require "strict" compliance with their elaborate provisions. *Application of Filippini*, 66 Nev. 176, 27, 202 P.2d 535, 540 (1949)." Yet, other than a broad policy statement, the State Engineer cannot point to any portion of the "elaborate" statutory scheme that discusses the authority to do what he has done in Order 1309.

In order for an executive agency to act, there must be an affirmative grant of authority, not a prohibition against every other possibility. *See Nev. Dep't of Pub. Safety v. Coley*, 368 P.3d 758, 761 (Nev. 2016) ("The legislative act is the charter of the administrative agency and administrative action beyond the authority conferred by the statute is ultra vires.") (internal citation omitted). Moreover, when interpreting statutes "the expression of one thing is the exclusion of another." *Desert Irrigation, Ltd. v. State*, 113 Nev. 1049, 1060, 944 P.2d 835 (1997).

Here, the Legislature provided methods in the statutory scheme for the State Engineer to curtail, forfeit, designate, and manage an over-appropriated basin—and those provisions do not look like Order 1309. For example, statutes provide for the

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

State Engineer to designate "as a critical management area any basin in which withdrawals of groundwater consistently exceed the perennial yield of the basin." NRS 534.110(7)(a). The designation of a basin is appealable. NRS 534.110(7). Moreover, once an area has been designated by the State Engineer,[3] only then does statute authorize the State Engineer to "make such rules, regulations and orders as are deemed essential" for the designated basin or portion of a basin. NRS 534.120(1).

Under the critical management area statute, once a basin has been designated for at least 10 years, the State Engineer is then required to order withdrawals be restricted unless a groundwater management plan has been approved for that basin. *Id.* A groundwater management plan is developed by "a majority of the holders of permits or certificates to appropriate water in the basin" rather than by fiat decree of the State Engineer. NRS 534.037(1).

The State Engineer does not argue that he followed the statutory scheme for designating basins or allowing stakeholders to develop a management plan as he should have done. The Legislature has given the State Engineer the tools to protect water supply in over-appropriated basins. And the expression of that authority is the exclusion of alternative methods <u>not</u> expressly adopted by the Legislature. But rather than follow those statutes, he has re-framed and deviated from existing water law in Nevada without Legislative mandate.

Instead, the State Engineer posits that the definition of what constitutes a "hydrographic basin" is a fluid definition that can be changed at his discretion because it is not specifically defined by statute. *See* NSE Answering Brief at 33-35. The State Engineer ignores the statutes, rules, and regulations which have for decades governed water rights in Nevada and which have provided certainty to public entities managing and purveying water such as Lincoln, and private interests in developing water resources such as Vidler. By ignoring the statutory tools for designating basins and curtailing water use within basins cited above, the State Engineer has turned decades of

[3] *See also* NRS 534.030.

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

water law upside down, leaving water-users in limbo and uncertainty as to the development of their permitted rights, procedures, and rules for joint management of basins, and priority of rights in formerly independent basins.

The State Engineer simply states that "[t]here is no language in any prior appropriation case that limits existing rights by Petitioners' concept of a basin." NSE Answering Brief at 32:80-20. In making this statement, the State Engineer ignores the comprehensive statutory scheme and all prior case law which base the adjudication of water rights on their location within a hydrographic basin. *See, e.g.*, *supra* II.A and *infra* II.C (discussing statutory scheme).

C. The State Engineer Historically Manages and Administers Water Pursuant to Legislative Directive Basin-by-Basin.

The State Engineer has traditionally administered and managed groundwater in Nevada basin by basin. The State Engineer's orders going back to 1971 ***designating*** the Muddy River Springs, Lower Meadow Valley Wash, Coyote Springs Valley, Black Mountains, Hidden Valley (North), Garnet Valley and California Wash all indicate he is issuing an order designating and describing the ground water basin and finding that conditions warrant he designate the basin under NRS Chapter 534: "The State Engineer finds that conditions warrant the designation of the Muddy River Springs Area Ground Water Basin, Clark County, Nevada and by this Order designates the following described area of land as a ground water basin coming under the provisions of Chapter 534 NRS (Conservation and Distribution of Under Ground Waters . . . ."

The State Engineer's Orders designating the other basins named above contain the same language. *See* ROA at 670-698 (containing the State Engineer's Orders 392, 803, 905, 2028, 1023, 1024 1025 and 1026 designating Muddy River Springs (Basin No. 219), Lower Meadow Valley Wash (Basin No. 205), Coyote Springs Valley (Basin No. 13-210), Black Mountains (Basin No. 215), Hidden Valley (North) (Basin No. 217), Garnet Valley (Basin No. 216) and California Wash (Basin No 218)); *see also* ROA at 71-72. All the Orders (except Order 392 from July 1971) state the basin is also

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

delineated as a Hydrographic Area on a map titled "State of Nevada Water Resources and Inter-Basin Flows" prepared cooperatively by the Nevada Division of Water Resources and the Geological Survey, United States Department of the Interior and published in September 1971 or state the basin is depicted and defined on Nevada Division of Water Resources, State Engineer's office maps. The September 1971 basin map is in the record. ROA at 9295. The Orders indicate the State Engineer held a hearing as required by NRS 534.030. Thus, for the last 50 years the State Engineer has recognized and separately administered these basins as depicted and defined on the September 1971 map found at ROA 9295. When the State Engineer has determined to designate a basin, he has issued an order such as contained in the record for each individual basin within the LWRFS with the exception of Kane Springs. SNWA's argument that "basin" means a regional area is without merit because the State Engineer's Orders regarding these basins and the maps on file in the State Engineer's office specifically depict, delineate, and define groundwater basins as depicted on the September 1971 map or the State Engineer's orders.

As further evidence of the Legislative mandate to manage each basin as a distinct unit, in 2017, the Legislature enacted NRS 532.167 which requires the State Engineer to prepare a water budget and inventory for each basin in the State. NRS 532.167 provides:

> **Duties: Water budget and inventory.** For each basin located in whole or in part in the State, the State Engineer shall prepare a water budget and calculate and maintain an inventory of water which includes, without limitation:
> 1. The total amount of groundwater appropriated in the basin in accordance with decreed, certified and permitted rights regardless of whether the water appropriations are temporary in nature;
> 2. An estimate of the amount of groundwater used by domestic wells in the basin; and
> 3. An estimate of the amount of all groundwater that is available for appropriation in the basin.

If the Legislature had wanted the State Engineer to administer and manage basins jointly, it certainly would have included language in NRS 532.167 indicating the State

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

Engineer could prepare the water budget and inventory for combined basins. Instead, the Legislature used the words "each basin" in providing the State Engineer's duties for basin water budgets and inventories as recently as 2017.

D. The State Engineer Impermissibly Ignored Prior Rulings, Legislative Direction, and His Own Previous Statutory Interpretations When Issuing Order 1309.

The State Engineer argues that he is entitled to deference regarding his own interpretation of his statutory authority. But this affirmation begs the question, to which of the several, conflicting interpretations of statutory authority should the court give deference? Or should this Court give ANY deference to the State Engineer when his prior orders, rulings, and administrative practice is contrary to the current interpretation including arguments that he is not obligated to follow prior orders and rulings? *See* NSE Answering Brief at 22:26-27.

The Supreme Court has recognized that, with respect to rules and regulations, courts need not "defer to a new interpretation, whether or not introduced in litigation, that creates 'unfair surprise' to regulated parties. . . . That disruption of expectations may occur when an agency substitutes one view of a rule for another." *Kisor v. Wilkie*, 588 U.S. __, 139 S.Ct. 2400, 2418 (2019) (internal citation omitted). Moreover, the "general rule, then, is not to give deference to agency interpretations advanced for the first time in legal briefs." *Id.* at n.6. The Supreme Court applies these deference principles to agency interpretations of statutes as well. *Bowen v. Georgetown Univ. Hosp.*, 488 U.S. 204, 212 (1988) (refusing to grant deference to agency's litigating position on interpretation of statute unsupported by prior "regulations, rulings, or administrative practice.").

In 2019, the State Engineer proposed an amendment to the statutory scheme which would have given him authority to enact regulations regarding, and ultimately combining separate hydrographic basins into a jointly-administered basin.[4] *See*

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[4] The State Engineer argues that this Court should not draw any inferences from the Legislature's refusal to pass the AB 51. Answering Brief at 34:27-28. Although courts are reluctant to draw inferences from a legislature's failure to act, the legislative history

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

Assembly Bill 51 (2019). The basis for the introduction of this bill, as stated by the State Engineer, was because "[p]reviously, under Nevada water law, we have treated surface water and groundwater separately . . . ." Minutes of the Meeting of the Ass. Comm. on Natural Resources, Ag., and Mining, Feb. 27, 2019, Tim Wilson at p. 6. "We have been managing groundwater and surface water separately for over 100 years. . . . Assembly Bill 51 is designed to . . . get some direction from the Legislature as to how best to manage [conflict among existing right holders]." *Id.*, Bradley Crowell at p. 31. Notably, the State Engineer testified that "**existing statute does not provide the framework necessary to effectively implement the Legislature's policy direction.**" *Id.* at p. 32 (emphasis added).

Critically, the State Engineer's interpretation of his statutory authority did not include the authority to adopt rules or regulations governing conjunctive management of groundwater and surface water resources:

> As a continuation of the 2017 policy directive, Assembly Bill 51 proposes two basic first steps: First, it directs the Division of Water Resources to adopt regulations for the conjunctive management of groundwater and surface water resources. Regulations need to be specific to the affected region to account for different hydrologic settings and different manners of use. **The process of developing regulations will include full public and stakeholder participation with full transparency. It is critical that any new regulations for conjunctive management have the benefit of careful consideration and a clear, understandable outcome.** Second, A.B. 51 authorizes the Division of Water Resources to create the programs necessary to develop regulations and effectively implement conjunctive management of groundwater and surface water.

Id. at 32 (emphasis added). The State Engineer goes on to testify about what regulations would be necessary to provide for the conjunctive management. *Id.* In response, at

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of this Bill reflects the State Engineer's prior interpretation of his statutory authority, and this Court can and should consider the legislative history at least for that purpose. That the State Engineer specifically asked for the statutory authority to do what he did in Order 1309 is extremely telling—he did not believe in 2019 that he had the authority to do what he did only months later.

Moreover, the Nevada Supreme Court has expressly determined legislative intent where the Legislature "demonstrated through its silence that Nevada's water law statutes should remain as they have been . . . ." *Pyramid Lake Paiute Tribe v. Washoe Cnty.*, 112 Nev. 743, 749 918 P.2d 697, 700-01 (1996).

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

least one legislator expressed discomfort that "this is essentially giving all the authority to the State Engineer, someone who is not an elected official. This does not have a lot of input from the elected body . . . ." *Id.* at 39, comments of Assemblywoman Hansen. Assembly Bill 51 never became law. Nevertheless, in Order 1309, the State Engineer proved the Legislative fears correct, when without the benefit of statutory authority, he in fact usurped the power that the Legislature refused to give. *See infra* § VII.

In 2019, the State Engineer recognized several critical points: First that he lacked the statutory authority to enact regulations governing conjunctive management. Second, that any rules or regulations must be subject to public and stakeholder participation "with full transparency." And third, that any regulations must provide for a "clear, understandable outcome." Those three points regarding his statutory authority and expressly raised by the State Engineer, conflict with the subsequent interpretation and actions of the State Engineer in this case.

The State Engineer's conflicting interpretations of his own statutory authority undermine any argument that he is entitled to deference. The water statutes were designed to give certainty to water rights. *Mineral Cnty.*, 473 P.3d at 429. By ignoring the legislative grant of authority, the State Engineer has created uncertainty in an already complex statutory scheme.

III. Even If He Had Authority to Create the LWRFS, the State Engineer Treated Kane Springs Differently than the Other Basins in the LWRFS and Failed to Follow Statutory Mandates in Creating the Super Basin and Including Kane Springs.

The State Engineer and other parties argue the State Engineer has the authority to include Kane Springs in the super basin based upon the authority granted to him by NRS 534.030, NRS 534.110 and/or NRS 534.120.[5] They gloss over or ignore the

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[5] Lincoln/Vidler do not believe the State Engineer complied with or performed the analysis required by those statutes to create the super basin in Order 1303, but that occurred prior to Kane Springs being included in the super basin and Lincoln/Vidler's involvement in the LWRFS. Likewise, some parties argue—and the State Engineer indicated in Order 1303—that groundwater rights in the original LWRFS basins, excluding Kane Springs, have been managed jointly since Rulings 6254-6261 were issued in 2014. ROA at 77. Kane Springs was not included in those determinations

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

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402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

statutory requirements for the State Engineer to manage and administer a basin. The State Engineer failed to comply with or perform any of the analysis required by those statutes to include Kane Springs in the super basin—even assuming those statutes provide authority for the State Engineer to create a super basin which Lincoln/Vidler dispute.

The State Engineer previously determined that the Order 1169 pumping caused impacts and therefore he needed to manage basin pumping. This action was in accord with the powers granted under NRS 534.030, NRS 534.110 and NRS 534.120 for management of a basin after the State Engineer first made a determination that pumping is decreasing ground water levels in the basin. The State Engineer did not do any of this analysis for Kane Springs as he is required to do under NRS 534.030, NRS 534.110 and NRS 534.120. There is no evidence that groundwater levels in Kane Springs are being depleted. There is no evidence of over appropriation of water in Kane Springs. The State Engineer ignored the process required by NRS 534.030, NRS 534.110 and NRS 534.120 and included Kane Springs in the super basin because of the impacts to the springs caused by pumping in the over-appropriated Coyote Springs Basin and the Muddy River Springs Area Basin and without any evidence that pumping in Kane Springs would impact the springs or the Muddy River. This is why Lincoln/Vidler complain about the State Engineer's actions and how they have been (mis)treated during this process. The State Engineer performed no analysis allowed by statute for Kane Springs before determining to include it in the super basin even if he had the power to create a super basin, which Lincoln and Vidler dispute.

A. The State Engineer Did Not Follow Statute to Designate Kane Springs as a Basin in Need of Administration.

NRS 534.030 provides two scenarios to initiate basin administration—one in which 40% of the water right holders petition the State Engineer to administer the basin

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and Lincoln and Vidler were not impacted by any such "joint management." Lincoln and Vidler focus their arguments on Kane Springs being included in the super basin by Order 1309.

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and a second in which the State Engineer initiates that process. NRS 534.030(2) is the relevant section in this scenario and provides:

> In the absence of such a petition from the owners of wells in a groundwater basin which the State Engineer considers to be in need of administration, the State Engineer shall hold a public hearing:
> (a) If adequate facilities to hold a hearing are available within the basin; or
> (b) If such facilities are unavailable, hold the hearing within the county where the basin lies or within the county, where the major portion of the basin lies,
> ➥to take testimony from those owners to determine whether administration of that basin is justified. If the basin is found, after due investigation, to be in need of administration the State Engineer may enter an order in the same manner as if a petition, as described in subsection 1, had been received.

There was no process initiated by the State Engineer pursuant to NRS 534.030 to designate Kane Springs as a basin in need of administration. There was no public hearing in Lincoln County prior to Order 1309 to take testimony from the water right holders in Kane Springs to determine whether administration of that basin was justified as explicitly required by NRS 534.030. To date, the State Engineer has not designated the Kane Springs basin pursuant to NRS 534.030. Nor can he under the statutory scheme.

Additionally, numerous parties cite NRS 534.110 and in particular NRS 534.110(6) as authority for the State Engineer to create the LWRFS. NRS 534.110(6) provides:

> Except as otherwise provided in subsection 7, the State Engineer shall conduct investigations in any basin or portion thereof where it appears ***that the average annual replenishment to the groundwater supply may not be adequate for the needs of all permittees and all vested-right claimants,*** and if the findings of the State Engineer so indicate, except as otherwise provided in subsection 9, the State Engineer may order that withdrawals, including, without limitation, withdrawals from domestic wells, be restricted to conform to priority rights.

(Emphasis added).

The State Engineer did not make any average annual replenishment finding with regard to the groundwater supply in Kane Springs or for any other basin he included in

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the LWRFS, and he did not make this finding with regard to the LWRFS as a whole in Order 1309. The State Engineer has already determined the average annual replenishment in Kane Springs is adequate to support the needs of all permittees and all vested-right claimants in the basin. In Ruling 5712, the State Engineer determined the perennial yield for Kane Springs is 1,000 afa. ROA at 712, *see also* ROA at 1063. The perennial yield for Kane Springs was determined taking into account the annual average replenishment for the basin.[6] ROA at 709-713. As the State Engineer noted in Ruling 5712, the perennial yield of a groundwater reservoir is "defined as the maximum amount of ground water that can be salvaged each year over the long term without depleting the ground-water reservoir. The perennial yield cannot be more than the natural recharge to a ground water basin and in some cases is less." ROA at 712. Thus, the evidence supports the State Engineer could not make the determination required by NRS 534.110(6) for Kane Springs to curtail water rights even if the State Engineer had authority to create a super basin, which authority Lincoln and Vidler dispute.

The State Engineer made no attempt to comply with NRS 534.110(6) if he purportedly relied upon that statute as authority for Order 1309. The water supply numbers the State Engineer used to exclude Kane Springs from Order 1169 and Order 1303 were the very same water supply numbers the State Engineer used when he included Kane Springs in the LWRFS. ROA at 43, 76-77, 663. Further, the State Engineer specifically determined in Order 1309 the annual water budget was not to be used to determine water available for development in the LWRFS. ROA at 59. NRS 534.110(6) does not authorize the State Engineer to create super basins based upon purported hydrologic connection and then to order withdrawals to conform to priority rights. He must have made a determination that the average annual replenishment to the groundwater supply of that basin may not be adequate for the needs of all permittees and all vested-right claimants which is not found in Order 1309.

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[6] This also complied with the State Engineer's obligation under statute to identify the inventory for "each basin." *See* discussion at *supra* § II.C.

No other provisions in NRS 435.110 provide authority for the actions taken by the State Engineer. NRS 534.110(1) provides "[t]he State Engineer shall administer this chapter and shall prescribe all necessary regulations ***within the terms of this chapter*** for its administration." (Emphasis added). NRS 534.110(7) does not provide any support for Order 1309 as the State Engineer has not declared the LWRFS as a "critical management area."

B. NRS 534.120 Does Not Provide the State Engineer Authority to Manage Kane Springs as a Designated Basin.

Numerous parties cite NRS 534.120(1) as authority for the State Engineer to create the super basin. NRS 534.120(1) provides:

> ***Within an area that has been designated by the State Engineer, as provided for in this chapter***, where, in the judgment of the State Engineer, ***the groundwater basin is being depleted***, the State Engineer in his or her administrative capacity may make such rules, regulations and orders as are deemed essential for the welfare of the area involved.

(Emphasis added).

As set forth above, the State Engineer has never designated Kane Springs pursuant to NRS 534.030. Nor has the State Engineer ever issued an order, similar to the orders issued by the State Engineer for the other basins in the LWRFS, designating the basin in need of administration.[7] Further, the State Engineer made no determination the Kane Springs groundwater basin is being depleted nor did he make a finding in Order 1309 that the "LWRFS groundwater basin," if he had authority to create such a super basin, is being depleted. To the contrary, the State Engineer found stabilization of spring discharge, steady state conditions in the Warm Springs area spring flow and slight declining water levels in Garnet Valley which were not evident in wells close to the Warm Springs area. ROA at 60, 62-63. There was no finding of decreasing water levels in Kane Springs or the LWRFS to trigger the State Engineer's administrative

[7] *See supra* § II.C (identifying orders designating other basins in the LWRFS).

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

capacity to make rules, regulations, and orders for the welfare of the area involved as provided in NRS 534.120(1).

Instead of performing the investigation and analysis required by NRS 534.030, NRS 534.110 and/or NRS 534.120 to administer and manage water rights and curtail pumping of water rights in a singular basin, which powers the State Engineer clearly possesses, the State Engineer determined to lump basins together centered on *potential* hydrologic connectivity—not any of the prerequisites or requirements of NRS 534.030, NRS 534.110 or NRS 534.120 which trigger the State Engineer's authority. To include Kane Springs, the State Engineer developed six factors as the standard for determining potential hydrologic connectivity after the hearing. He included Kane Springs in the super basin even though the groundwater is not being depleted in Kane Springs and while acknowledging in Order 1309 that water levels in the LWRFS are stabilizing, not decreasing or being depleted.

IV. The State Engineer Unlawfully Reprioritized Water Right Appropriations When He Issued Order 1309.[8]

A. Priority Is Historically Based on Individual Basins.

The State Engineer argues that he did not reprioritize water rights in the LWRFS because the "Legislature left it to the State Engineer to identify basins as a management and planning tool." NSE at 34:11-12. He further states—without legal citation—that it does not matter "in which hydrographic area the junior right holder stakes its claim versus the senior right holder." *Id.* at 35:13-15. Again, this argument ignores the statutes, decades of appropriations, and the State Engineer's own practice.

In granting a water right, the law states that the State Engineer "shall determine whether there is unappropriated water in the area affected and may issue permits only if the determination is affirmative." NRS 534.110(3). The State Engineer grants

[8] The arguments in this section apply equally to the following sections answering briefs: LDS Church Answering Brief at § VII.A.1-2; MVWD Answering Brief at § VI.C; NSE Answering Brief at § II.B; NV Energy Answering Brief at § IV.b; and SNWA Answering Brief at § I.C.

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Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

appropriations based on the available water in a basin. *See, e.g.*, Ruling 5712; ROA 699-721, 713 (application filed to appropriate water in specific hydrographic basin granted "for appropriation from Kane Springs Valley"). And those water rights are administered based on priority within the independent basin. SNWA said it best when it characterized the individual basins comprising the LWRFS as "formerly independent sub-basins." SNWA Answering Brief at 20:18-19. Even SNWA recognizes that the basins were independent—and now they are not. This represents the significant and critical deviation from the priority of water rights in individual basins.

Further, designation of areas and development of critical management plans is done on a basin-by-basin basis as mandated by the Legislature. *See supra*, § II.C. And only water users in a particular basin may petition the State Engineer for administration of that basin. NRS 534.030. Special assessments are based on a particular basin. NRS 534.040(6). Money is allocated by the State Controller based on an individual basin. NRS 534.040(7). Curtailment and forfeiture of rights is based on the water rights in that basin. NRS 534.110; 534.090. And most critically, the forfeiture of rights is specifically based, in part, on the "date of priority of the water right as it relates to the potential curtailment of water use in the basin;" and the "availability of water in the basin . . . ." NRS 534.090(3)(g), (h).

The State Engineer admits in his Answering Brief that water planning and management is based on the definition of a basin or "discrete hydrologic unit." NSE Answering Brief at 33-34. Changing the definition of a basin in which a water right is located, as the State Engineer has done here, necessarily alters the fundamental nature of the right previously granted. One constraint on the State Engineer's view of a basin is how water rights in each hydrographic unit have historically been administered.

Thus, to state that the basin in which a water right is granted has no bearing on priority ignores both statutes and practice. And based upon the State Engineer's actions here, what is to stop him from enlarging the LWRFS super-basin to include the Upper White River Flow System which extends to Elko and beyond, hundreds of miles away?

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402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

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Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

By combining previously individual basins, which had their own priorities, into one large basin the State Engineer has changed the priority of water rights—plain and simple—even if the State Engineer contends there is not a sentence in Order 1309 that adjusts the priority of water rights. *See* NSE Answering Brief at 35:10-12.

B. The Effect of Order 1309 Reprioritized Rights within All Affected Basins.

Numerous parties argue since Order 1309 does not specifically state water rights in the LWRFS will be managed by priority in the future, there has been no reprioritization of rights.[9] This argument contradicts the very arguments these parties make that senior rights are entitled to protection under the prior appropriation doctrine and ignores the significance of Order 1309's 8,000 afa pumping cap. The State Engineer combined seven previously independent basins into one basin for administration and management. ROA at 66. The seven basins have a total of 40,731.83 acre feet of water rights issued including the 1,000 afa issued in Kane Springs. *See* ROA at 8215-8218, State Engineer's exhibit of LWRFS water rights by priority with cumulative duty of 39,731.83 and adding 1,000 acre feet for Kane Springs. The State Engineer has limited pumping in the LWRFS to 8,000 afa. ROA at 66. Simple math indicates there are 32,731.83 acre feet of existing water rights in the LWRFS that will not be able to be pumped under Order 1309. If the State Engineer does not intend to manage water rights in the LWRFS by priority in the future, why will he not sign CSI's subdivision map supported by Coyote Spring and Kane Springs water rights approved for that development?

No party disputes Lincoln/Vidler had the most senior rights in Kane Springs Valley with a priority date of February 14, 2005. ROA at 716 (Ruling 5712 stating at the time of the Ruling there were no other permitted or certificated groundwater rights in Kane Springs Valley). Lincoln/Vidler would be able to pump their rights as the most

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[9] State Engineer Answering Brief at 44; SNWA Answering Brief at 20-24; MVWD Answering Brief at 9-10; Church Answering Brief at 24-28; NV Energy Answering Brief at 7-8; MVIC Answering Brief at 23-24; CBD Answering Brief at 25-29.

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senior in the basin. Based upon the State Engineer's LWRFS water rights by priority exhibit, if water rights are regulated by seniority in the LWRFS, the last rights allowed to be pumped under the 8,000 afa cap have a priority date of March 31, 1983. ROA at 8216. Lincoln/Vidler's rights with a priority date of February 14, 2005 are way below (junior to) the 8,000 afa cap and would only be allowed to be pumped after a cumulative duty of 38,804.73 of existing rights with a priority date of August 25, 2000 ahead of its rights would be allowed to be pumped in the LWRFS. ROA at 8217.

The argument that there has been no reprioritization of rights because Order 1309 did not specifically say water rights in the LWRFS will be managed by priority in the future is disingenuous. All these parties strenuously argue the Court must recognize the prior appropriation doctrine and that junior rights, such as Lincoln/Vidler's rights in the LWRFS, were issued "subject to existing rights." If the State Engineer did **not** regulate by priority in the LWRFS, these parties would contend the State Engineer was violating the prior appropriation doctrine and the requirement that junior water rights are issued "subject to existing rights." The State Engineer reprioritized the seniority of Lincoln/Vidler's water rights by creating the super basin, not allowing Kane Springs to be administered and managed as it has historically been managed as a separate basin per existing law and putting Kane Springs into the LWRFS to be administered and managed as one super basin. The Nevada Supreme Court has specifically indicated that "the public trust doctrine cannot be used as a tool to uproot an entire water system, particularly where finality is firmly rooted in our statutes. We cannot read into the statutes any authority to permit reallocation when the Legislature has already declared that adjudicated water rights are final, nor can we substitute our own policy judgments for the Legislature's." *Min. Cty. v. Lyon Cty.*, 136 Nev. 503, 519, 473 P.3d 418, 430 (2020). That is exactly what the State Engineer did here. He decided that in order to protect the Moapa dace, he needed to manage and administer seven historically managed individual basins, as one basin. He had no statutory authority to do so nor has the Nevada Supreme Court allowed such reprioritization under existing law. *Id.* at 518, 473 P.3d at 429 (the statutory water scheme in Nevada expressly prohibits reallocating adjudicated water rights that have not been abandoned, forfeited, or otherwise lost pursuant to an express statutory provision.) As the Supreme Court noted:

> Municipal, social, and economic institutions rely on the finality of water rights for long-term planning and capital investments. Likewise, agricultural and mining industries rely on the finality of water for capital and output, which derivatively impacts other businesses and influences the prosperity of the state. To permit reallocation would create uncertainties for future development in Nevada and undermine the public interest in finality and thus also the management of these resources consistent with the public trust doctrine.

Id. Thus, any arguments the State Engineer did not reprioritize Lincoln/Vidler's water rights by including Kane Springs in the LWRFS ignores the basin-by-basin approach to management and administration of water enacted by the Nevada Legislature and historically used and recognized by the State Engineer, the law of prior appropriation and effect of Order 1309.

Nothing in statute speaks to a multi-tiered process that leaves thousands of acre feet of water rights in limbo until the State Engineer decides to continue with Phase 2 (which has not been scheduled and which has no criteria for ascertaining relative water rights). *See infra* § VI.B. On this basis alone, Order 1309 should be vacated in its entirety.

V. The State Engineer Did Not Base His Decision to Include Kane Springs in the LWRFS on Substantial Evidence.[10]

The State Engineer's own statements regarding inclusion of Kane Springs in the LWRFS are contradictory and ignore the substantial evidence presented in this case. Although this Court need not "reweigh the evidence," the case law dictates that the Court must consider whether the State Engineer's decision is not just based on evidence, but that the evidence supporting the State Engineer's findings amount to "substantial evidence." *Revert v. Ray*, 95 Nev. 782, 603 P.2d 262, 265 (1979). Critically, the State

[10] The arguments in this Section apply equally to the following sections answering briefs: CBD Answering Brief at § III; LDS Church Answering Brief at § VII.A.1-2; MVWD Answering Brief at § VI.C; NSE Answering Brief at § I.B.2.

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Telephone: (775) 687-0202 Fax: (775) 882-7918
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Engineer must both "resolve all crucial issues presented" and "must prepare findings in sufficient detail to permit judicial review . . . ." *Id.* (internal citation omitted).

A. The State Engineer's "Factual Conclusions" Contradict Each Other and Fail His Own Criteria.

The State Engineer stated the rationale for creating the geographic boundary of the LWRFS as: (1) the presence of a carbonate-rock aquifer underlying the areas; (2) the flat potentiometric surface in the area; (3) the diagnostic groundwater pattern from monitoring wells; and (4) the area-wide diagnostic water level response to pumping. ROA at 47. These criteria indicated a "close hydrologic connection" warranting joint management. ROA at 48. However, a boundary to the "joint management area" would be indicated by a steep hydraulic gradient or where a geologic structure existed. ROA at 49.

The State Engineer found that the water elevations in Kane Springs were "60 feet higher than those observed in the majority of carbonate-rock aquifer wells within the LWRFS to the south" comprising all of the other basins. ROA at 53.[11] Additionally, the State Engineer ignores the evidence of a geologic structure between Kane Springs and the LWRFS. ROA at 53. This is extremely surprising because Order 1309 recognizes significant differences between Kane Springs and the remaining LWRFS. Specifically, the responses in monitoring wells and response to pumping in Kane Springs "is different compared to that exhibited in wells located in the LWRFS, being muted, lagged, obscured by climate response, or compromised by low-resolution data." ROA at 53. The State Engineer ignores the evidence presented that would explain this difference—a geologic structure separating Kane Springs from the LWRFS. *See, e.g.*, ROA 36460.[12] Even the National Parks Service expert (Waddell)—upon whom the

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[11] MVWD's expert indicated this gradient was "flat." MVWD Answering Brief at 12. However, this is based on extrapolating the 60 foot elevation difference over 20 miles rather than proximate to the well readings. ROA 39269 (calculating the gradient between KMW-1 and EH-5). This is likely why the State Engineer disregarded his testimony.

[12] Had the Petitioners known of the State Engineer's criteria before the hearing, they could have provided evidence of the geologic structure to the State Engineer.

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E-Mail Address: law@allisonmackenzie.com

State Engineer relies heavily—agrees that the geologic structure explains the muted connection. *See* ROA 53224. Even the State Engineer initially recognized the existence of the geologic boundary when he issued Ruling 5712 granting Petitioners' water applications. ROA 699-721. But the State Engineer ignores prior rulings and cherry picks the information he wants to meet the criteria released only after the evidentiary hearing. Finally, the State Engineer recognizes that "there is insufficient information available to determine whether the non-carbonate bedrock" indicates a boundary in northern Kane Springs. ROA at 53.

Despite these inconsistencies and the admitted and significant differences between Kane Springs and the remainder of the LWRFS, the State Engineer simply lumped the entirety of Kane Springs into the LWRFS. This was improper because the decision was not based on "substantial evidence."

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B. The State Engineer Relied on Faulty Information to Determine the Correlation between Kane Springs and the LWRFS.

Next, the State Engineer relies on faulty evidence to determine the diagnostic relationship across the area in response to pumping. First, he misstates Petitioner's Opening Brief, stating that they "concede[] that no other expert thought the potential temporary transducer error undermined the data." NSE Answering Brief at 22:23-24. To the contrary, the Opening Brief points out that no other expert "accounted for this transducer error failure of a foot or so." Opening Brief at 30:16-19. The "concession" the State Engineer manufactured is false.

The hydrographs upon which all experts relied "had a high failure rate due to high water temperature in the well, so fluctuations of a foot or less should not be used to infer absolute response." ROA 10141. In contrast, the well in Kane Springs decreased by approximately half a foot. Further, although measurements were taken from 30 wells within the LWRFS during the pump test, the only well relied upon to include Kane Springs was CSVM-4 —the well with faulty readings. Moreover, the opinion relied on in Order 1309 was based on a visual comparison of the hydrographs "because at the time I could not locate the data to actually do the analysis." ROA 53668. But a visual comparison is unreliable and not based on the "best available science."

Further, it is uncontested that the response in Kane Springs to the pumping test was different from any other area. Specifically, experts testified that "you don't see any response when [pumping] turned off during the 1169 aquifer test . . . . And the water levels continue to decline after pumping ends." ROA 53509. This coupled with a lack of increase of water level rise in Kane Springs "indicates that drought has a strong influence on the groundwater elevations . . . ." ROA 36481.

Critically, none of the experts for any other stakeholder performed the critical drawdown analysis for Kane Springs. *See* discussion at *infra* § V.C.2. The State Engineer again ignored this evidence despite its significance.

C. Substantial Evidence Exists that Groundwater Pumping from SNWA, MVWD, the Church, and NV Energy Impacted the Springs—Not Petitioners or Kane Springs.

The substantial evidence indicates that pumping in other basins proximate to the springs caused the impacts identified in Order 1309. And certainly, the State Engineer cannot conclude that pumping by Petitioners in Kane Springs caused any negative impacts—no pumping was conducted.

1. Pumping proximate to the Springs caused the impacts alleged in Order 1309.

The parties to this proceeding who argue the most about groundwater pumping impacting the springs and senior Muddy River rights are the parties who pumped the most water during the Order 1169 pump test impacting the springs. It was SNWA, MVWD, the Church and NV Energy in the Coyote Spring Valley and Muddy River Springs Area basins who pumped the most groundwater during the Order 1169 pump test, and it was their pumping which caused the impacts to the springs. ROA at 8058-8104. Other than LVVWD, the pumping by others in basins such as Garnet Valley or California Wash did not amount to much of the total amount pumped during the Order 1169 pump test and did not compare in volume to the total pumped from Coyote Spring

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E-Mail Address: law@allisonmackenzie.com

Valley and Muddy River Springs Area basins. ROA at 8058-8104. Thus, if there is any pumping that needs to be stopped based upon quantified impacts to the springs and Muddy River senior rights, it is the pumping from wells in the Coyote Spring Valley and Muddy River Springs Area basins in close proximity to the springs and which caused the sharp decline in discharge at the springs. SNWA, the Church, NV Energy, MVIC and MVWD did not appeal the above findings of the State Engineer in Order 1309.

The State Engineer took some action in response to the Order 1169 pump test results and denied pending applications in Coyote Spring Valley and the Muddy River Springs Area. *See* ROA at 726-948 (Rulings 6254-6261 not copied in Master Appendix). The water rights granted to SNWA, MVWD, the Church and NV Energy contain the same permit terms they argue Lincoln/Vidler are subject to, i.e., their permits were issued subject to existing rights. NRS 533.030(1), 534.020(1). Based upon his pump test, the State Engineer could have and should have taken action to shut down groundwater pumping by SNWA, MVWD, the Church and NV Energy in close proximity to the springs and the Muddy River—the very parties who acknowledge Order 1169 test pumping caused impacts to the springs and the Muddy River.

The State Engineer could have taken that action under his basin-by-basin management powers provided in NRS 534.110(6) and NRS 534.120 and to protect the Muddy River Decree right holders pursuant to NRS 533.085 and NRS 533.0245. Instead of recognizing the pumping evidence which they all acknowledge caused the impacts, the State Engineer and SNWA, MVWD, the Church and NV Energy seek to include basins further away, including Kane Springs, with no evidence that pumping from these distal basins causes any impacts to the springs or the Muddy River, and which distal pumping the State Engineer now acknowledges has correlated with stabilization of the springs. There was no pumping from Kane Springs Valley during the Order 1169 pump test, therefore there were no impacts from Kane Springs Valley on the headwaters of the springs or on the Muddy River. The majority of the pumping

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E-Mail Address: law@allisonmackenzie.com

from Garnet Valley during the Order 1169 pump test was by LVVWD. There is no evidence pumping of the smaller quantities of water by the other parties pumping water from that basin impacted the springs or the Muddy River.

2. No evidence from other parties' experts indicates that pumping in Kane Springs will impact the Springs or the Muddy River.

There is no evidence of record that any pumping from Kane Springs will impact the springs or the Muddy River. Lincoln/Vidler asked each expert at the hearing, including those that advocated for the inclusion of Kane Springs in the LWRFS, if the expert had performed any analysis that pumping from Kane Springs would impact the springs or the Muddy River. No expert had performed any such analysis:

a. Center for Biological Diversity did not analyze impact of pumping in Kane Springs on the Muddy River Springs Area. ROA at 53627.

b. City of North Las Vegas did not advocate Kane Springs be included in the LWRFS. ROA at 53581.

c. Moapa Band of Paiute Indians did not calculate the propagation of drawdown from assumed pumping in Kane Springs Valley. ROA at 53277.

d. National Park Service did not investigate if the Kane pumping would impact the Muddy River Springs Area. ROA at 53223.

e. Nevada Cogeneration Associates No. 1 and 2 had three experts and did not calculate drawdowns of the Muddy River Springs Area from Kane Springs pumping nor did they calculate drawdown to the wells owned or controlled by Nevada Cogeneration Associates from pumping the Kane Springs Valley wells. ROA at 53674.

f. NV Energy did not calculate drawdown to the Muddy River Springs Area from pumping Kane Springs Valley wells. ROA at 53732.

g. US Fish and Wildlife Service's two experts, Dr. Halford or Ms. Braumiller, did not do any analysis of Kane Springs pumping impacts on the Muddy River. ROA at 53087.

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Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

h. SNWA was asked by MVWD if SNWA conducted or contracted for any geohydrological studies specific to boundary flows between Kane Springs Valley and Coyote Springs Valley and SNWA answered "no". MVWD clarified the no answer by asking "SNWA didn't conduct or contract to have on its behalf any geohydrological studies in Northern Coyote Springs Valley?" SNWA replied "no." ROA at 53359.

Lincoln/Vidler's water rights located in Kane Springs are now being included in the LWRFS with no evidence pumping of their water rights will impact the springs or the Muddy River. The State Engineer acknowledged as much in Order 1309 by his finding that it is not known if pumping in Kane Springs will impact water resources in the LWRFS. ROA at 55 (Additional hydrologic study is necessary in Kane Springs to determine the degree to which water use in Kane Springs would impact the LWRFS.). This is contrary to the standard used by the State Engineer to determine impacts to the springs and/or the Muddy River for other water right holders in the LWRFS. It is also contrary to law which requires pumping restrictions if pumping causes a conflict with existing rights—not restrictions based upon potential, hypothetical, and speculative impacts as admitted by the State Engineer. ROA at 55.

D. The State Engineer Found No Evidence that Senior Rights Failed to Receive Their Water Allotment and no "Take" Ever Occurred as a Result of Groundwater Pumping.

Finally, the State Engineer has taken severe and unprecedented action in issuing Order 1309 without citing any adverse consequences precipitating the Order. The stated purpose of Order 1309 was to protect senior rights and to protect the Moapa dace, but none of the preliminary orders or rulings cite to even one instance where senior rights did not receive their allotment or where a take of the Moapa dace occurred.

And even if he had made such findings, he then failed to follow the law to curtail pumping in the designated basins. The State Engineer previously designated all the basins in the LWRFS pursuant to NRS 534.030—with the exception of Kane Springs. Nothing in Order 1309 or any other ruling restricts groundwater withdrawals be restricted "to conform to priority of rights" as required by NRS 534.110(6). Instead of

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curtailing pumping based on the priority of rights in individual basins (as required by the statutory scheme), the State Engineer re-defined the term "basin," created the LWRFS, and injured permitted water rights holders in undesignated and unpumped basins such as Kane Springs.

For the foregoing reasons, the decision to include Kane Springs was not based either on the "best available science" or "substantial evidence" and that portion of Order 1309 should be vacated.

VI. The State Engineer Violated Petitioner's Due Process Rights.

The State Engineer gives little concern for (and misstates) the due process violations raised by Lincoln and Vidler in their Opening Brief. *Compare, e.g.*, Petitioners' Opening Brief at 21-25, 40, *with* NSE Answering Brief at 42. The State Engineer incorrectly states that Petitioners' argument is that the hearing was "too short" and that experts were allowed to express new opinions "based upon testimony heard at the hearing." NSE Answering Brief at 42:13-16. Not only does this ignore Lincoln's and Vidler's arguments, but it also demonstrates the failings in the process about which Petitioners complain.

It is axiomatic that a "fair trial in a fair tribunal is a basic requirement of due process. . . . This applies to administrative agencies which adjudicate as well as to courts." *Withrow v. Larkin*, 421 U.S. 35, 46-47 (internal citation omitted).

Petitioners' due process concerns are, in fact, that the State Engineer: (1) failed to follow his own rules for the hearing, changed the rules during the hearing, and created a new legal standard for developing the LWRFS boundary from the evidence presented to which he then applied the evidence; (2) did not give Lincoln and Vidler a full and fair opportunity to be heard; and (3) failed to notify parties that the Order 1303 proceedings may result in a deprivation or fundamental alteration of property rights.

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Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

A. The State Engineer Violated Due-Process in Order 1309 Proceedings by Creating Legal Standards Based on Evidence and Engaging in *Ex Post*, Non-Public Rulemaking.

The State Engineer first asserts that his actions passed constitutional muster because "[n]one of the Petitioners asserts that the State Engineer violated any procedural statute." NSE Answering Brief at 38:19. In the next sentence, he argues that Petitioners "must prove a constitutional violation while overcoming the respect due to **the Legislature's choice of procedure in the unique context of water-rights proceedings.**" *Id.* at 38:20-22 (emphasis added). But as pointed out above, the Legislature approved a completely different procedure for administering over-appropriated basins. Lincoln and Vidler's complaint in these proceedings is that no statute granted the State Engineer authority to do what he did in Order 1309. And there certainly is no statutory "procedure" for what has occurred in Order 1309. The State certainly does not identify any.[13]

During the process that led to the issuance of Order 1309, none of the stakeholders had access to the criteria the State Engineer ultimately used to determine whether a close-hydrologic connection existed to create the LWRFS—the State Engineer identified the legal criteria for redrawing hydrographic basins based on the evidence presented and for the first time when he issued Order 1309. Moreover, the process left all parties in a state of limbo as to their relative priorities in the new super-basin because of the incomplete "multi-tiered" process not contemplated by legislative authority. It is the very lack of procedure about which Lincoln and Vidler complain.

1. The State Engineer impermissibly created rules based on a survey of the evidence rather than statute.

In a terrifying display of partiality, the State Engineer crafted six legal criteria in Order 1309 based on the evidence presented in order to determine the extent of the LWRFS. ROA 48-49. In his Answering Brief, the State Engineer admits he "surveyed

[13] This is additional evidence, if any were needed, that the State Engineer exceeded his statutory authority.

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Telephone: (775) 687-0202 Fax: (775) 882-7918
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the extensive evidence presented to him to determine the best criteria for making the scientific finding that an area has a uniquely close connection to the rest of the LWRFS." NSE Answering Brief at 41:24-26. He compares this to a court surveying caselaw to determine what is the best test to apply to a set of facts. *Id.* at 41:23-24. The State Engineer's argument reflects a fundamental misunderstanding regarding the adjudication process and suggests that he created criteria for redrawing basin boundaries in an outcome-based strategy rather than by applying facts to a pre-determined legal standard.

"The Due Process Clause forbids an agency to use evidence in a way that forecloses an opportunity to offer a contrary presentation." *Eureka Cnty. v. State*, 359 P.3d 1114, 1120 (Nev. 2015). When a legal standard is based on the evidence presented, rather than disclosed prior to presentation of evidence, the participants are prevented from offering a meaningful, contrary presentation. Moreover, the standard developed based on a survey of evidence is prone to bias and improper influence. To state that a legal standard is based on the evidence presented, and then to apply the evidence to the legal standard created is circular at best. Any evidence can amount to "substantial evidence" if the law for applying the evidence is created from the evidence itself. Unsurprisingly, case law does not reflect any legal standard developed from a "survey of the evidence."

2. The State Engineer's incomplete rulemaking including the "multi-tiered process" for super-basin administration violates fundamental principles of due process and democratic principles of governance.

The State Engineer admits that Order 1309 did not "establish a management policy governing the LWRFS" and argues that the yet-to-be-determined "manner of managing the uniquely connected sub-basins within the LWRFS" will be based upon input of all parties with an interest. NSE Answering Brief at 17-18. SNWA also argues that priority will be determined according to a yet-to-be-released standard developed during Phase 2. SNWA Answering Brief at 21:9. In other words, although the State

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402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

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402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

Engineer created the LWRFS as a super-basin, no stakeholder has any idea what management of that basin will look like because the State has made no subsequent efforts to create any policies, rules, or regulations governing its management—nor has it released a timeframe for doing so. The "interested parties" are left with unanswered questions that the State Engineer failed to address including, according to the parties who argue no priorities have been set yet in the super basin, who has priority in the LWRFS? Do priorities change if places of diversion are changed to different sub-basins within the LWRFS? What are the criteria for changing places of diversion to different sub-basins?

The State Engineer's answer to all of this is that he is not bound to follow the Administrative Procedures Act. NSE Answering Brief at 38. While true that the exemption from NRS 233B applies in most instances,[14] the State Engineer is not exempt from the due process violations of incomplete or deferred decision-making.

The Nevada Supreme Court has stated that "the status of water rights should be readily determinable from the public record." *Town of Eureka v. State Engineer*, 108 Nev. 163, 169, 826 P.2d 948 (1992). That Court further invalidated a decision of the State Engineer regarding permit changes where he left for future determination a management and mitigation plan. *Eureka Cnty.*, 359 P.3d at 1120. The State Engineer ignores this case entirely, and SNWA argues that it does not apply here. SNWA Answering Brief at 24-25. Both parties ignore the fact that Order 1309 is a stand-apart order not governed by any statutory guidelines or elucidated management principles. There is no framework from which Petitioners can work, no timeframe for issuance of further guidance, and no rules governing priority. Order 1309, in violation of principles of due process recognized by the Nevada Supreme Court, impermissibly defers decision-making on critical issues and should be declared void for that reason.

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[14] Some rulemaking is expressly included within the APA. NRS 533.365(7).

B. The State Engineer Violated Principles of Due Process by Refusing to Grant Parties a Full and Fair Opportunity to be Heard During the Hearing Process.

The State Engineer gives short-shrift to Petitioners' complaint that the hearing process employed by the hearing officer did not give them a full and fair opportunity to be heard, simply stating that Petitioners' claim the hearing was "too short." NSE Answering Brief at 42. But the complaint has nothing to do with the brevity of the hearing process, but the refusal by the hearing officer to give parties a full and fair opportunity to be heard.[15] Due process requires a "full opportunity to be heard, . . . and the State Engineer must clearly resolve all the crucial issues presented . . . ." *Revert v. Ray*, 95 Nev. 782, 787, 603 P.2d 262 (1979).

Not only were Petitioners unaware of the standard the State Engineer would employ, but the rules of the hearing also changed throughout the process. Despite being told that experts would be held and limited to the opinions in written reports, their opinions changed through the hearing, and the hearing officer refused to hold experts to the scope of their reports. *See* Petitioners' Opening Brief at 40. Moreover, the participants were given a limited opportunity to present evidence. *Id.* Finally, the State Engineer refused to resolve a motion to strike evidence that violated the hearing officer's stated rules. *Id.* All these actions violated principles of due process as stated in *Revert v. Ray*.

C. Lincoln and Vidler Had No Notice that the State Engineer Was Going to Refuse to Follow Ruling 5712—the Only Water Appropriated in Kane Springs.

The State Engineer avers in his Answering Brief that he does not have to follow Ruling 5712. NSE Answering Brief at 22. This is the only position the State Engineer could take since he contradicted nearly every factual finding and conclusion in Ruling 5712 which granted the only appropriation in Kane Springs Valley.

[15] Notably, the Petitioners could not have had a full and fair opportunity to be heard because, as pointed out in the previous section, Petitioners were unaware of upon what criteria the State Engineer would base his decision. The State Engineer only developed the legal standard for super-basin boundaries based on the evidence presented.

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Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

"An elementary and fundamental requirement of due process in any proceeding which is to be accorded finality is notice reasonable calculated, under all the circumstances, to apprise interested parties of the pendency of the action and afford them an opportunity to present their objections." *Mullane v. Central Hanover Tr. Co.*, 339 U.S. 306, 314 (1950).

Nothing in Order 1303 put Lincoln and Vidler on notice that its appropriated water rights under Ruling 5712 in Kane Springs Valley were in jeopardy of losing their priority. Nothing in Order 1303 put Lincoln and Vidler on notice that the State Engineer would take the position that he did have to follow a previous State Engineer's Ruling and determinations in a contested proceeding which adjudicated Lincoln/Vidler's water right applications and granted them property rights. Order 1303 said nothing about Kane Springs, and all previous rulings from the State Engineer (including Ruling 5712) specifically excluded Kane Springs from the LWRFS. For those reasons, Petitioners' due process rights were violated and Order 1309 should be vacated.

VII. The State Engineer Violated the Separation of Powers by Usurping Legislative Functions and Exceeding His Authority.

Petitioners argue that the State Engineer usurped the Legislative power by exceeding the scope of the comprehensive water statutes. Petitioners' Opening Brief at 24-25. The State Engineer's position is that Petitioners do "not point to any statute that delegates truly legislative power to the State Engineer without suitable standards." NSE Answering Brief at 43:16-17. But the State Engineer exceeded his legislative mandate by ignoring the comprehensive statutory scheme and by the creation of the six criteria to determine the boundaries of the LWRFS under Order 1309.

The State Engineer ignores the caselaw which provides that a complete legislative enactment must establish the standards the agency is to employ and must "guide the agency with respect to the . . . power authorized." *Sheriff v. Luqman*, 101 Nev. 149, 153-54, 697 P.2d 107 (1985).

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In this case, the State Engineer has no standards for defining the boundaries of a super-basin, having created them from "a survey of the evidence." The Legislature certainly provided no standards for "conjunctive management" of water rights. NRS 533.024(1)(e). And the Legislature refused to provide guidance to the State Engineer by failing to adopt Assembly Bill 51 in 2019, demonstrating "through its silence that Nevada's water law statutes should remain as they have been . . . ." *Pyramid Lake Paiute Tribe*, 112 Nev. at 749.

Therefore, the State Engineer usurped the Legislative power by issuing Order 1309, and the Order should be vacated for that reason.

VIII. The 8,000 afa Cap on Pumping Is Arbitrary.

The State Engineer, NV Energy, the Church, MVWD and SNWA contend the 8,000 afa pumping cap imposed by the State Engineer in the LWRFS by Order 1309 was based upon substantial evidence.[16] NV Energy, the Church and MVWD generally argue the State Engineer relied upon the testimony of experts to support his 8,000 afa cap and merely repeat statements made by the State Engineer in Order 1309 to support their arguments. These parties do not point to or cite any evidence of record relied upon by the State Engineer in Order 1309 to support his 8,000 afa pumping cap.

Furthermore, these statements recited from Order 1309 do not support the State Engineer's 8,000 afa pumping cap conclusion and the only numbers close to 8,000 afa in Order 1309 mischaracterized the expert's report or were developed outside the record and after the hearing. The State Engineer noted the acceptable pumping caps of the experts on page 61 of Order 1309 who recommended pumping at 9,318 afa, 11,400 afa, 10,000 afa or 4,000-6,000 afa. ROA at 62-63. Except for SNWA's recommendation, all the experts' acceptable pumping caps were substantially above 8,000 afa. As set forth in Lincoln/Vidler's Opening Brief, the only evidence cited in this section of Order 1309 which mentions 7,000-8,000 afa pumping and stabilization of spring discharge

[16] State Engineer Answering Brief at 23-26; NV Energy Answering Brief at 8-9; the Church Answering Brief at 19-24; MVWD Answering Brief at 18-19; and SNWA Answering Brief at 45-54.

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E-Mail Address: law@allisonmackenzie.com

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Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

misstates the expert's statements in the report. The NV Energy report cited in footnote 326 of Order 1309 (ROA at 63, n. 326) does not conclude that only 7,000-8,000 afa can continue to be pumped. ROA at 41882. The report uses the 7,000-8,000 afa pumping amount to determine there is no 1:1 depletion ratio from groundwater pumping to impacts to the Muddy River. ROA at 41882. That paragraph of the NV Energy report concludes that groundwater pumping in certain areas of the LWRFS will have less impacts on the Muddy River than other areas of pumping. ROA at 41882. No party addressed the State Engineer's misuse of the 7,000 – 8,000 afa figure cited in NV Energy's report in their Answering Briefs.

In Order 1309, the State Engineer also stated on page 55 that pumping from the carbonate rock aquifer since the completion of the aquifer test has consistently ranged between 7,000 and 8,000 but does not cite to any evidence supporting that statement. ROA at 56. The evidence the State Engineer cites in the sentences right before this unsupported statement provides average pumping figures for the LWRFS which are 12,635 afa in 2013-2014 and 9,318 afa in 2015-2017. ROA at 56. The State Engineer then indicates that pumping inventories for 2018 ***which were published after the completion of the hearing***, report a total of 8,300 afa. ROA at 56. The pumping inventories published after the completion of the hearing appear to be the only evidence which could possibly correlate to the State Engineer's arbitrary 8,000 afa cap, but that evidence was outside the hearing and the record in this case. Thus, there is no evidence of record, let alone substantial evidence of record, to support the 8,000 afa pumping cap arbitrarily picked by the State Engineer in Order 1309. Finally, the State Engineer's 8,000 afa cap is inconsistent with his other finding in Order 1309 that distributed pumping since the completion of the aquifer test ***in excess of 8,000 afa*** has correlated with a stabilization of spring discharge. ROA at 60. We don't know if that distributed pumping is 12,635 afa, 9,318 afa or the evidence outside the record of 8,300 afa. That is why Order 1309 must be vacated because we have no idea what evidence the State Engineer purportedly relied upon to support his conclusions.

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The State Engineer cites to evidence in his Answering Brief that is not cited by the State Engineer in Order 1309 to support the argument the State Engineer's 8,000 afa pumping cap is supported by substantial evidence. *See* State Engineer's Answering Brief at 24-26. The Nevada Supreme Court has specifically held a district court errs in relying upon the State Engineer's post review brief to supply missing findings. *Revert v. Ray*, 95 Nev. 782, 787, 603 P.2d 262, 265 (1979) (district court erred in looking to post-review brief filed by the State Engineer to supply missing findings on adverse possession issue). For this Court to perform a proper judicial review and not merely rubber stamp the State Engineer's determination, it must review the evidence relied upon by the State Engineer to make sure his findings are supported by substantial evidence and support the conclusion reached. The State Engineer's findings must be provided in sufficient detail to permit judicial review. *Id.* The State Engineer providing the citations to evidence in the record in his Answering Brief he may have relied upon to make his findings is not appropriate because it supplies the evidence the State Engineer purportedly relied upon after the fact. Because the purported evidence to support his determination was not provided in the Order, this procedure does not allow the Court to determine whether the evidence is "that which a reasonable mind might accept as adequate to support a conclusion." *Bacher v. State Engineer*, 122 Nev. 1110, 1121, 146 P.3d 793, 800 (2006). On appeal, a reviewing court must "determine whether the evidence upon which the engineer based his decision supports the order." *State Engineer v. Morris*, 107 Nev. 699, 701, 819 P.2d 203, 205 (1991) (citing *State Engineer v. Curtis Park*, 101 Nev. 30, 32, 692 P.2d 495, 497 (1985)). We don't know what that evidence is because the State Engineer did not cite to the evidence he purportedly relied upon to support his order. For these reasons, Order 1309 should be vacated.

Even if the Court could rely upon the evidence of record citations contained in the State Engineer's Answering Brief to support the 8,000 afa cap contained in Order 1309, the record citations provided by the State Engineer in his Answering Brief do not support his arguments and statements in his Answering Brief:

a. State Engineer Answering Brief states: "Based on all that, he found that 8,000 afa appropriately balanced two contradictory factors: (1) data showing that current pumping levels had led to the slowing of groundwater decline and (2) certain warning signs for future groundwater movement", citing ROA at 64, 10928, 10930, 34695-34696 and 53070 as the record that supports that analysis. State Engineer Answering Brief at 24:22-25. ROA at 64 is the State Engineer's conclusion in Order 1309 that water pumping has declined since completion of the pump test, is approaching 8,000 afa and this coincides with the period of time when spring discharge may be approaching steady state. There are no citations to any portion of the record in this paragraph. Pages 10928 and 10930 of the record are from the federal agencies' 2013 report after the Order 1169 pump test and relate to observed results to Pederson springs levels from the aquifer test pumping; pages 34695-34696 are from the City of North Las Vegas expert's report discussing the conceptual yield of groundwater in Garnet Valley, recommends additional pumping in Garnet Valley and merely recites certain conclusions from earlier 1169 reports which do not include Kane Springs as part of the LWRFS (*see* ROA at 34651); and page 53070 is testimony from the USFWS expert regarding climate conditions and water levels in basins not in the LWRFS, i.e., Dry Lake, Delamar and Tule Desert. None of this evidence cited supports the State Engineer's analysis as framed in the State Engineer's Answering Brief.

b. State Engineer Answering Brief states: "But the LWRFS's defining features are the uniquely close connections between its sub-basins—including Kane Springs Valley—and the shared single source of water." State Engineer Answering Brief at 25:9-11, citing ROA at 63 and footnote 4. ROA at 63 contains paragraphs discussing whether there will be continued spring flow decline and concludes further data collection is needed to further refine the amount of groundwater that can be pumped over the long term. Footnote 4 cites ROA 749 (Ruling 6254 denying water right applications in Coyote Spring Valley and discussing the hydrologic connection between 5 basins—Coyote Spring Valley, Muddy River Springs Area, Hidden Valley,

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Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

Garnet Valley and California Wash—which does not include Kane Springs); page 10888 (federal agencies' 2013 test pump report conclusions which do not include Kane Spring Valley in the study area of the report); page 42174 (SNWA response to Lincoln/Vidler report discussing the Northern Kane Springs fault and has no discussion regarding uniquely close connections of the sub-basins); and page 48740 (USFWS hydrographs of CSVM-4 and KMW-1). Again, the record cited by the State Engineer does not support his statement in his Answering Brief.

c. State Engineer Answering Brief states: "Substantial evidence supports the finding that pumping in one location in the LWRFS affects the groundwater supply and spring flow throughout it," citing ROA at 64-65, 10888, 48740 and 52899. State Engineer Answering Brief at 25:11-13. Order 1309 at ROA 64-65 discusses movement of water rights and that pumping from different locations in the LWRFS is not homogeneous; page 10888 is the federal agencies' 2013 Order 1169 test pump report conclusions which do not include Kane Spring Valley in the study area of the report; page 48740 is the USFWS' hydrographs of CSVM-4 and KMW-1; and page 52899 is Nevada Cogeneration's post hearing brief citing Kane Springs Ruling 5712 out of context. A post hearing brief is not evidence.

d. State Engineer Answering Brief states: "Kane Springs was always hydrologically connected to the rest of the LWRFS." citing ROA at 53, 52899 and 53170. State Engineer Answering Brief at 25:22-23. Order 1309 at 53 is the State Engineer's discussion of the evidence he relies upon to include Kane Springs in the LWRFS. Lincoln/Vidler discussed this evidence at length in their Opening Brief at 29-33. Page 52899 is Nevada Cogeneration's post hearing brief citing Kane Springs Ruling 5712 out of context. As indicated above, a post hearing brief is not evidence. Page 53170 is Dr. Waddell's testimony discussing MX-5 and seasonal Muddy River Springs Area pumping and Dr. Waddell's testimony refusing to opine that CSVM-4 and KMW-1 are "well connected" as the rest of the LWRFS and are only "connected."

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402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

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402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

e. State Engineer Answering Brief states: "There was substantial evidence that if a larger proportion of the junior water rights already granted in the LWRFS were pumped, that would significantly interfere with senior decreed rights to the Muddy River." citing ROA at 8-9, 10890 and 10928-10930. State Engineer's Answering Brief at 26:16-18. ROA at 8-9 in Order 1309 summarizes various parties' reports discussing their 2013 opinions from the Order 1169 pump test that ***pending*** applications at that time should not be granted and other reports concluded additional water could be developed in certain areas of the study area; Page 10890 was the federal agencies' 2013 Order 1169 test pump report conclusions that no water was available for appropriation for the ***pending*** applications held in abeyance which did not include Kane Spring Valley in the study area of the report; and pages 10928-10930 of the record are from the federal agencies' report in 2013 after the Order 1169 pump test and relate to observed results to Pederson springs levels from the aquifer test pumping in Coyote Springs Basin from MX-5. Thus, even if the State Engineer's Answering Brief could be used to supply citations to the record that are missing from Order 1309, the citations to the record made by the State Engineer in his Answering Brief do not support his arguments and statements.

SNWA's Answering Brief also for the most part recites the State Engineer's findings in Order 1309 to support its argument the 8,000 afa pumping cap is supported by substantial evidence. *See* SNWA's Answering Brief at 45-52. At footnote 165, SNWA cites to transcript testimony in which it contends experts debated whether impacts from the pump test had stabilized. None of this testimony is cited by the State Engineer in Order 1309 at ROA 58-64 and none of this testimony is cited by the State Engineer in his Answering Brief to support the 8,000 afa pumping cap. SNWA then summarily concludes "Thus, substantial evidence supports that 8,000 afa is the upper limit on the amount of water that can be safely pumped in the LWRFS based on existing data. SNWA Answering Brief at 46-47. There is no correlation to experts debating whether impacts from the pump test had stabilized and that 8,000 afa is the upper limit on the amount of water that can be safely pumped in the LWRFS based on existing data. SNWA contends "the State Engineer relied upon decades of pumping data, observed flows in the Muddy River and extensive scientific study to support his conclusion." SNWA Answering Brief at 47:16-18. However, nowhere in that section of its brief does SNWA state where that evidence is cited by the State Engineer in Order 1309 to support the 8,000 afa pumping cap or provide any cites to evidence in the record to support that statement.

Finally, SNWA argues Lincoln/Vidler confuse three separate limitations to groundwater pumping (unappropriated water, conflicts and public interest citing to NRS 533.370(2)) in making their arguments that the pumping cap is discriminatory and contrary because it ignores their wells are 22 miles from the Muddy River and the springs. SNWA Answering Brief at 49:3-17. SNWA thus concludes the 8,000 afa regional cap is proper and movement of individual water rights will be considered case-by-case under Order 1309, the two concepts work together and are not in conflict with each other. SNWA Answering Brief at 49:13-17.

SNWA's argument is fatally flawed and highlights the reasons why the State Engineer's Order 1309 must be vacated because it is unlawful. NRS 533.370(2) governs the analysis the State Engineer must make in granting groundwater right applications. Lincoln/Vidler's water applications have already been granted. The State Engineer already made the determinations required by NRS 533.370(2) when he granted Lincoln/Vidler's applications in 2007 finding: (1) there was unappropriated water available notwithstanding the arguments there was no water available in the regional water supply, (2) there were no conflicts with existing rights even though NPS argued Kane Springs should be included in Order 1169 and granting the applications would impact existing rights downgradient, and (3) granting the applications would not impact the Moapa dace or the Muddy River. ROA at 712-713, 716, 718-719. SNWA's argument requires the State Engineer reevaluate the NRS 533.370(2) criteria as to Lincoln/Vidler's vested water rights already granted based upon the State Engineer's

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

creation of the super basin. There is no statutory authority allowing the State Engineer to reallocate and reconsider vested water rights already granted under the provisions of NRS 533.370(2) which govern the grant of initial water right applications. The Nevada Supreme Court agreed in *Min. Cty. v. Lyon Cty.*, 136 Nev. 503, 518-519, 473 P.3d 418, 429-430 (2020) (the statutory water scheme in Nevada expressly prohibits reallocating adjudicated water rights that have not been abandoned, forfeited, or otherwise lost pursuant to an express statutory provision.)

SNWA's arguments further highlight why Order 1309 is discriminatory and unworkable. Lincoln/Vidler have no need to move their water rights or for their rights to be addressed further under the State Engineer's determination to review future applications for the movement of water rights in the LWRFS on a case-by-case basis. ROA at 64-66. Lincoln/Vidler's points of diversion in the newly created LWRFS are some of the most distal from the springs and the Muddy River. There is no evidence in the record that Lincoln/Vidler's pumping of their water rights in Kane Springs will impact the springs or the Muddy River. The evidence of hydrologic connection between Kane Springs and the rest of the LWRFS south of northern Coyote Spring Valley is "very attenuated" and based upon faulty data. The State Engineer admitted as much in Order 1309 when he stated inclusion of Kane Springs in the LWRFS "provides the opportunity for conducting additional hydrologic studies in sub-basins such as these [Kane Springs], ***to determine the degree to which water use would impact water resources in the LWRFS***". ROA at 55. There has been no pumping from Kane Springs which has impacted the springs or contributed to declining water levels in the original super basin or current stabilizing water levels. Thus, arguments the 8,000 afa pumping cap is appropriate because it is a proper regional limit and movement of individual water rights will be considered on a case-by-case basis, show Order 1309 is discriminatory and unworkable for Kane Springs because there is no correlation that pumping from Kane Springs impacted the springs or Muddy River during the pump test and Lincoln/Vidler have no need to move their water rights

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

For the foregoing reasons, the State Engineer's Order 1309 must be vacated

IX. Order 1309 Is Based on Non-Existent Liability for an ESA Take That Has Never Occurred—The ESA Provides No Authority to Uproot Established Water Law Procedures.

The CBD, NV Energy and SNWA[17] accept the State Engineer's analysis of his potential liability under the Endangered Species Act ("ESA"). Notably, the State Engineer's Answering Brief failed to address the legal arguments questioning his authority to consider and make an order on the ESA. In Order 1309, the State Engineer appears to conclude he and groundwater users in the LWRFS would be subject to strict liability for a "take" resulting from the State Engineer's permitted water use. However, Courts have rejected theories of "per se" liability under the ESA for government officials issuing water permits as the State Engineer appears to impose upon himself in Order 1309. *Aransas Project v. Shaw*, 775 F.3d 641, 659 (5th Cir. 2014) (the court's rule establishing proximate cause from "authorizing" any activity that "caused" a take creates liability far beyond the contours of current ESA case law.) Proximate cause and foreseeability are required to affix liability for ESA violations, and the United States Supreme Court has rejected the application of strict liability for ESA violations that are unlimited by causal connection. *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*, 515 U.S. 687, 700 (1995) (ESA statute "should be read to incorporate ordinary requirements of proximate causation and foreseeability"), cited in *Aransas Project v. Shaw*, 775 F.3d 641, 656–57 (5th Cir. 2014).

In *Aransas*, the Fifth Circuit Court of Appeals overturned the district court's erroneous analysis of causation based upon the issuance of water permits. *Aransas Project*, 775 F.3d at. The Court stated: "The district court either misunderstood the relevant liability test or misapplied proximate cause when it held the state defendants responsible for remote, attenuated, and fortuitous events following their issuance of water permits." *Id.* The Fifth Circuit observed:

[17] CBD Answering Brief at 4-14; NV Energy Answering Brief at 9-10; and SNWA Answering Brief at 27-30.

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

> The court concluded in the very next paragraph to one of these citations that "[p]roximate causation exists where a defendant government agency authorized the activity that caused the take." *Id.* at 786. This is an erroneous view of proximate cause standards. Taken at face value, the court's statement eliminates "proximate" from "proximate cause" whenever a governmental entity's licensing activity is involved in a "take."

Aransas at 658. The Fifth Circuit noted the district court failed to consider direct relationship and foreseeability in its proximate causation analysis:

> The district court's formulation and its ensuing opinion ignore both of those concepts, as it nowhere mentions remoteness, attenuation, or the natural and probable consequences of actions. Nowhere does the court explain why the remote connection between water licensing, decisions to draw river water by hundreds of users, whooping crane habitat, and crane deaths that occurred during a year of extraordinary drought compels ESA liability.

Aransas at 658-659. The Fifth Circuit stated the district court either misunderstood the relevant liability test or misapplied proximate cause when it held the state defendants responsible for remote, attenuated, and fortuitous events following their issuance of water permits. *Id.* at 656.

The Court noted the state's control over water usage is at a macro, not a micro level. Surface water is the property of the state, subject to the vested property rights of landowners. *Texas Water Rights Comm'n v. Wright,* 464 S.W.2d 642, 647 (Tex.1971). *Aransas* at 662. The State had no control over who used their water rights and who did not and the reasons why permit holders used or did not use their water. Other users, such as domestic users, did not need permits. The Court observed that even more unpredictable and uncontrollable were the forces of nature. In that case, the weather, tides, and temperature conditions dramatically affect salinity within and throughout the bay. *Id.* The Court rejected liability based upon modeling and estimation in expert reports, such as presented in this case, which provided no basis of foreseeability based upon non-specific, conditional, predictive statements. *Id.* at 660-661. The Court observed: "The lack of foreseeability or direct connection between TCEQ permitting and crane deaths is also highlighted by the number of contingencies affecting the chain

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

of causation from licensing to crane deaths. The contingencies are all outside the state's control and often outside human control." *Id.* at 661-662. The Fifth Circuit Court of Appeals concluded:

> Contingencies concerning permittees' and others' water use, the forces of nature, and the availability of particular foods to whooping cranes demonstrate that only a fortuitous confluence of adverse factors caused the unexpected 2008–2009 die-off found by the district court. This is the essence of unforeseeability.

Id. Accordingly, the Court determined finding proximate cause and imposing liability on the State defendants in the face of multiple, natural, independent, unpredictable, and interrelated forces affecting the cranes' estuary environment goes too far under the ESA. *Id.* at 663.

As Georgia-Pacific and Republic's Opening Brief at 30 and Georgia-Pacific and Republic's Answering Brief at 4-5 set forth, there are factors other than spring flows that are more meaningful regarding the survival of the Moapa dace, including the documented impact of invasive species found in the record in this proceeding. Further, the CBD's Answering Brief at 11:22-28 and 12:9-14 appears to acknowledge that Lincoln/Vidler's Biological Opinion provides protection from Section 9 "take" liability. Lincoln/Vidler do not agree to or with the State Engineer's assumption of liability under the ESA based solely on the issuance of groundwater permits in the LWRFS.

CBD and SNWA argue the State Engineer is required to consider the Moapa dace under his public interest responsibilities pursuant to NRS 533.370, and that is exactly what he did when he issued Ruling 5712 granting Petitioners' water rights in Kane Springs. ROA 701-02. That statute governs applications to appropriate water. The Nevada Supreme Court addressed this issue in *Min. Cty. v. Lyon Cty.*, 136 Nev. 503, 519, 473 P.3d 418, 430 (2020) and specifically rejected the argument made by CBD and SNWA here. In *Min. Cty. v. Lyon Cty.*, the Supreme Court held Nevada's comprehensive water statutes are consistent with the public trust doctrine. *Id.* at 517, 473 P.3d at 429. First, Nevada's statutes regulating water use require the State Engineer

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

to consider the public interest in allocating water rights. *Id.* at 513-514, 473 P.3d at 426-427. Next, the statutory scheme ensures that the State is fulfilling its continuous public trust duties because water usage is constrained to uses that are necessary and the statutory scheme terminates water rights when water is not used beneficially. *Id.* at 514, 473 P.3d at 427. Water rights may be abandoned, and the State Engineer is permitted to declare preferred uses and regulate groundwater in the interest of the public welfare. *Id.* at 515. However, the Supreme Court refused to allow a reallocation of water rights based upon the public trust doctrine as SNWA and CBD urge here. The Court stated the State's water statutes recognize the importance of finality in water rights and therefore do not permit reallocation of adjudicated water rights. *Id.* at 517, 473 P.3d at 429. The Supreme Court concluded:

> Nonetheless, this does not necessarily mean that water rights can be reallocated under the public trust doctrine. Rather, it means that rights holders must continually use water beneficially or lose those rights. We therefore hold that the public trust doctrine does not permit reallocating water rights already adjudicated and settled under the doctrine of prior appropriation.

Id. at 518–19, 473 P.3d at 430. Finally, the Supreme Court indicated "the public trust doctrine cannot be used as a tool to uproot an entire water system, particularly where finality is firmly rooted in our statutes. We cannot read into the statutes any authority to permit reallocation when the Legislature has already declared that adjudicated water rights are final, nor can we substitute our own policy judgments for the Legislature's." *Id.* at 519, 473 P.3d at 430. Thus, the Supreme Court has specifically rejected reallocation of water rights based upon public trust motives. The State Engineer's creation of the super basin which results in the reallocation of water rights in the LWRFS for public trust reasons cannot stand.

NV Energy cites to *Cappaert v. United States*, 426 U.S. 128 (1976) to support the State Engineer's actions in this case. *Cappaert* is inapposite because it involved enforcement of a senior reserved water right held by the United States when it established Devil's Hole as a national monument which senior reserved right the State

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

Engineer refused to recognize. The State Engineer allowed local junior groundwater right holders to pump their rights which lowered water in an underground pool in the national monument below a certain level necessary to preserve the pool's scientific value and implement the Presidential Proclamation. The Supreme Court upheld the injunction enjoining junior groundwater pumping that would lower the water level below a certain level necessary to preserve the fish based on the United States' reservation of water necessary to the purpose of the national monument reservation. *Id.* at 147. This case does not involve a senior reserved water right held by the United States for the Moapa dace which the State Engineer refused to recognize and therefore, the *Cappaert* case is not relevant

There are practical consequences resulting from the State Engineer's assumption of liability under the ESA which will impede private mitigation measures for protection of the Moapa dace. By operating outside his jurisdiction and overlooking any mitigation agreed to by the USFWS with water right holders, the State Engineer has effectively halted any monetary and water right mitigation measures any party might be willing to provide to mitigate impacts to the Moapa dace. No one will agree to mitigation measures with the USFWS in the future if the State Engineer can ignore the mitigation measures agreed to by the USFWS or Biological Opinions issued by the USFWS so the water right holder can pump its ground water rights. The State Engineer's actions in this case to assume liability for himself under the ESA and ignore the monetary and water right mitigation measures parties have made in this case for protection of the Moapa dace underscores why the State Engineer needs to stay within the scope of his jurisdiction under the Nevada water law statutes and not inject himself and permitted water right holders into areas outside his jurisdiction by his orders purportedly made to manage and administer water rights. Lincoln/Vidler agree with Georgia Pacific and Republic "the State Engineer has no authority to determine when and whether a 'take' could occur under the ESA, failed to provide due process regarding this issue and regarding factual findings affecting the dace, and arbitrarily applied those

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

findings to all groundwater use and users within the consolidated basin regardless of location" and regardless of mitigation measures agreed to by the USFWS and a water right holder. *See* Georgia Pacific and Republic Opening Brief at 31.

X. Broad, Sweeping Statements Made by Certain Petitioners Should Be Disregarded by the Court.

Various petitioners make broad sweeping statements in their answering briefs about the scope of the State Engineer's powers, pumping impacts in the LWRFS and the State Engineer's findings in Order 1309. For example, SNWA contends the State Engineer has authority over all water in the State. SNWA Answering Brief at 14:7-8.[18] Some Petitioners contend any groundwater pumping in the LWRFS impacts Muddy River senior rights and/or the Moapa dace. SNWA Answering Brief at 33; CBD Answering Brief at 3:1-3, 26:12-13. SNWA contends the State Engineer found no discrete aquifers had been proven to exist in the LWRFS. SNWA Answering Brief at 34. The Church contends "pumping in one basin affects the available water in another basin." Church Answering Brief at 26:12-13. As explained in more detail below, the Court should be very cautious in accepting such broad generalizations which are not supported by the evidence of record in this case or the law cited in support of such generalizations.

A. The State Engineer's Authority over All Waters Is Limited by the Legislative Enactment.

SNWA cites to NRS 533.030(1) to support its statement the State Engineer has authority over all water in the State. However, NRS 533.030(1) provides that subject to existing rights, all water in the State may be appropriated for beneficial use as provided in Chapter NRS 533. This statute says nothing about the State Engineer's authority over all water in the State and in fact directs the State Engineer to grant

[18] *See also* NSE Answering Brief at 3:7-8.

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

appropriations for all water in the State for beneficial use subject to existing rights. The citation does not support SNWA's statement.[19]

B. The State Engineer Found Evidence that Discrete Aquifers Exist.

As another example, SNWA states: "While the State Engineer recognized discrete aquifers may conceptually exist within the LWRFS, he found none had been proven to exist." SNWA Answering Brief at 34:3-4, citing to ROA at 54. However, a review of ROA 54 reveals the State Engineer stated: "The State Engineer finds that while information such as that provided by Bedroc is convincing and supports a finding that local, potentially discrete aquifers may exist in parts of the northern Coyote Springs Valley, his criteria for defining the LWRFS calls for the inclusion of the entirety of the basin in the LWRFS." ROA at 54. Nowhere in that sentence did the State Engineer state discrete aquifers may conceptually exist within the LWRFS but he finds none have been proven to exist as SNWA contends. The State Engineer found just the opposite, that is, that Bedroc's evidence was convincing and supported a finding that local, potentially discrete aquifers may exist in northern Coyote Springs Valley. ROA at 54.

C. Nothing In the Answering Briefs Support Contentions that the State Engineer Previously Amended Basin Boundaries or Jointly Managed Discrete Basins.

Statements made by NV Energy in its Answering Brief to support its argument the State Engineer has changed basin boundaries or managed basins together are not supported by NV Energy's citations in its Answering Brief. For instance, NV Energy argues the State Engineer has previously changed basin boundaries. *See* page 7 of NV Energy's Answering Brief and footnotes 27, 28 and 29. Ruling 995 referenced in footnote 27 to support the statement the State Engineer has amended basin boundaries numerous times and has broken out numerous subareas as the need for separate regulation has arisen does not mention basin boundaries, regulation of basin boundaries and that subareas are broken out as the need for separate regulation has arisen. Ruling

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[19] For further discussion of the State Engineer's statutory authority, *see supra* § II.

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

995 involved applications to appropriate water in an over appropriated area that the State Engineer denied because the applications would adversely impact existing rights in the nearby area. The Ruling mentions the Oreana subarea but did not discuss anything about a subarea being created for separate regulation or that the State Engineer was amending basin boundaries. The citation does not support NV Energy's statement.

NV Energy stated on page 7 of its Answering Brief the State Engineer has managed several basins together based on hydrologic connection citing the entire Reconnaissance Series Report 27 in footnote 28 as support for that statement. Reconnaissance Series Report 27 involves the Meadow Valley Area, refers to it as a drainage area, and takes notice that water flowing through a basin from above that is utilized, would not be available for appropriation in a basin below. Reconnaissance Series Report 27 does not manage basins together based on hydrologic connection, does not reprioritize rights, and in fact confirms that basins are managed separately in Nevada.

On page 7 of its Answering Brief, NV Energy refers to the entire report entitled "Water for Nevada, Nevada Division of Water Resources Water Planning Report 3, 1971" in footnote 29, claiming "The State Engineer is not bound to use the same basin boundaries that in existed in 1971 . . . ," Lincoln/Vidler did not find any statement or reference to that idea anywhere in this report.

D. The State Engineer Made No Finding that Any Pumping within the LWRFS Impacts Muddy River or the Moapa dace.

As the final example, SNWA and CBD broadly state that any pumping in the LWRFS impacts Muddy River senior water right holders and/or the Moapa dace. However, that is not what the evidence from the Order 1169 pump test showed. As the State Engineer recites in Order 1309: "For instance, the Order 1169 aquifer test demonstrated that pumping 5,290 afa from the carbonate rock aquifer wells in ***Coyote Spring Valley***, caused a sharp decline in discharge at the springs but distributed pumping since the completion of the aquifer test in excess of 8,000 afa has correlated

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

with a stabilization of spring discharge." (Emphasis added) ROA at 60, *see also* ROA at 7, 10 ("that the impacts of aquifer tests pumping in ***Coyote Spring Valley*** was widespread throughout the Order 1169 test area and that the additional pumping in ***Coyote Spring Valley*** was a significant contributor to the decline in the springs that serve as the headwaters of the Muddy River and habitat for the Moapa dace;" (emphasis added)). Similar findings were made by the State Engineer with regard to alluvial and carbonate pumping from the Muddy River Springs Area affecting Muddy River flows. ROA at 65. The State Engineer concluded "pumping from locations within the LWRFS that are distal from the Warm Springs area can have a lesser impact on spring flow than pumping from locations more proximal to the springs." ROA at 60. The State Engineer recognized that drawdown from Garnet Valley may not yet have propagated to the Muddy River Springs Area. ROA at 63. The State Engineer found "there remains some uncertainty as to the extent that distance and location relative to other capturable sources of discharge either delay, attenuate, or reduce capture from the springs." ROA at 60. Thus, there has been no finding made by the State Engineer that pumping from any location within the LWRFS impacts the springs or the Moapa dace and it is certainly not true that pumping from Kane Springs impacts the springs or Moapa dace. Similarly, there is no evidence of record that "pumping in one basin affects available water in another basin" as the Church broadly proclaims.

The Court should disregard such broad, sweeping statements not supported by the record or by law in making its determinations in this case.

XI. Conclusion

The State Engineer's actions in Order 1309 are a significant departure from and refusal to follow legislative mandates and the comprehensive statutory scheme—the actions of the State Engineer exceed his statutory authority and should be vacated. In violation of Nevada Supreme Court precedent, Order 1309 impermissibly reprioritized water rights within the seven, previously-independent basins.

Order 1309 also violated Lincoln's and Vidler's due process rights by creating legal standards only after the hearing and based on "a survey of the evidence" rather than any law or legislative approval. The State Engineer violated due process standards by changing the hearing rules midstream and by failing to give Petitioners a full and fair opportunity to be heard. And the hearing notice was constitutionally inaccurate because it failed to give Petitioners notice that their senior property rights were in jeopardy.

The State Engineer's decision to include Kane Springs in the LWRFS is not based on "substantial evidence" required by law, and his 8,000 afa cap on pumping is arbitrary. The State Engineer's factual conclusions were contradictory and relied on faulty information. No pumping in Kane Springs caused any impact on the springs or Moapa dace. And no evidence demonstrated any impact to senior water rights or the Moapa dace implicating the Endangered Species Act.

For those reasons and as shown in Lincoln/Vidler's Opening Brief, this Court should vacate Order 1309. Order 1309's findings as to Kane Springs must be vacated. Kane Springs should continue to be administered in accordance with the basin specific statutory scheme set out by the Legislature.

DATED this 11th day of January, 2022.

LINCOLN COUNTY DISTRICT ATTORNEY
181 North Main Street, Suite 205
P.O. Box 60
Pioche, Nevada 89043
Telephone: (775) 962-8073

/s/ Dylan V. Frehner
DYLAN V. FREHNER #9020
Email: dfrehner@lincolncountynv.gov

GREAT BASIN LAW
1783 Trek Trail
Reno, Nevada 89521
Telephone: (775) 770-0386

/s/ Wayne O. Klomp
WAYNE O. KLOMP #10109
Email: wayne@greatbasinlawyer.com

*Attorneys for **Lincoln County Water District***

ALLISON MacKENZIE, LTD.
402 North Division Street
Carson City, Nevada 89703
Telephone: (775) 687-0202

/s/ Karen A. Peterson
KAREN A. PETERSON #366
Email: kpeterson@allisonmackenzie.com

Attorneys for ***Vidler Water Company, Inc.***

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

CERTIFICATE OF COMPLIANCE

We hereby certify that we have read the foregoing Reply Brief and to the best of our knowledge, information and belief, it is not frivolous or interposed for any improper purpose. We further certify that this brief complies with all applicable Nevada Rules of Appellate Procedure, in particular NRAP 28(e), which requires every assertion in the brief regarding matters in the record to be supported by appropriate references to the record on appeal. We further certify that this brief is proportionately spaced, has a typeface of 14 points or more, and contains 17, 449 words. The Court determined the parties do not have to comply with the type-volume limitations stated in NRAP 32(a)(7). We understand that we may be subject to sanctions in the event that the accompanying brief is not in conformity with the requirements of Nevada Rules of Appellate Procedure.

DATED this 11th day of January, 2022.

LINCOLN COUNTY DISTRICT ATTORNEY
181 North Main Street, Suite 205
P.O. Box 60
Pioche, Nevada 89043
Telephone: (775) 962-8073

/s/ Dylan V. Frehner
DYLAN V. FREHNER, ESQ.
Nevada State Bar No. 9020
Email: dfrehner@lincolncountynv.gov

~ and ~

GREAT BASIN LAW
1783 Trek Trail
Reno, Nevada 89521
Telephone: (775) 770-0386

/s/ Wayne O. Klomp
WAYNE O. KLOMP, ESQ.
Nevada State Bar No. 10109
Email: wayne@greatbasinlawyer.com

Attorneys for Petitioner, **LINCOLN COUNTY WATER DISTRICT**

///

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

ALLISON MacKENZIE, LTD.
402 North Division Street
Carson City, NV 89703
Telephone: (775) 687-0202

/s/ Karen A. Peterson
KAREN A. PETERSON, ESQ.
Nevada State Bar No. 366
Email: kpeterson@allisonmackenzie.com

Attorneys for Petitioner **VIDLER WATER COMPANY, INC.**

CERTIFICATE OF SERVICE

Pursuant to NRCP 5(b), I hereby certify that I am an employee of ALLISON MacKENZIE, LTD., Attorneys at Law, and that on this date, I caused a true and correct copy of the foregoing document to be served on all parties to this action by electronic service to the participates in this case who are registered with the Eighth Judicial District Court's Odyssey eFileNV File & Service system to this matter.

I hereby certify that I caused a true and correct copy of the foregoing document to be served via FedEx as follow:

Clark County District Court
Attn: Hon. Bita Yeager – District. Ct. Dept. 1
Court Administration – 2nd Floor
200 Lewis Avenue
Las Vegas, NV 89101

DATED this 11th day of January, 2022.

/s/ Nancy Fontenot
NANCY FONTENOT

4868-0268-1609, v. 1

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

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Steven D. Grierson
CLERK OF THE COURT

ROA

DYLAN V. FREHNER, ESQ.
Nevada State Bar No. 9020
LINCOLN COUNTY DISTRICT ATTORNEY
181 North Main Street, Suite 205
P.O. Box 60
Pioche, Nevada 89043
Telephone: (775) 962-8073
Email: dfrehner@lincolncountynv.gov

WAYNE O. KLOMP, ESQ.
Nevada State Bar No. 10109
GREAT BASIN LAW
1783 Trek Trail
Reno, Nevada 89521
Telephone: (775) 770-0386
Email: wayne@greatbasinlawyer.com

KAREN A. PETERSON, ESQ.
Nevada State Bar No. 366
ALLISON MacKENZIE, LTD.
402 North Division Street
Carson City, Nevada 89703
Telephone: (775) 687-0202
Email: kpeterson@allisonmackenzie.com

Attorneys for Petitioners, LINCOLN COUNTY WATER DISTRICT and VIDLER WATER COMPANY, INC.

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

DISTRICT COURT

CLARK COUNTY, NEVADA

LAS VEGAS VALLEY WATER DISTRICT, and SOUTHERN NEVADA WATER AUTHORITY, et al.,	Case No. A-20-816761-C
	Dept. No. 1
Petitioners,	Consolidated with Cases: A-20-817765-P A-20-818015-P A-20-817977-P A-20-818069-P A-20-817840-P A-20-817876-P A-21-833572-J
vs.	
ADAM SULLIVAN, P.E., Acting Nevada State Engineer, et al.,	
Respondent.	

_________________________________/

LINCOLN COUNTY WATER DISTRICT AND VIDLER WATER COMPANY, INC.'S MASTER RECORD ON APPEAL CITED IN OPENING, ANSWERING AND REPLY BRIEFS
<u>(VOLUME 1 OF 3)</u>

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ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

Petitioners, LINCOLN COUNTY WATER DISTRICT ("LINCOLN") and VIDLER WATER COMPANY, INC. ("VIDLER"), by and through their counsel, DYLAN V. FREHNER, LINCOLN COUNTY DISTRICT ATTORNEY, WAYNE O. KLOMP of GREAT BASIN LAW, and KAREN A. PETERSON of ALLISON MacKENZIE, LTD., submit their Master Record on Appeal cited in their Opening, Answering and Reply Briefs in support of their Petition for Judicial Review.

The attached documents constitute excerpts from the Record on Appeal cited in LINCOLN/VIDLER's Opening, Answering and Reply Briefs in support of their Petition for Judicial Review.

DESCRIPTION	SE ROA NO.
Volume 1	2 – 4945
Volume 2	8058 – 36591
Volume 3	36689 – 54520

AFFIRMATION

The undersigned does hereby affirm that the foregoing **DOES NOT** contain the social security number of any person.

DATED this 11th day of January, 2022.

LINCOLN COUNTY DISTRICT ATTORNEY
181 North Main Street, Suite 205
P.O. Box 60
Pioche, Nevada 89043
Telephone: (775) 962-8073

/s/ Dylan V. Frehner
DYLAN V. FREHNER #9020
Email: dfrehner@lincolncountynv.gov

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///

///

GREAT BASIN LAW
1783 Trek Trail
Reno, Nevada 89521
Telephone: (775) 770-0386

/s/ Wayne O. Klomp
WAYNE O. KLOMP #10109
Email: wayne@greatbasinlawyer.com

Attorneys for ***Lincoln County Water District***

ALLISON MacKENZIE, LTD.
402 North Division Street
Carson City, Nevada 89703
Telephone: (775) 687-0202

/s/ Karen A. Peterson
KAREN A. PETERSON #366
Email: kpeterson@allisonmackenzie.com

Attorneys for ***Vidler Water Company, Inc.***

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

CERTIFICATE OF SERVICE

Pursuant to NRCP 5(b), I hereby certify that I am an employee of ALLISON MacKENZIE, LTD., Attorneys at Law, and that on this date, I caused a true and correct copy of the foregoing document to be served on all parties to this action by electronic service to the participates in this case who are registered with the Eighth Judicial District Court's Odyssey eFileNV File & Service system to this matter.

I hereby certify that I caused a true and correct copy of the foregoing document to be served via FedEx as follow:

Clark County District Court
Attn: Hon. Bita Yeager – District. Ct. Dept. 1
Court Administration – 2nd Floor
200 Lewis Avenue
Las Vegas, NV 89101

DATED this 11th day of January, 2022.

/s/ Nancy Fontenot
NANCY FONTENOT

4871-7479-1433, v. 1

IN THE OFFICE OF THE STATE ENGINEER
OF THE STATE OF NEVADA

#1309

ORDER

DELINEATING THE LOWER WHITE RIVER FLOW SYSTEM HYDROGRAPHIC BASIN WITH THE KANE SPRINGS VALLEY BASIN (206), COYOTE SPRING VALLEY BASIN (210), A PORTION OF BLACK MOUNTAINS AREA BASIN (215), GARNET VALLEY BASIN (216), HIDDEN VALLEY BASIN (217), CALIFORNIA WASH BASIN (218), AND MUDDY RIVER SPRINGS AREA (AKA UPPER MOAPA VALLEY) BASIN (219) ESTABLISHED AS SUB-BASINS, ESTABLISHING A MAXIMUM ALLOWABLE PUMPING IN THE LOWER WHITE RIVER FLOW SYSTEM WITHIN CLARK AND LINCOLN COUNTIES, NEVADA, AND RESCINDING INTERIM ORDER 1303

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I. BACKGROUND OF THE ADMINISTRATION OF THE LOWER WHITE RIVER FLOW SYSTEM BASINS

WHEREAS, the State Engineer has actively managed and regulated the Coyote Spring Valley Hydrographic Basin (Coyote Spring Valley), Basin 210, since August 21, 1985; the Black Mountains Area Hydrographic Basin (Black Mountains Area), Basin 215, since November 22, 1989; the Garnet Valley Hydrographic Basin (Garnet Valley), Basin 216, since April 24, 1990; the Hidden Valley Hydrographic Basin (Hidden Valley), Basin 217, since April 24, 1990; the California Wash Hydrographic Basin (California Wash), Basin 218, since April 24, 1990; and the

Muddy River Springs Area Hydrographic Basin (Muddy River Springs Area), Basin 219, since July 14, 1971.[1]

WHEREAS, in 1984, the United States Department of Interior, Geological Survey (USGS), Water Services Division, proposed a ten-year investigation into carbonate-rock aquifers that underlay approximately 50,000 square miles of eastern and southern Nevada.[2] In 1985, a program for the study and testing of the carbonate-rock aquifer system of eastern and southern Nevada was authorized by the Nevada Legislature. In 1989, a report was published by the USGS summarizing the first phase of the study.[3] Included in the summary was a determination that:

> Large-scale development (sustained withdrawals) of water from the carbonate-rock aquifers would result in water-level declines and cause the depletion of large quantities of stored water. Ultimately, these declines would cause reductions in the flow of warm-water springs that discharge from the regional aquifers. Storage in other nearby aquifers also might be depleted, and water levels in those other aquifers could decline. In contrast, isolated smaller ground-water developments, or developments that withdraw ground water for only a short time, may result in water-level declines and springflow reductions of manageable or acceptable magnitude.
>
> Confidence in predictions of the effects of development, however, is low; and it will remain low until observations of the initial hydrologic results of development are analyzed. A strategy of staging developments gradually and adequately monitoring the resulting hydrologic conditions would provide information that eventually could be used to improve confidence in the predictions.[4]

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[1] *See* NSE Ex. 9, *Order 905*, Hearing on Interim Order 1303, official records of the Division of Water Resources. *See* NSE Ex. 8, *Order 1018*, Hearing on Interim Order 1303, official records of the Division of Water Resources. *See* NSE Ex. 5, *Order 1025*, Hearing on Interim Order 1303, official records of the Division of Water Resources. *See* NSE Ex. 6, *Order 1024*, Hearing on Interim Order 1303, official records of the Division of Water Resources. *See* NSE Ex. 4, *Order 1026*, Hearing on Interim Order 1303, official records of the Division of Water Resources. *See* NSE Ex. 7, *Order 1023*, Hearing on Interim Order 1303, official records of the Division of Water Resources; NSE Ex. 11, *Order 392*, Hearing on Interim Order 1303, official records of the Division of Water Resources.

[2] Memorandum dated August 3, 1984, from Terry Katzer, Nevada Office Chief, Water Resources Division, United States Department of Interior Geologic Survey, Carson City, Nevada to Members of the Carbonate Terrane Study.

[3] Michael D. Dettinger, *Distribution of Carbonate-Rock Aquifers in Southern Nevada and the Potential for their Development, Summary of Findings, 1985-1988*, Summary Report No. 1, U.S. Geological Survey, Department of Interior and Desert Research Institute, University of Nevada System, 1989, p. Forward. *See also* NSE Ex. 3, *Order 1169*, Hearing on Interim Order 1303, official records of the Division of Water Resources.

[4] *Id.*, p. 2.

WHEREAS, beginning in 1989 and through the early 2000s, numerous groundwater applications were filed in Coyote Spring Valley, Black Mountains Area, Garnet Valley, Hidden Valley, California Wash, and Muddy River Springs Area Hydrographic Basins seeking to appropriate more than 300,000 acre-feet annually (afa) of groundwater from the carbonate-rock aquifer underlying these basins.[5] The State Engineer held a hearing on July 12-20, 23-24, and August 31, 2001, for pending Applications 54055–54059, filed by Las Vegas Valley Water District (LVVWD) to appropriate 27,510 afa of water in Coyote Spring Valley.[6] The State Engineer conducted a hearing on Coyote Springs Investments LLC (CSI) Applications 63272–63276 on August 20-24, 27-28, 2001.[7]

WHEREAS, following the conclusions of these hearings, the State Engineer issued Order 1169 on March 8, 2002, requiring all pending applications in Coyote Spring Valley, Black Mountains Area, Garnet Valley, Hidden Valley, Muddy River Springs Area, and Lower Moapa Valley Hydrographic Basin (Basin 220), be held in abeyance pending an aquifer test of the carbonate-rock aquifer system to better determine whether the pending applications and future appropriations could be developed from the carbonate-rock aquifer.[8]

WHEREAS, in Order 1169, the State Engineer found that he did not believe that it was prudent to issue additional water rights to be pumped from the carbonate-rock aquifer until a significant portion of the then existing water rights were pumped for a substantial period of time to determine whether the pumping of those water rights would have a detrimental impact on existing water rights or the environment.[9]

WHEREAS, Order 1169 required that at least 50%, or 8,050 afa, of the water rights then currently permitted in Coyote Spring Valley be pumped for at least two consecutive years.[10] On April 18, 2002, the State Engineer added the California Wash to the Order 1169 aquifer test basins.[11]

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[5] *See* NSE Exs. 14–20, *Ruling 6254–Ruling 6260*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[6] *See* NSE Ex. 14.
[7] *Id.*
[8] *See* NSE Ex. 3.
[9] *Id.*
[10] *Id.*
[11] *See* State Engineer's Ruling 5115, dated April 18, 2002, official records of the Division of Water Resources.

WHEREAS, subsequent to the issuance of Order 1169, the United States Fish and Wildlife Service (USFWS) expressed concern that current groundwater pumping coupled with additional groundwater withdrawals in Coyote Spring Valley and California Wash may cause reduction of spring flow to the Warm Springs area, tributary thermal springs in the upper Muddy River, which serves as critical habitat to the Moapa dace (*Moapa corciacea*), an endemic fish species federally listed as endangered in 1967.[12] Due to these concerns, on April 20, 2006, the Southern Nevada Water Authority (SNWA), USFWS, CSI, the Moapa Band of Paiute Indians (MBOP) and the Moapa Valley Water District (MVWD) entered into a Memorandum of Agreement (MOA).[13]

WHEREAS, the MOA stated that all the parties shared "a common interest in the conservation and recovery of the Moapa dace and its habitat." The MOA established certain protections to the Moapa dace, including protocols relating to pumping from the regional carbonate-rock aquifer that may adversely impact spring flow to the dace habitat in the Warm Springs area. Specifically, the MOA identified conservation measures, which included protections for minimum instream flows in the Warm Springs area with trigger levels set at 3.2 cubic feet per second (cfs) at the Warm Springs West gage requiring initial action by the MOA parties, and the most stringent action required at a flow rate of 2.7 cfs.[14]

WHEREAS, the MBOP raised concerns that pumping 8,050 afa from the Coyote Spring Valley as part of the aquifer test would adversely impact the water resources at the Warm Springs area, and consequently the Moapa dace, and that the impacts would persist such that protective measures established in the MOA would be inadequate to protect the dace.[15] As a result, the Order 1169 study participants, which included the LVVWD, SNWA, CSI, Nevada Power Company,[16] MVWD, Dry Lake Water Company, LLC, Republic Environmental Technologies, Inc. (Republic),

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[12] USFWS, *Fish and Aquatic Conservation - Moapa dace*, https://bit.ly/moapadace (last accessed June 3, 2020). *See also* SNWA Ex. 8, p. 1-1.
[13] *See* NSE Ex. 236, *2006 Memorandum of Agreement between the Southern Nevada Water Authority, United States Fish and Wildlife Service, Coyote Springs Investment LLC, Moapa Band of Paiute Indians and Moapa Valley Water District*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[14] *Id.*
[15] *See* May 26, 2010, letter from Darren Daboda, Chairperson, Moapa Band of Paiutes, to Jason King, Nevada State Engineer, official records of the Division of Water Resources.
[16] Nevada Power Company, following the merger with Sierra Pacific Power Company and Sierra Pacific Resources subsequently began doing business as NV Energy. *See, e.g.*, NV Energy, *Company History*, https://bit.ly/NVEhistory (last accessed April 20, 2020).

Chemical Lime Company, Nevada Cogeneration Associates, and the MBOP, or their successors, agreed that even if the minimum 8,050 afa was not pumped, sufficient information would be obtained to inform future decisions relating to the study basins.[17]

WHEREAS, on November 15, 2010, the Order 1169 aquifer test began, whereby the study participants began reporting to the Nevada Division of Water Resources (Division) on a quarterly basis the amounts of water pumped from wells in the carbonate-rock and alluvial aquifers during the pendency of the aquifer test.

WHEREAS, on December 21, 2012, the State Engineer issued Order 1169A declaring the completion of the Order 1169 aquifer test to be December 31, 2012, after a period of 25½ months. The State Engineer provided the study participants the opportunity to file reports with the Division until June 28, 2013, to present information gained from the aquifer test in order to estimate water to support applications in the Order 1169 study basins.[18]

WHEREAS, during the Order 1169 aquifer test, an average of 5,290 acre-feet per year (afy) was pumped from carbonate-rock aquifer wells in Coyote Spring Valley, and a cumulative reported total of 14,535 afy of water was pumped throughout the Order 1169 study basins. Of this total, approximately 3,840 afy was pumped from the Muddy River Springs Area alluvial aquifer with the balance pumped from the carbonate-rock aquifer.[19]

WHEREAS, during the aquifer test, pumpage was measured and reported from 30 other wells in the Coyote Spring Valley, Muddy River Springs Area, Garnet Valley, California Wash, Black Mountains Area, and Lower Meadow Valley Wash Hydrographic Basin (Lower Meadow Valley Wash). Stream diversions from the Muddy River were reported, and measurements of the natural discharge of the Muddy River and from the Warm Springs area springs were collected daily. Water-level data were collected from a total of 79 monitoring and pumping wells within the Order 1169 study basins. All of the data collected during the aquifer test were made available to each of the study participants and the public.[20]

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[17] *See* July 1, 2010, letter from Jason King, Nevada State Engineer, to Order 1169 Study Participants, official records of the Division of Water Resources.
[18] *See* NSE Ex. 2, *Order 1169A*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[19] *See, e.g.*, NSE Ex. 1, Appendix B.
[20] *See* Division, *Water Use and Availability – Order 1169*, https://bit.ly/Order1169

WHEREAS, during the Order 1169 aquifer test, the resulting water-level decline encompassed 1,100 square miles and extended from southern Kane Springs Valley, northern Coyote Spring Valley through the Muddy River Springs Area, Hidden Valley, Garnet Valley, California Wash, and the northwestern portion of the Black Mountains Area.[21] The water-level decline was estimated to be 1 to 1.6 feet throughout this area with minor drawdowns of 0.5 foot or less in the northern portion of Coyote Spring Valley north of the Kane Springs Wash fault zone.[22]

WHEREAS, results of the two-year aquifer test demonstrated that pumping 5,290 afa from the carbonate-rock aquifer in Coyote Spring Valley, in addition to the other carbonate-rock aquifer pumping in Garnet Valley, Muddy River Springs Area, California Wash and the northwest portion of the Black Mountains Area, caused sharp declines in groundwater levels and flows in the Pederson and Pederson East springs, two springs considered to be sentinel springs for the overall condition of the Muddy River due to being higher in altitude than other Muddy River source springs, and therefore are proportionally more affected by a decline in groundwater level in the carbonate-rock aquifer.[23] The Pederson spring flow decreased from 0.22 cfs to 0.08 cfs and the Pederson East spring flow decreased from 0.12 cfs to 0.08 cfs. Additional headwater springs at lower altitude, the Baldwin and Jones springs, declined approximately 4% in spring flow during the test.[24] All of the headwater springs contribute to the decreed and fully-appropriated Muddy River and are the predominant source of water that supplies the habitat of the endangered Moapa dace.

WHEREAS, Order 1169A provided the study participants an opportunity to submit reports addressing three specific questions presented by the State Engineer: (1) what information was obtained from the study/pumping test; (2) what were the impacts of pumping under the pumping test; and, (3) what is the availability of additional water resources to support the pending applications. SNWA, USFWS, National Park Service (NPS) and Bureau of Land Management

[21] USFWS Ex. 5, *Report in Response to Order 1303*, Hearing on Interim Order 1303, official records of the Division of Water Resources, pp. 21, 67. *See, e.g.*, NSE Ex. 14. *See also* NSE Ex. 256, *Federal Bureaus Order 1169A Report*, Hearing on Interim Order 1303, official records of the Division of Water Resources. There was no groundwater pumping in Hidden Valley, but effects were still observed in the Hidden Valley monitor well.
[22] *See, e.g.*, NSE Ex. 14. *See also* NSE Ex. 256.
[23] *See* NSE Ex. No. 236.
[24] NSE Ex. 256, pp. 43–46, 50–51. *See also*, USGS, *Water Data for Nevada*, https://bit.ly/nvwater.

(BLM), MBOP, MVWD, CSI, Great Basin Water Network (GBWN) and Center for Biological Diversity (CBD) submitted either reports or letters.

WHEREAS, in its report, SNWA addressed water levels throughout the Order 1169 basins. SNWA acknowledged that hydrologic connectivity supported the potential need for redistribution of existing pumping, and indirectly acknowledged the limitation on availability of water to satisfy the pending applications.[25] SNWA further acknowledged declines to spring flow in the Pederson and Pederson East springs as a result of the aquifer test, but characterized the decline in spring flow at the Warm Springs West location as minimal. SNWA further correlated the declining trends as associated with climate but opined that Muddy River flow did not decline as a result of the aquifer test and carbonate-rock aquifer pumping; rather, impact to Muddy River flows were due to alluvial aquifer pumping.[26]

WHEREAS, CSI, through a letter, agreed with SNWA's report and asserted that additional water resources could be developed within the Coyote Spring Valley north of the Kane Springs Fault, which supported granting new appropriations of water.[27]

WHEREAS, the United States Department of Interior Bureaus (USFWS, NPS and BLM) concluded that the aquifer test provided sufficient data to determine the effects of the aquifer drawdown as well as identify drawdown throughout the region and was sufficient to project future pumping effects on spring flow. Based upon their analysis, the Department of Interior Bureaus concluded that water-level declines due to the aquifer test encompassed 1,100 square miles throughout the Order 1169 study basins. Additionally, the Department of Interior Bureaus' analysis found a direct correlation between the aquifer test pumping and flow declines at Pederson, Plummer and Apcar units and Baldwin Spring, all springs critical to the Moapa dace habitat, and asserted that pumping at the Order 1169 rate at well MX-5 in Coyote Spring Valley could result in both of the high-altitude Pederson and Pederson East springs going dry in 3 years or less.[28]

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[25] *See* NSE Ex. 245, *Southern Nevada Water Authority Order 1169 Report*, Hearing on Interim Order 1303, official records of the Division of Water Resources, pp. 23–25.
[26] *Id.*
[27] NSE Ex. 247, *Coyote Springs Investments, LLC Order 1169 Report*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[28] *See, e.g.*, NSE Ex. 14, pp.15–18. *See also* NSE Ex. 256.

WHEREAS, the Department of Interior Bureaus further found that the groundwater withdrawals that occurred in Coyote Spring Valley during the Order 1169 aquifer test represented approximately one-third of the then existing water rights within Coyote Spring Valley, concluding that even one-third of the existing water rights could not be developed without adversely impacting spring flow to the headwaters of the Muddy River and habitat for the Moapa dace.[29] Ultimately, the Department of Interior Bureaus concluded that there was insufficient water available for the pending applications, and that the area that was subject to the Order 1169 aquifer test behaved as one connected aquifer and pumping in one basin would have similar effects on the whole aquifer.[30]

WHEREAS, MBOP's report disagreed with the magnitude of drawdown resulting from the Order 1169 aquifer test, but ultimately concluded carbonate-rock aquifer pumping in Coyote Spring Valley and the Muddy River Springs Area would have a one-to-one impact on Muddy River flows.[31] MBOP opined to the existence of a southern flow field, which included California Wash, Hidden Valley, Garnet Valley, and the northwest portion of the Black Mountains Area, that could be developed without depleting spring flows. MBOP also argued that changes in the groundwater levels were directly tied to water level declines in Lake Mead.[32]

WHEREAS, MVWD's report was limited to water levels and flows within the Muddy River Springs Area. In its report, MVWD acknowledged the groundwater level declines resulting from the aquifer test, including decreased spring flow at the Pederson springs, Warm Springs West gage and Baldwin Spring, but not at Jones Spring or Muddy Spring.[33] Ultimately, MVWD concluded that additional water was available in the Lower Moapa Valley, as that aquifer did not appear hydrologically connected to the regional carbonate-rock aquifer.

WHEREAS, GBWN presented a report that recognized the decline in the groundwater levels in Coyote Spring Valley and discharge to the Muddy River Springs Area resulting from the

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[29] *Id.*
[30] *Id.*
[31] *See* NSE Ex. 252, *Moapa Band of Paiute Indians Order 1169 Report*, Hearing on Interim Order 1303, official records of the Division of Water Resources, p. 25.
[32] *Id.*
[33] NSE Ex. 250, *Moapa Valley Water District Basin 220 Well Site Analysis*, Hearing on Interim Order 1303, official records of the Division of Water Resources; NSE Ex. 251, *Moapa Valley Water District Evaluation of MX-5 Pumping Test on Springs and Wells in the Muddy Springs Area*, dated June 24, 2013, Hearing on Interim Order 1303, official records of the Division of Water Resources.

aquifer test.[34] However, GBWN believed that the aquifer test failed to provide sufficient data to determine water availability throughout the other study basins. GBWN did assert that pumping of existing rights within all of the study basins would unacceptably decrease spring discharge.[35]

WHEREAS, CBD, relying on GBWN's technical report, opined that pumping existing water rights within the Order 1169 study basins would result in unacceptable decline in spring flow, ultimately threatening the Moapa dace and the habitat necessary for the species survival.[36]

WHEREAS, based upon the findings of the Order 1169 aquifer test, in denying the pending applications the State Engineer found: (1) that the information obtained from the Order 1169 aquifer test was sufficient to document the effects of pumping from the carbonate-rock aquifer on groundwater levels and spring flow and that the information could assist in forming opinions regarding future impacts of groundwater pumping and availability of groundwater in the study basins; (2) that the impacts of aquifer test pumping in Coyote Spring Valley was widespread throughout the Order 1169 aquifer test study basins and that the additional pumping in Coyote Spring Valley was a significant contributor to the decline in the springs that serve as the headwaters of the Muddy River and habitat for the Moapa dace; and, (3) that additional pumping from the then pending applications would result in significant regional water-level decline, and decreases in spring and Muddy River flows.[37]

WHEREAS, the basins that were included in the Order 1169 aquifer test were acknowledged to have a unique hydrologic connection and share the same supply of water.[38] The State Engineer further went on to find that the total annual supply to the basins could not be more than 50,000 acre-feet, that the perennial yield is much less than that because the Muddy River and the springs in the Warm Springs area utilize the same supply, and that the quantity and location of

[34] NSE Ex. 246, *Great Basin Water Network Order 1169 Report*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[35] *Id.*
[36] NSE Ex. 248, *Center for Biological Diversity Order 1169 Report*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[37] NSE Exs. 14–21. The study basins include Coyote Spring Valley, Garnet Valley, Hidden Valley, Muddy River Springs Area, California Wash, and that portion of the Black Mountains Area lying within the LWRFS was defined as those portions of Sections 29, 30, 31, 32, and 33, T.18S., R.64E., M.D.B.&M.; Section 13 and those portions of Sections 1, 11, 12, and 14, T.19S., R.63E., M.D.B.&M.; Sections 5, 7, 8, 16, 17, and 18 and those portions of Sections 4, 6, 9, 10, and 15, T.19S., R.64E., M.D.B.&M.
[38] *See, e.g.*, NSE Ex. 14, p. 24.

any groundwater that could be developed without conflicting with senior rights on the Muddy River and the springs was uncertain.[39]

II. INTERIM ORDER 1303

WHEREAS, on January 11, 2019, the State Engineer issued Interim Order 1303 designating the Lower White River Flow System (LWRFS), a multi-basin area known to share a close hydrologic connection, as a joint administrative unit for purposes of administration of water rights. The Interim Order defined the LWRFS to consist of the Coyote Spring Valley, Muddy River Springs Area, California Wash, Hidden Valley, Garnet Valley, and the portion of the Black Mountains Area Hydrographic Basins as described in the Interim Order.[40] Pursuant to Interim Order 1303, all water rights within the LWRFS were to be administered based upon their respective dates of priority in relation to other rights within the regional groundwater unit.

WHEREAS Interim Order 1303 recognized the need for further analysis of the LWRFS because the pre-development discharge of 34,000 acre-feet of the Muddy River system plus the more than 38,000 acre-feet of existing groundwater appropriations within the LWRFS greatly exceed the total water budget, which was determined to be less than 50,000 acre-feet.[41] Stakeholders with interests in water right development within the LWRFS were invited to file a report with the Office of the State Engineer addressing four specific matters, generally summarized as: 1) The geographic boundary of the LWRFS, 2) aquifer recovery subsequent to the Order 1169 aquifer test, 3) the long-term annual quantity and location of groundwater that may be pumped from the LWRFS, and 4) the effect of movement of water rights between alluvial and carbonate wells within the LWRFS. Stakeholders were also invited to address any other matter believed to be relevant to the State Engineer's analysis.

WHEREAS, on May 13, 2019, the State Engineer amended Interim Order 1303 modifying the deadlines for the submission of reports and rebuttal reports by interested stakeholders. Reports

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[39] *Id.*
[40] *See* NSE Ex. 1, *Order 1303 and Addendum to Interim Order 1303*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[41] *Id.*, p. 7.

submitted by interested stakeholders were intended to aid in the fact-finding goals of the Division.[42]

WHEREAS, a public hearing was held in Carson City, Nevada between, September 23, 2019, and October 4, 2019. The purposes of this hearing were to afford stakeholder participants who submitted reports pursuant to the solicitation in Interim Order 1303 an opportunity to provide testimony on the scientific data analysis regarding the five topics within the Interim Order and to test the conclusions offered by other stakeholder participants.

WHEREAS, during the Interim Order 1303 hearing, testimony was provided by expert witnesses for the participants CSI, USFWS, NPS, MBOP, SNWA and LVVWD[43], MVWD, Lincoln County Water District and Vidler Water Company (LC-V), City of North Las Vegas (CNLV), CBD, Georgia Pacific Corporation (Georgia Pacific) and Republic, Nevada Cogeneration Associates Nos. 1 and 2 (collectively "NCA"), Muddy Valley Irrigation Company (MVIC), Western Elite Environmental, Inc. and Bedroc Limited, LLC (collectively "Bedroc"), and NV Energy.

WHEREAS, following the conclusion of the Interim Order 1303 hearing, stakeholder participants were permitted to submit written closing statements no later than December 3, 2019. The specific area evaluated, data analyzed, and methodology used varied by participant. Generally, participants relied on spring and streamflow discharge, groundwater level measurements, geologic and geophysical information, pumping data, climate data, and interpretations of aquifer hydraulics. Methodologies applied ranged from conceptual observations to statistical analysis to numerical and analytical models; the level of complexity and uncertainty differing for each.

WHEREAS, each of the participants' conclusions with respect to the topics set forth in Interim Order 1303 are summarized as follows:

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[42] *Id.*, pp. 16–17.
[43] SNWA is a regional water authority with seven water and wastewater agencies, one of which is LVVWD. References to SNWA include its member agency, LVVWD, which too retains water rights and interests within the LWRFS.

Center for Biological Diversity

The primary concern of the CBD was to ensure adequate habitat for the survival and recovery of the Moapa dace. CBD felt "that the Endangered Species Act is the primary limiting factor on the overall quantity of allowable pumping within the [LWRFS] and thus [...] geared [the] analysis toward that goal of protecting the dace." The Moapa dace primarily resides in the springs and pools of the Muddy River; protecting those areas of habitat are of the utmost importance to CBD's goal and have the collateral benefit of protecting the Muddy River decreed rights. Furthermore, CBD "believe[d] that withdrawals from the carbonate aquifer that cause a reduction in habitat quantity for the dace are a take under the Endangered Species Act and thus prohibited."[44]

CBD urges that Kane Springs Valley Hydrographic Basin (Kane Springs Valley) be included and managed as part of the LWRFS; otherwise CBD did not dispute the boundary as presented in Interim Order 1303. The inclusion of Kane Springs Valley was based on a shallow hydraulic gradient between Coyote Spring Valley and Kane Springs Valley; propagation of water level decline into Kane Springs Valley during the Order 1169 aquifer test; and a finding that the carbonate-rock aquifer extends into Kane Springs Valley. In CBD's opinion, adequate management of the LWRFS does not require that the administrative boundary include the White River Flow System north of Coyote Spring Valley.[45]

CBD identified a long-term, declining trend commencing in the 1990s in carbonate-rock aquifer water levels within the Muddy River Springs Area, which was accelerated by the Order 1169 aquifer test. Although CBD observed a partial, immediate recovery in the carbonate-rock aquifer water levels and spring flows, CBD finds that full recovery to pre-Order 1169 aquifer test conditions were never realized. Concurring with multiple other participants, CBD identified higher water levels in response to wet years despite the continued decline in the overall trend in the hydrographs. However, with regards to long-term drought, in their review of the Climate Division Data for southern Nevada, CBD saw no indication of a 20-year drought and disagreed with the conclusions and analysis presented by MBOP. Decreased spring flows in conjunction with

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[44] *See* CBD Ex. 3, *CBD Order 1303 Report by Dr. Tom Myers; 27 pp.*, Hearing on Interim Order 1303, official records of the Division of Water Resources, p. 1; Transcript 1504–1505.
[45] *See* CBD Ex. 3, pp. 1, 2, 12, 17, 19; *See* CBD Ex. 4, *CBD Order 1303 Rebuttal in Response to Stakeholder Reports by Dr. Tom Myers; 30 pp.*, Hearing on Interim Order 1303, official records of the Division of Water Resources, pp. 17–21; Tr. 1516; 1520–1521; 1526–1527; 1538–1539; CSI Ex. 2, p. 38; LC-V Ex. 2, pp. 11–14.

increased carbonate-rock aquifer pumping, led the CBD to infer the dependency of spring flows on carbonate-rock aquifer water supply.[46]

Again, with emphasis on protecting spring flows, and thus the Moapa dace habitat, CBD did not support any pumping of the carbonate-rock aquifer. CBD's desired outcome would be to avoid decreases in spring flow in the Warm Springs area attributed to continued carbonate-rock aquifer pumping. CBD postulated that surface water rights on the Muddy River will be protected by limiting carbonate-rock aquifer pumping.

Alternatively, CBD speculated that some alluvial aquifer pumping, within the Muddy River Springs Area and Coyote Spring Valley, could be sustained without significantly impacting the Warm Springs area. A preliminary estimate of 4,000 afa of sustainable alluvial aquifer pumping was proposed, based on the existing pumping within the Muddy River Springs Area and considering pumping in the 1990s near 5,000 afa when alluvial aquifer water levels were stable.[47]

Church of Jesus Christ of Latter-day Saints

The Church of Jesus Christ of Latter-day Saints (the Church) chose not to directly participate in the hearing but joined the evidentiary submissions of CNLV.[48] In response to the directives set forth in Interim Order 1303 and considering the testimony provided, the Church requests the continued administration and management of the LWRFS as identified in Interim Order 1303, and to allow for change applications throughout the LWRFS basins that move pumping of groundwater further away from the Muddy River Springs Area and from the alluvial aquifer to the carbonate-rock aquifer. The Church further requests that the testimony and recommendation of Dwight Smith, PE, PG on behalf of CNLV be considered and adopted.[49]

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[46] *See* CBD Ex. 3, pp. 1, 24; *See* CBD Ex. 4, p. 8–10, 21–25; Tr. 1508–1525; LC-V Ex. 2, p. 12, GP-REP Ex. 2, p. 3; CBD's expert suggest that the Palmer Drought Severity Index is more robust to evaluate for drought rather than using precipitation.
[47] *See* CBD Ex. 3, pp. 20–26; *See* CBD Ex. 4, p. 28–29; Tr. 1525-1528.
[48] *See* Letter from the Church, received August 15, 2019, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[49] *See Closing Brief of the Church of Jesus Christ of Latter-Day Saints* (Church closing), Hearing on Interim Order 1303, official records of the Division of Water Resources.

City of North Las Vegas

In CNLV's report submissions and closing statement it addressed four questions set forth in Interim Order 1303.[50] CNLV generally urges for more analysis and study of the LWRFS before administrative decisions are made due to lack of agreement on fundamental interpretations of the water availability and basin connectivity. It was agreed to by CNLV that most of Garnet Valley and a small portion of the Black Mountains area were within the larger carbonate-rock aquifer underlying the LWRFS basins, but that there is uncertainty in the boundaries of Garnet Valley with California Wash and Las Vegas Valley Hydrographic Basin (Las Vegas Valley).[51] With respect to the recovery of the groundwater aquifer following the Order 1169 aquifer test, CNLV concluded that the record and evidence demonstrates a long-term declining trend in the groundwater level since the late 1990s and that pumping responses can propagate relatively quickly through the carbonate-rock aquifer and drawdown is directly related to the pumping.[52]

While CNLV did consider the long-term quantity of groundwater that may be developed without adversely impacting discharge to the Warm Springs area, its opinions were limited to the sustainability of pumping within Garnet Valley.[53] CNLV concluded that the safe yield concept should be applied to the management of pumping within the LWRFS and that pumping between 1,500 afa to 2,000 afa does not appear to be causing regional drawdown within the LWRFS carbonate-rock aquifer and that pumping this quantity of water may be sustainable within the APEX Industrial Park area of Garnet Valley.[54] Finally, CNLV asserted that movement of alluvial water rights from the Muddy River Springs Area along the Muddy River would reduce the capture

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[50] *See* CNLV Ex. 5, *City of North Las Vegas Utilities Department: Interim Order 1303 Report Submittal from the City of North Las Vegas – July 2, 2019*, Hearing on Interim Order 1303, official records of the Division of Water Resources. *See* CNLV Ex. 6, *Rebuttal Document submitted on behalf of the City of North Las Vegas, to Interim Order 1303 Report Submittals of July 3, 2019 – Prepared by Interflow Hydrology – August 2019*, Hearing on Interim Order 1303, official records of the Division of Water Resources. *See* Tr. 1416–66, and *City of North Las Vegas' Closing Statement* (CNLV Closing), Hearing on Interim Order 1303, official records of the Division of Water Resources.
[51] *See* CNLV Ex. 5, pp. 2–3. *See also* CNLV Ex. 3, *Garnet Valley Groundwater Pumping Review for APEX Industrial Complex, City of North Las Vegas, Clark County, Nevada- Prepared by Interflow Hydrology, Inc.- July 2019*, pp. 7–8, 38.
[52] *Id.*, p. 3, Technical Memo, pp. 14–16.
[53] *Id.*, pp. 3–4.
[54] *Id.*, p. 4., Technical Memo, p. 45.

of Muddy River flow, move more senior water rights into Garnet Valley to support a secure water supply for the municipal uses within the APEX area, and would support overall objectives relating to the management of the LWRFS.[55] CNLV advocated that transferring water rights between alluvial aquifer and carbonate-rock aquifer should be considered on a case-by-case basis with consideration given as to location, duration, and magnitude of pumping.[56]

CNLV disagreed with certain conclusions of the NPS relating to the inclusion of the entirety of the Black Mountains Area within the LWRFS boundaries and had concerns relating to the reliability of the Tetra Tech model for future water resource management within the LWRFS.[57] CNLV further disagreed with stakeholder conclusions that movement of groundwater withdrawals from the alluvial aquifer along the Muddy River to the carbonate-rock aquifer in Garnet Valley will not alleviate the conflicts to Muddy River flow, rather concluding that there may be benefits for overall management of the LWRFS.[58] Further, CNLV disagreed with certain findings regarding water flow through the carbonate-rock aquifer, finding that it is likely that some groundwater can be pumped within Garnet Valley without capturing groundwater that would otherwise discharge to the Warm Springs area and the Muddy River.[59] Finally, in its rebuttal the CNLV joined other stakeholders in supporting the conclusion that there is a quantity of water that may be sustainably developed within the LWRFS and that use of carbonate-rock aquifer groundwater in Garnet Valley is critical to the short-term and long-term management and development of the APEX Industrial Complex.[60]

Coyote Springs Investments

In presenting its opinions and conclusions CSI's focus was primarily on climate as the foundation for groundwater elevation declines after the Order 1169 aquifer test, and additional geophysical research that provided evidence of a structural block isolating the west side of Coyote Spring Valley.

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[55] *Id.*, Technical Memo, p. 48–49.
[56] *Id.*
[57] *See* CNLV Ex. 6, pp. 1–2.
[58] *Id.*, p. 2.
[59] *Id.*, pp. 2–3.
[60] *Id.*, p. 3.

CSI did a statistical analysis of climate data, and determined from the results that 1998, 2004, 2005, and 2010 were wetter than normal, with a drying trend from 2006 to 2017.[61] The Order 1169 aquifer test took place toward the end of an extended dry period when all water resources throughout the LWRFS were negatively affected.[62] Additionally, annual cyclical patterns of groundwater pumping should not be confused with long-term climate variability.[63]

CSI challenged the basic assumption that the LWRFS, as proposed in Interim Order 1303, is a homogenous unit.[64] CSI could not duplicate the results of the SeriesSEE, and its own Theis solution modeling concluded that a greater impact occurred from pumping at a well closer in proximity to Pederson Spring than pumping from a well further away, or the combined effect of both wells.[65] CSI also acknowledged that due to the fragmented nature of the LWRFS, the Theis solution is of limited utility.[66]

CSI presented geologic and geophysical information in support of the idea that the LWRFS administrative unit is a geophysically and hydrogeologically heterogenous area, characterized by multiple flow paths defined by faults and structural elements that control the occurrence and movement of regional and local groundwater along the western side of Coyote Spring Valley, the eastern side of Coyote Spring Valley, and from Lower Meadow Valley Wash into the LWRFS.[67] CSI stated that the LWRFS does not include Kane Springs Valley.[68]

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[61] CSI Ex. 1, *CSI July 3, 2019 Order 1303 Report*, Hearing on Interim Order 1303, official records of the Division of Water Resources, pp. 4–5; Tr. 53.
[62] CSI Ex. 1, p. 5.
[63] CSI Ex. 2, *CSI August 16, 2019 Rebuttal Report*, Hearing on Interim Order 1303, official records of the Division of Water Resources, pp. 2, 7.
[64] CSI Ex. 1, p. 7.
[65] CSI Ex. 1, p. 7; Tr. 131–132.
[66] Tr. 154.
[67] CSI Ex. 2, p. 2; *CSI Closing Statement* (CSI Closing), Hearing on Interim Order 1303, official records of the Division of Water Resources; CSI recommended including Lower Meadow Valley Wash in its Rebuttal report. See CSI Ex. 2, p. 12; Mr. Herrema said Lower Moapa Valley, but the report said Lower Meadow Valley 10:10.
[68] CSI Ex. 1, p. 15; the outflow from Kane Springs Valley is included in the water budget, but due to isolating geologic features, groundwater elevations in Kane Springs Valley are not impacted by pumping in the LWRFS. Tr. 135:7–137:3, 160:2–12.

CSI engaged a geophysicist to conduct a CSAMT survey at multiple points in the valley.[69] CSI's CSAMT study showed evidence of a prominent carbonate block bounded on either side by normal faults.[70] CIS asserts that the carbonate block isolates recharge from the zone west of the block, such that it eliminates or limits contribution of local recharge to the Warm Springs area.[71] Faulting has created a preferred path for groundwater flow "from the east side Coyote Spring Valley to the Muddy River Springs Area".[72]

CSI relied on a water budget as the best method to determine available water in the LWRFS, accounting for recharge and subsurface flow as well as climatic variations.[73] Comparing several models of recharge, CSI estimated recharge at 5,280 afy from the Sheep Range to the western side of Coyote Spring Valley.[74] CSI stated that 30,630 afa can be pumped from the LWRFS, but there would be impacts from pumping the water, and that the Coyote Spring Valley can sustain 5,280 afa of pumping from the western side without impact to the Warm Springs area or the Muddy River.[75]

As asserted by CSI, groundwater pumping from the carbonate-rock aquifer in the Muddy River Springs Area affects flow in the carbonate-rock aquifer to the alluvial aquifer, which then affects flow from the alluvial aquifer to the Muddy River.[76] CSI argues that effects are dependent on well location, geologic formations, hydraulic gradients, and elevation.[77] Transfers between carbonate and alluvial pumping should be made on a case-by-case basis, analyzing place of use, points of diversion, and quantity of groundwater.[78] Movement of water rights between alluvial wells and carbonate-rock aquifer wells will only serve to shift the timing and location of impacts and not the amount of the impact.[79]

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[69] CSI Ex. 1, p. 25
[70] CSI Ex. 1, p. 25.
[71] CSI Ex. 1, p. 29; evidence of impermeability, Tr. 181.
[72] CSI Ex. 1, p. 29.
[73] CSI Closing.
[74] CSI Ex. 1, pp. 31–40.
[75] Tr. 221–223; CSI Closing, pp. 8–9.
[76] CSI Closing.
[77] CSI Closing, p. 19.
[78] CSI Closing.
[79] CSI Ex. 1, p. 58.

As a consequence of the heterogenous nature of the LWRFS, CSI recommended sustainable management of the LWRFS through the creation of "Management Areas" that recognize flow paths and their relative contributions to spring flow, surface flow, evapotranspiration, and sub-surface outflow.[80] For example, though pumping in the Muddy River Springs Area near the Warm Springs area would have a direct impact on available surface water resources, structural blocks and faults isolate the effect of groundwater pumping in other areas of the LWRFS.[81] Thus CSI does not recommend a blanket ban on carbonate-rock aquifer pumping, or a decrease in carbonate-rock aquifer pumping in exchange for alluvial aquifer pumping.

Georgia Pacific and Republic

Dry Lake Water, LLC, Georgia Pacific and Republic submitted initial and rebuttal responses to Interim Order 1303 and offered testimony during the hearing.[82] In their response, Georgia Pacific and Republic acknowledged impacts to groundwater elevations throughout the LWRFS, including wells in the Black Mountains Area and Garnet Valley, which does demonstrate a degree of hydraulic connectivity throughout the carbonate-rock aquifer. However, Georgia Pacific and Republic called for collection of more scientific evidence to further understand the LWRFS and its boundaries. Further, it was their opinion that climate, seasonal fluxes and pumping within Garnet Valley and the Black Mountains Area resulted in the groundwater declines observed during the Order 1169 aquifer test.[83] Ultimately, Georgia Pacific and Republic do not believe sufficient information exists to draw distinct conclusions as to the cause of the groundwater declines during the Order 1169 aquifer test and whether carbonate-rock aquifer pumping within

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[80] CSI Closing.

[81] CSI Ex. 2, p. 17.

[82] The initial response was submitted on behalf of Dry Lake Water, LLC, Georgia Pacific, and Republic. *See* GP-REP Ex. 1, *Broadbent July 2, 2019 Initial Report*, Hearing on Interim Order 1303, official records of the Division of Water Resources. The rebuttal response was submitted on behalf of Dry Lake Water, LLC, Georgia Pacific Gypsum LLC, and Republic. *See* GP-REP Ex. 2, *Broadbent August 16, 2019 Rebuttal Report*, Hearing on Interim Order 1303, official records of the Division of Water Resources. However, the expert only appeared at the Hearing on Interim Order 1303 on behalf of Georgia Pacific and Republic. *See* Tr. 1588-91.

[83] *See* GP-REP Ex. 01, GP-REP Ex. 02, and *Closing Argument of Georgia Pacific Corporation and Republic Environmental Technologies, Inc.* (Closing GP-REP), Hearing on Interim Order 1303, official records of the Division of Water Resources.

the Garnet Valley and the Black Mountains Area has a measurable impact to spring flow in the Warm Springs area.[84]

Great Basin Water Network

GBWN elected to pose procedural suggestions relating to public involvement, availability of documents and data, transparency, and decision making, and did not submit a report with an independent analysis addressing the questions in Interim Order 1303.[85] GBWN advocates for sustainable management of the entirety of the White River Flow System as one unit based on the interconnected nature of all of the hydrologically connected basins, although no analysis to support which areas this would include was provided. GBWN relies on conclusory statements to establish the interconnected nature of the system as support for its position. Later, GBWN chose not to participate in the hearing nor submit a rebuttal report, closing arguments, or public comment.

Lincoln County Water District and Vidler Water Company

LC-V's participation in the LWRFS hearing was driven by their existing and pending groundwater rights in Kane Springs Valley, and an interest in excluding Kane Springs Valley from the LWRFS management area.[86] They disputed that Kane Springs Valley should be included within the LWRFS boundary based on their assertion of: prior decisions of the State Engineer that acknowledged the separate nature of the basin from the rest of the LWRFS, groundwater elevation comparisons, precipitation and recharge data, groundwater chemistry, and geophysical study results. In general, Kane Springs Valley should be managed based on its perennial yield, recognizing that there is groundwater flow to the LWRFS as there are from other basins into the LWRFS, but where they are excluded from the proposed management area.[87]

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[84] *See* Closing GP-REP.
[85] *GBWN Report on Order 1303*, (GBWN Report), Hearing on Interim Order 1303, official records of the Division of Water Resources.
[86] LC-V Ex. 1, *Lower White River Flow System Interim Order #1303 Report Focused on the Northern Boundary of the Proposed Administrative Unit, prepared by Lincoln County Water District and Vidler Water Company in Association with Zonge International Inc., dated July 3, 2019*, Hearing on Interim Order 1303, official records of the Division of Water Resources, p. 2-1.
[87] LC-V Ex. 2, *Rebuttal Submittal to Reports Submitted in Response to Interim Order #1303, dated August 16, 2019 and Attachments A, B, C, D and E containing the reports or technical memorandums of Greg Bushner, Peter Mock, Thomas Butler, Todd Umstot and Norman Carlson.*, Hearing on Interim Order 1303, official records of the Division of Water Resources, pp. 7, 14–15.

Various rulings of the State Engineer have previously addressed whether appropriation of groundwater from Kane Springs Valley would affect the Muddy River Springs Area.[88] LC-V states that these findings have not been challenged by any of the Order 1169 participants.[89] However, to the extent that SNWA relied on multiple linear regression models to establish groundwater flow from Kane Springs Valley to the LWRFS, LC-V do not agree.[90]

LC-V identified a distinct "break," or local increase, in water levels in the regional hydraulic gradient between wells drilled in the LWRFS versus wells drilled in Kane Springs Valley and northern Coyote Spring Valley.[91] It attributed the break to geologic structures located throughout the carbonate-rock aquifer. Although wells within the LWRFS exhibit very consistent groundwater levels, indicative of high transmissivity values across the area, the gradient between well KPW-1 and down-basin wells is much steeper, implying an impediment to groundwater flow near the mouth of Kane Springs Valley.[92]

In a 2006 hearing for protested water rights applications, LC-V presented an analysis of the regional geochemistry data including stable isotopes, temperature, and carbon-14 data.[93] That analysis found that the groundwater pumped from Kane Springs Valley could not be identified in the source water for the Big Muddy Spring, nor other springs farther south and outside the boundaries of the LWRFS.[94] LC-V concluded that groundwater pumped from production well KPW-1 is on a different groundwater flow path from the springs, consistent with the differences in hydraulic gradients, groundwater levels, and geophysical data.[95] CSVM-4, a well located in Coyote Spring Valley, and KPW-1, in Kane Springs Valley, have similar temperatures compared to the other wells in the basin, and a lower percentage difference on other markers tracked throughout groundwater in the basin.[96] LC-V argues that the water from these wells is chemically

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[88] LC-V Ex. 1, pp. 2-2 through 2-3, citing State Engineer's Rulings 5712, 6254, 5712.
[89] LC-V Ex. 1, p. 2-3.
[90] Testimony generally at Tr. 1311–1318. "... simply having correlation is not proof of causation. Causation is neither proved nor evaluated in a regression analysis." Tr. 1303.
[91] LC-V Ex. 1, p. 3-1.
[92] LC-V Ex. 1, pp. 1-1, 3-1 through 3-4. LC-V went on to conclude that local groundwater recharge occurs in Kane Springs Valley that does not flow to the LWRFS, and therefore there is available unappropriated water in the basin. LC-V Ex. 1, p. 3-5.
[93] LC-V Ex. 1, Appendix C, pp. 111–153.
[94] *Id.*, pp. 124–125.
[95] "Gradient alone does not mean flow." Thomas Butler, witness on behalf of LC-V, Tr. 1281.
[96] Tr. 1281–1282; LC-V Ex. 1, pp. 3-7 through 3-11.

unique and does not appear in any other wells in the LWRFS.[97] LC-V concludes carbon isotope data also confirmed that the water from Kane Springs Valley does not appear in the Muddy River Springs area.[98]

LC-V engaged a geophysical company to perform a CSAMT survey across the boundary line between Kane Springs Valley and Coyote Spring Valley, and identified significant geologic structures in southern Kane Springs Valley and northern Coyote Spring Valley.[99] Several transect lines were conducted perpendicular to the axis of the Kane Springs Valley, and one was also conducted along the axis of the southern part of the basin.[100] Additional transects were run in Coyote Spring Valley.[101] The results of the geophysical data validated concealed faulting indicated on existing maps, and was ground-truthed with observations in the field.[102] Results indicated a previously unmapped fault at the mouth of Kane Springs Valley, which LC-V named the Northern Boundary LWRFS fault, with a potentially 2,500-foot offset of materials with different resistivities.[103] LC-V argues that the extensive faulting that occurs in southern Kane Springs Valley and northern Coyote Spring Valley form the basis for the exclusion of Kane Springs Valley from the LWRFS.[104]

LC-V gave no opinion on the long-term annual quantity of groundwater that could be pumped from the LWRFS.[105] LC-V attributes all reduction in flows of the Muddy River and its associated springs to carbonate-rock aquifer pumping within the Muddy River Springs Area, and finds no discernable effect from carbonate-rock aquifer pumping occurring in Coyote Springs

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97 Tr. 1284.
98 Tr. 1286.
99 LC-V Ex. 1, pp. 1-1, 4-1 through 4-10.
100 LC-V Ex. 1, p. 4-3.
101 LC-V Ex. 1, p. 4-3.
102 LC-V Ex. 1, p. 4-8, Tr. 1322.
103 Tr. 1271–1272; LC-V Ex. 1, p. 4-9.
104 LC-V Ex. 1, p. 7-1 through 7-2; Tr. 1408. Questions from the National Park Service and the State Engineer inquired whether the areas of high resistivity in the CSAMT necessarily implied low transmissivity, low permeability of the rock. LC-V conceded that the resistivity information alone does not provide data about the hydraulic properties of either side of the resistive area, but when considered with all available information, LC-V concluded that the fault is likely an impediment to groundwater flow. Tr. 1327–1328, 1363–1364.
105 LC-V Ex. 1, p. 5-2.

Valley.[106] As a result, LC-V finds that the efforts to protect the Warm Springs area must focus on groundwater pumping within the Muddy River Springs Area itself.[107]

Moapa Band of Paiutes

The MBOP participated in the administrative hearing due to their interest in the outcome of the proceedings and how it may affect their pending water right applications within California Wash. A regional approach, spanning a large aerial expanse, was taken by MBOP; the analysis and modeling efforts extended into central Nevada and Utah. MBOP stands apart from other participants with their interpretation of the data.[108] MBOP opposed management of the LWRFS as one basin and argues the scientific consensus is lacking amongst participants.[109] Regarding the interpretation of other participants, MBOP disagreed with the methodology and application of the 2013 USFWS SeriesSEE analysis and SNWA's multiple linear regression and requests repudiation of both.[110]

While not agreeing with the proposed boundaries of the LWRFS, MBOP did not provide a clear suggestion for which basins or portions therein should be included or excluded. MBOP suggested that pumping in California Wash has little to no impact on the Warm Springs area.[111] MBOP further suggested there are two capture zones, separated by a hydrodynamic and hydrochemical divide, which transects the Moapa River Indian Reservation area and results in south-flowing groundwater into the Las Vegas Valley through the LWRFS, bypassing the Muddy

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[106] LC-V Ex. 1, p. 5-3.
[107] LC-V Ex. 1, p. 5-3.
[108] Tr. 772–773; 839.
[109] *See Closing Statement by the Moapa Band of Paiute Indians for Order 1303 Hearing* (MBOP Closing), Hearing on Interim Order 1303, official records of the Division of Water Resources, pp. 1–2, 6.
[110] *Id.*, pp. 7–12, 15–16; *See* MBOP Ex. 3, *Johnson, C., and Mifflin, M. Rebuttal Report of the Moapa Band of Paiutes in Response to Stakeholder Technical Reports Filed under Order #1303: unpublished report and appendices, August 16, 2019. 27 p.*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[111] *See* MBOP Ex. 2, *Johnson, C., and Mifflin, M. Water Level Decline in the LWRFS: Managing for Sustainable Groundwater Development. Initial Report of the Moapa Band of Paiutes in Response to Order #1303: unpublished report and appendices, July 3, 2019. 84 p.*, Hearing on Interim Order 1303, official records of the Division of Water Resources, pp. 2, 4, 14, 35; Tr. 819.

River Springs Area.[112] This hydrodynamic divide theory was not shared by SNWA, CBD, CSI, and NPS.[113]

Several participants agree that climate impacts were observed in the hydrographs, e.g., periods of wet and dry; however, MBOP interpreted the existing data to show that climate-driven decline, specifically drought, as the primary response observed in the long-term declining groundwater levels.[114] Thus, MBOP concluded that no reduction in pumping will restore high-elevation spring flows.[115] MBOP did not agree with other participants that decreasing groundwater levels and spring flows were attributed to increased carbonate-rock aquifer pumping beginning in the early 1990s.[116]

A quantity available for sustainable pumping was not proposed, but MBOP presumed more water is available in California Wash than previously thought.[117] A flux of approximately 40,000 afy of south-flowing groundwater into the Las Vegas Valley, bypassing the Muddy River Springs Area, was postulated in the initial report as possible with the hydrodynamic divide; however, during the hearing this quantity was given a range of plus or minus an order of magnitude based on assumptions for calculations.[118]

MBOP acknowledged that the Muddy River is connected to the alluvial aquifer and thus pumping from the alluvial and carbonate-rock aquifers in the Muddy River Springs Area impact the Muddy River flows.[119] Therefore, to mitigate impacts to the Muddy River, MBOP proposed that alluvial aquifer pumping, specifically between Arrow Canyon and White Narrows, can be moved to the carbonate-rock aquifer in basins to the south, such as California Wash, with minimal anticipated impacts to the Muddy River flows, rather than moving alluvial aquifer pumping from the Muddy River Springs Area to the carbonate-rock aquifer in connected areas, where impacts

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[112] *See* MBOP Ex. 2, pp. 2, 4, 12, 14, 20, 35, 55; Tr. 812; 845.
[113] SNWA Ex. 9, pp. 12–13; CBD Ex. 4, p. 15; CSI Ex. 2, p. 23; NPS Ex. 3, *National Park Service's Response to July 2019 Interim Order 1303 Reports, Waddell, August 16, 2019*, Hearing on Interim Order 1303, official records of the Division of Water Resources, p. 4.
[114] *See* MBOP Ex. 2, pp. 3, 26–32, 35; Tr. 764–771; 805.
[115] *See* MBOP Ex. 2, pp. 3, 35; Tr. 821–826.
[116] *See* MBOP Ex. 2, p. 29; Tr. 775, 838–840; 848.
[117] *See* MBOP Ex. 2, pp. 2, 20, 35.
[118] *See* MBOP Ex. 2, pp. 6, 19, 35; Tr. 850–851.
[119] *See* MBOP Ex. 2, pp. 23–24, 35; Tr. 836.

proportional to pumping may be expected.[120] Thus, MBOP proposed favoring temporary over permanent uses and transferring of rights between the carbonate-rock and alluvial aquifers on a case-by-case basis.[121]

Moapa Valley Water District

MVWD was created by the Nevada legislature in 1983, pursuant to NRS Chapter 477, to provide water service "vital to the economy and well-being of Moapa Valley."[122] MVWD provides municipal water service to approximately 8,500 people with 3,250 metered service connections, including service to the MBOP.[123]

MVWD supported the inclusion of Kane Springs Valley within the LWRFS boundary.[124] Data indicated a direct connection between Kane Springs Valley and Coyote Spring Valley. This data included observations that the water level in KMW-1/KSM-1 decreased 0.5 foot over the duration of the Order 1169 aquifer test.[125] State Engineer's rulings have concluded that geochemical evidence and groundwater gradient data indicate that groundwater flows from the Kane Springs Valley into Coyote Spring Valley, and MVWD supports LVVWD's 2001 calculation of that quantity of water at approximately 6,000 afy.[126] MVWD performed its own calculations of the groundwater gradients from Kane Springs Valley at KMW-1 to EH-4, and concluded that the gradient was "an uninterrupted, continuous, exceptionally flat gradient," unlike gradients commonly seen in the western U.S., especially in highly fractured areas.[127] MVWD also

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[120] *See* MBOP Ex. 2, pp. 23, 35.
[121] *See* MBOP Closing.
[122] Tr. 1172.
[123] MVWD Ex. 3, *District July 1, 2019 Report in response to Interim Order 1303*, p.5, Hearing on Interim Order 1303, official records of the Division of Water Resources; MVWD Ex. 4, *District August 16, 2019 Rebuttal Report*, p. 1, Hearing on Interim Order 1303, official records of the Division of Water Resources. MVWD has 3,147 afa of water rights in Arrow Canyon. Tr. 1169–1170.
[124] MVWD Ex. 3, p. 1; Tr. 1175.
[125] MVWD Ex. 3, p. 1; MVWD Ex. 4, p. 2.
[126] MVWD Ex. 3, pp. 1–2, referring to State Engineer's Ruling 5712 (*see*, NSE Ex. 12, *Ruling 5712*, Hearing on Interim Order 1303, official records of the Division of Water Resources) and MVWD Ex. 8, *Las Vegas Valley Water District, Water Resources and Ground-Water Modeling in the White River and Meadow Valley Flow Systems, Clark, Lincoln, Nye, and White Pine Counties, Nevada (2001)*, Hearing on Interim Order 1303, official records of the Division of Water Resources, p. 6-3.
[127] Tr. 1177–1178.

introduced evidence of a stipulation between LC-V and the USFWS that bases a reduction in pumping in Kane Springs Valley on a lowering of spring discharges in the Warm Springs area, and introduced a letter from SNWA to the State Engineer, as additional support that the participants to the Interim Order 1303 hearing have previously recognized Kane Springs Valley is part of the LWRFS.[128]

MVWD disagreed that a hydrologic barrier exists between Coyote Springs Valley and Kane Springs Valley.[129] Relying on a 2006 report prepared by another consultant, MVWD said the evidence indicated that the fault at the mouth of Kane Springs Valley was not an impediment to flow, and that there was no evidence of having encountered hydraulic barriers to groundwater flow during a seven-day aquifer test.[130] Additionally, the "highly transmissive fault zone" is continuous across the basin boundary between Kane Springs Valley and Coyote Spring Valley.[131] MVWD found further support for its position from evidence that KMW-1 showed drawdown during both the seven-day aquifer test on KPW-1, as well as from the Order 1169 aquifer test pumping that occurred from MX-5.[132] MVWD considered the water level data collected before, during and after the Order 1169 aquifer test, and Warm Springs area spring discharge to support its finding that the fault is not interrupting groundwater flow.[133] MVWD found it "questionable" that the first suggestion of a fault that impedes southward groundwater flow would be prepared by LC-V for this hearing.[134]

Although water levels and spring discharge did not recover to the levels measured before the Order 1169 aquifer test, MVWD believed that the LWRFS is at or near steady-state conditions

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[128] Tr. 1195–1197.
[129] Tr. 1176–1177.
[130] Tr. 1181–1182. MVWD also quoted from the report that "the fracturing was so extensive that the fractured aquifer system really behaved as an equivalent porous media." *Id.* MVWD later agreed that this would behave like a sandy aquifer. Tr. 1224.
[131] Tr. 1185.
[132] Tr. 1250.
[133] Tr. 1219.
[134] *Post-Hearing Brief of Moapa Valley Water District* (MVWD Closing), Hearing on Interim Order 1303, official records of the Division of Water Resources, p. 5.

regarding aquifer recovery.[135] MVWD viewed this as being consistent with the State Engineer's statements in Interim Order 1303.[136]

Finally, MVWD did not provide a specific quantity of available water but did acknowledge that the "actual safe pumpage" is less than current pumping rates, and recognized a direct relationship between pumping from the carbonate-rock aquifer, spring and Muddy River flows, and alluvial aquifer pumping.[137] The timing and magnitude of carbonate-rock aquifer pumping effects on spring discharge is dependent on the volume of water pumped and the proximity of a pumping center to the springs; however, all cumulative carbonate-rock aquifer pumping in the seven interconnected basins will eventually cause depletions on the Warm Springs area springs.[138] Further, if carbonate rights are transferred to the alluvial aquifer there will be depletions to Muddy River flows and impacts to senior Muddy River water right owners.[139]

MVWD raised additional matters that they believed relevant to the analysis under Interim Order 1303. First, they stressed the importance of municipal water rights, and the necessity for a reasonably certain supply of water for future permanent uses without jeopardizing the economies of the communities that depend on the water supply, and to protect the health and safety of those who rely on the water supply.[140] To that end, MVWD requested that the State Engineer consider designating municipal use as the most protected and highest use of water, and to give MVWD the perpetual right to divert 6,791 afa of permitted and certificated rights from its carbonate-rock aquifer wells.[141] Second, MVWD stated that it had already satisfied its obligation to protect Moapa dace habitat and senior water rights when it dedicated 1cfs/724 afa, or approximately 25% of the MVWD current diversions, from its most senior water right, to the enhancement of the Moapa dace habitat.[142]

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135 Tr. 1198, MVWD Ex. 3, p. 4.
136 Tr. 1199.
137 Tr. 1199–1200; MVWD Closing, pp. 9–10.
138 MVWD Ex. 3, p. 5.
139 *Id.*
140 MVWD Ex. 3, p. 5.
141 MVWD Ex. 3, p. 6; Tr. 1203–1204; 6,791 afa constitutes an increase in the carbonate-rock aquifer pumping for MVWD. Tr. 1228.
142 MVWD Ex. 3, pp. 6–7; Tr. 1202–1203.

Muddy Valley Irrigation Company

The MVIC is a non-profit Nevada corporation with the senior decreed water rights to the Muddy River, who provided testimony that SNWA is a majority shareholder while other participants such as CSI, LC-V, and MVWD are minority shareholders of the decreed rights.[143] MVIC concurred with SNWA's conclusions regarding aquifer recovery, long-term quantity of groundwater, and movement of water between the alluvial and the carbonate-rock aquifers.[144] Specifically, that any groundwater pumping, from both alluvial or carbonate-rock aquifers, within the Muddy River Springs Area impacts Muddy River flows, thus violating the Muddy River Decree.[145] MVIC did not dispute the geographic boundaries as identified in Interim Order 1303.[146] MVIC argued that the Muddy River and all of its sources are fully appropriated and emphasized the decreed seniority to groundwater rights, and further asserts that these surface water rights are protected by the Muddy River Decree and the prior appropriation doctrine.[147]

United States Department of the Interior, National Park Service

NPS submitted both an initial and rebuttal report in response to the Interim Order 1303 solicitation and presented testimony during the hearing.[148] Based upon NPS's evaluation of the evidence relating to the Order 1169 aquifer test, the use of an updated numerical groundwater flow model previously developed to predict conditions within the LWRFS, data compiled since the conclusion of the Order 1169 aquifer test, and review of other available data, NPS came to multiple conclusions relating to the delineation and management of the LWRFS. NPS advocates for the

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[143] Tr. 1693–1696, 1705.
[144] MVIC Ex. 1, *MVIC Rebuttal Report dated August 15, 2019*, Hearing on Interim Order 1303, official records of the Division of Water Resources. MVIC identified sections from the SNWA report, but the references do not correspond with sections in SNWA's report. The State Engineer assumes that these section numbers correspond to page numbers of the SNWA report; *See also*, SNWA Ex. 7, *Burns, A., Drici, W., Collins, C., and Watrus, J., 2019, Assessment of Lower White River Flow System water resource conditions and aquifer response, Presentation to the Office of the Nevada State Engineer: Southern Nevada Water Authority, Las Vegas, Nevada*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[145] MVIC Ex. 1, p. 5; Tr. 1698.
[146] *See* MVIC Ex. 1, p. 3; Tr. 1697–1968.
[147] *Muddy Valley Irrigation Company Post Hearing Closing Statement* (MVIC Closing), Hearing on Interim Order 1303, official records of the Division of Water Resources; Tr. 1967, 1700–1708. *See also*, NSE Ex. 333, *Muddy River Decree*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[148] *See* NPS Ex. 2, *Prediction of the Effects of Changing the Spatial Distribution of Pumping in the Lower White River Flow System, Waddell, July 3, 2019*; Tr. 494–597.

inclusion of the entirety of the Black Mountains Area within the geographic boundary of the LWRFS based upon its review of geologic conditions that facilitate flow from the southern portion of the LWRFS through the Muddy Mountains thrust sheet and discharging in Rogers Spring and Blue Point Spring.[149] Further supporting this opinion, NPS cites to spring chemistry and isotopic composition of the water discharging from Rogers Spring and Blue Point Spring and the hydraulic head conditions that NPS believes supports the flow of groundwater beneath the Muddy Mountains from the carbonate-rock aquifer to those springs.[150] NPS acknowledge that there is a weak hydraulic connection between Rogers Spring and Blue Point Spring to the LWRFS based upon the geologic conditions within the Muddy Mountains, but argues that the entirety of the Black Mountains Area should be included to allow for management of the regional carbonate-aquifer to protect against diminished discharge to those springs.[151]

In addition to advocating for the inclusion of the entirety of the Black Mountains Area, the NPS provided evidence and analysis to support its conclusion that Kane Springs Valley too should be included within the geographic boundary of the LWRFS.[152] Based upon a review of the hydrologic data, geology of the Kane Springs Valley and basin boundaries, Coyote Spring Valley, and data from the Order 1169 aquifer test, NPS concludes that there is a clearly established hydrological connection between Kane Springs Valley and the other LWRFS basins, including discharge to the Warm Springs area.[153] While NPS advocates for the inclusion of the entire Black Mountains Area and Kane Springs Valley, it did not find any evidence to support the inclusion of the Las Vegas Valley within the LWRFS based upon a similar review of the geology and hydrological data.[154]

In interpreting data since the conclusion of the Order 1169 aquifer test, NPS reviewed the available data, concluding that the decades long decline of groundwater levels is not attributable to climate, but rather that the groundwater pumping within the LWRFS is the contributing

[149] *See* NPS Ex. 2, p. 22. *See also*, Tr. 569–70; NPS, *Closing Statements Interim Order 1303 Hearing Testimony* (NPS Closing), Hearing on Interim Order 1303, official records of the Division of Water Resources, p. 2.
[150] NPS Ex. 2, p. 22; NPS Closing, pp. 2–4.
[151] *Id.*
[152] NPS Ex. 2, p. 22; NPS Ex. 3, pp. 5–11; Tr. 550–551; NPS Closing, pp. 4–5.
[153] NPS Ex. 2, p. 22; NPS Ex. 3, pp. 5–11; Tr. 550–551; NPS Closing, pp. 5–6.
[154] NPS Ex. 2, p. 22; Tr. 552–554.

factor.[155] NPS opined that if recent pumping withdrawals continued, the current declining trend would be accelerated, adversely impacting spring discharge in the Warm Springs area and Muddy River flow.[156] Further, NPS's review of the data lead to its conclusion that it will take many years, if not decades for the LWRFS carbonate-rock aquifer to reach equilibrium, particularly at the current groundwater pumping withdrawals and even longer if pumping withdrawals occurred at Order 1169 aquifer test levels.[157] However, NPS did not provide an opinion as what rate of groundwater withdrawals would be sustainable within the LWRFS.

Finally, NPS concluded that the movement of groundwater withdrawals from the alluvial aquifer within the Muddy River Springs Area to the carbonate-rock aquifer within the LWRFS would ultimately have little impact on capture of Muddy River flow. Specifically, NPS found that while there may be near-term benefits to the Warm Springs area and Muddy River flow, those benefits would eventually disappear, as the impact would only be delayed and not eliminated.[158]

Nevada Cogeneration Associates

NCA submitted a Rebuttal Report Pertaining to Interim Order 1303 and provided testimony at the Interim Order 1303 hearing.[159] NCA objected to the inclusion of certain non-profit organizations on the basis that those organizations were not stakeholders and did not have an interest to protect as the non-governmental organizations did not have water rights within the LWRFS basins effected by the proceedings.[160]

With respect to the geographic boundary of the LWRFS, in its Rebuttal Report, NCA is of the opinion that the northwestern portion of the Black Mountains Area, as identified by the State Engineer, should be within the LWRFS basins, but expressed its disagreement with other opinions advocating for the inclusion of the entire Black Mountains Area based upon NCA's analysis of the geology and groundwater elevations.[161] During the Interim Order 1303 hearing and in its Post-Hearing Brief, NCA's opinion shifted to advocate for the boundary of the LWRFS to be adjusted

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155 NPS Ex. 2, pp. 7, 22–23. *See also* NPS Closing, pp. 5–6.
156 *Id.*
157 *Id.*
158 NPS Ex. 2, p. 23. *See also* NPS Closing, p. 6, and Tr. 593–594.
159 NCA Ex. 1, *NCA Rebuttal Report Pertaining to Interim Order 1303 August 16, 2019*, Hearing on Interim Order 1303, official records of the Division of Water Resources; Tr. 1602–50.
160 NCA Ex. 1, pp. 1, 23.
161 *Id.*, pp. 2, 23.

to exclude its production wells in the Black Mountains Area; however, NCA did not alter its opinion regarding the remaining portion of the Black Mountains Area staying within the LWRFS.[162]

NCA further expressed that the Lower Meadow Valley Wash should not be included in the LWRFS boundaries based upon the fact that observed groundwater levels do not indicate a hydrologic response to carbonate-rock aquifer pumping and that insufficient data supports a finding of continuity between water level trends to support its inclusion in the LWRFS.[163] However, NCA advocated for the inclusion of the Kane Springs Valley within the LWRFS based upon its opinion that the groundwater data demonstrated hydrologic connectivity between Coyote Spring Valley and Kane Springs Valley, acknowledging that the data is slightly attenuated resulting from the Kane Springs fault.[164] Ultimately, NCA concluded that Kane Springs Valley is tributary to the Coyote Spring Valley and the other LWRFS basins, which justify its inclusion within the boundary of the LWRFS.[165]

Similarly, based upon the groundwater data from the northern portion of Coyote Spring Valley demonstrating similar water level responses as other wells throughout the LWRFS and pumping data demonstrating high hydrologic connectivity across all the LWRFS basins, NCA concluded that there was no basis to exclude the northern portion of Coyote Spring Valley.[166] Finally, NCA rejected a suggestion that the entirety of the White River Flow system, which extends into northeastern Nevada, be included within the management area.[167] Specifically, NCA concluded that the Pahranagat Shear Zone creates a significant barrier to the northwestern portion of the LWRFS and that review of groundwater levels does not support a finding that groundwater level declines propagate into the northern reaches of the White River Flow System.[168] NCA concluded, advocating that proper management of the LWRFS is appropriate and sufficient for the

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[162] *Post-hearing brief of Nevada Cogeneration Associates Nos. 1 and 2 pertaining to Amended Notice of Hearing Interim Order #1303 following the hearing conducted September 23, 2019, through October 4, 2019, before the Nevada State Engineer* (NCA Closing), Hearing on Interim Order 1303, official records of the Division of Water Resources, pp. 2–10. *See also* Tr. 1619–22.
[163] NCA Ex. 1 pp. 3–7, 23. *See also* NCA Closing, pp. 15–16.
[164] NCA Ex. 1, pp. 8–17, 23. *See also* NCA Closing, pp. 10–14, and Tr. 1629–44.
[165] NCA Ex. 1, pp. 11–16.
[166] *Id.*, pp. 17–18, 23.
[167] *Id.*, pp. 19, 24.
[168] *Id.*

purpose of managing discharge of groundwater to the Warm Springs area to support habitat for the Moapa dace and serve senior Muddy River decreed rights.[169]

In addressing the annual amount of groundwater that could be developed within the LWRFS without adversely impacting senior decreed rights on the Muddy River or Warm Springs area discharge supporting the habitat for the Moapa dace, NCA supported a target of 9,318 afa, a recent three-year average of annual pumping within the LWRFS,[170] as it did not believe there to be sufficient data to support either an increase or decrease from this amount.[171] However, in its post-hearing brief, NCA opined that if their production wells located within the northwestern portion of the Black Mountains Area were excluded from the LWRFS boundary, then the annual amount of water that could be sustainably developed was less than the 9,318 afa.[172]

Finally, NCA did not support movement of water rights from the Muddy River Springs Area alluvial aquifer to the carbonate-rock aquifer, as it was of the opinion that the movement of those rights would not mitigate impact to the Warm Springs area.[173] Rather, NCA concluded that movement of those rights would compound the impact of pumping from the carbonate-rock aquifer.[174] However, NCA did express some support for movement of senior alluvial water rights as a management tool to offset existing junior carbonate-rock aquifer pumping within the LWRFS.[175]

NV Energy

NV Energy submitted a rebuttal report outlining its responses to the five matters the State Engineer solicited in Interim Order 1303 and presented its opinions and conclusions during the Interim Order 1303 hearing.[176] In its rebuttal report, NV Energy opined that the geographic boundary of the LWRFS should be as established in Interim Order 1303.[177] NV Energy further

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[169] *Id.*
[170] NCA Ex. 1, p. 19. *See, e.g.* Draft order of the State Engineer distributed to LWRFS stakeholders at the LWRFS Working Group meeting, September 19, 2018, official records of the Division of Water Resources.
[171] *Id.*, pp. 18, 24.
[172] NCA Closing, pp. 14–15.
[173] NCA Ex. 1, pp. 19–23, 24.
[174] *Id.*
[175] *Id.*
[176] NVE Ex. 1, *NV Energy Rebuttal Report to State Engineer's Order 1303 Initial Reports by Respondents*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[177] *Id.*, pp. 1–2.

opined that the existence of subsurface outflow from Kane Springs Valley into the LWRFS basins was insufficient to support its inclusion.[178]

NV Energy, in its rebuttal report, disagreed with MBOP's conclusion that the groundwater level declines observed during and after the Order 1169 aquifer test were primarily caused by drought. Rather, NV Energy agreed with SNWA's and MVWD's conclusions that the groundwater recovery occurred between 2–3 years following the conclusion of the aquifer test, but that continued pumping within the carbonate-rock aquifer has inhibited recovery to pre-Order 1169 aquifer test groundwater levels, and that at the current rate of carbonate-rock aquifer pumping the aquifer has nearly reached steady-state conditions and discharge to the Warm Springs area has reached equilibrium.[179]

NV Energy further agreed in its rebuttal report with MBOP's and CNLV's conclusions that some groundwater flowing within the carbonate-rock aquifer bypassed the Muddy River Springs Area, and ultimately the Muddy River. NV Energy also agreed that groundwater development within the southern boundary of the LWRFS would likely have less of an effect on discharge to the Warm Springs area and the river. NV Energy did not opine as to the quantity of water that bypassed the springs, but inferred that the current 7,000–8,000 afy of carbonate-rock aquifer pumping appeared to support the conclusion that steady-state conditions had been reached.[180] NV Energy also opined that movement of senior certificated alluvial water rights in the Muddy River Springs Area to carbonate-rock aquifer wells located in the southern portion of the LWRFS may be considered acceptable as Nevada law allows for the reasonable lowering of the groundwater table, and such movement would not necessarily result in a conflict to existing rights.[181] NV Energy further concluded that, contrary to the conclusions of MBOP, drought was not a significant cause for the groundwater level declines observed.[182] Finally, NV Energy concluded with suggestions that the State Engineer either: (1) combine the LWRFS basins into a single hydrographic basin and declare the new basin to be a Critical Management Area pursuant to NRS 534.037 and 534.110; or, (2) for the State Engineer to, under his authority in NRS 534.020 and

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178 *Id.*
179 *Id.*, pp. 2–7.
180 NVE Ex. 1, p. 8.
181 *Id.*, pp. 8–9; *Nevada Energy's Closing Statements* (NV Energy Closing), Hearing on Interim Order 1303, official records of the Division of Water Resources, pp. 4–5.
182 *Id.*, pp. 9–12.

534.120, require the water right holders within the LWRFS to develop a conjunctive management plan.[183]

After considering all of the evidence and testimony presented at the Interim Order 1303 hearing, NV Energy ultimately altered its opinion and found compelling arguments to both support the inclusion of Kane Springs Valley in the LWRFS as well as its exclusion.[184] Ultimately, NV Energy changed its opinion with respect to the geographic boundary of the LWRFS and in its closing statement expressed support for the inclusion of Kane Springs Valley within the LWRFS boundary due to the connection with Coyote Spring Valley and thus the potential for impacts to LWRFS from pumping within Kane Springs Valley.[185] NV Energy proposes that the current pumping regime of 7,000 to 8,000 afy be maintained to evaluate the potential for steady-state conditions and the continued monitoring of the Warm Springs West gage and agrees that moving pumping further south may reduce impact to the Muddy River and springs. With regards to moving water between the alluvial and carbonate-rock aquifers, similar to others, NV Energy agrees with the evaluation of change applications on a case-by-case basis with demonstration that impacts are reduced or unchanged by the proposed point of diversion compared to the existing point of diversion. NV Energy supports an agreement that would include all water users within the LWRFS for the purposes of not exceeding stresses within system and protecting the Moapa dace.[186]

Southern Nevada Water Authority and Las Vegas Valley Water District

The SNWA and LVVWD submitted multiple reports in response to the Interim Order 1303 solicitation.[187] SNWA and LVVWD supported the boundary of the LWRFS as identified in Interim Order 1303, and argued that there was a general consensus of the participants regarding the

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[183] *Id.*, p. 12.
[184] Tr. 1761–1762.
[185] NV Energy Closing, pp. 2–3.
[186] *Id.*, pp. 3–6.
[187] SNWA Ex. 7; SNWA Ex. 8, *Marshall, Z.L., and Williams, R.D., 2019, Assessment of Moapa dace and other groundwater- dependent special status species in the Lower White River Flow System, Presentation to the Office of the Nevada State Engineer: Southern Nevada Water Authority, Las Vegas, Nevada*, Hearing on Interim Order 1303, official records of the Division of Water Resources; SNWA Ex. 9, *Burns, A., Drici, W., and Marshall Z.L., 2019, Response to stakeholder reports submitted to the Nevada State Engineer with regards to Interim Order 1303, Presentation to the Office of the Nevada State Engineer: Southern Nevada Water Authority, Las Vegas, Nevada*, Hearing on Interim Order 1303, official records of the Division of Water Resources.

boundaries based upon the hydraulic connectivity within the identified basins.[188] Further, SNWA and LVVWD argued against the exclusion of the northern and western portions of Coyote Spring Valley, that management of adjoining basins should be done in a manner recognizing an impact on pumping from those basins on water availability in the LWRFS basins, and that the Las Vegas Valley should be excluded from the LWRFS.[189]

With respect to the evaluation of the carbonate-rock aquifer recovery since the conclusion of the Order 1169 aquifer test, SNWA and LVVWD concluded that the aquifer has not returned to pre-Order 1169 levels, and that the evidence demonstrates a continued declining trend within the carbonate-rock aquifer as a result of continued groundwater pumping.[190] SNWA and LVVWD concluded that the current pumping continues to capture groundwater storage and that based upon the current rate of groundwater withdrawals, water levels within the carbonate-rock aquifer will continue to decline for the foreseeable future.[191] Further, SNWA and LVVWD rejected the premise that climate was a significant factor over groundwater withdrawals for the observed groundwater level decline.[192]

Based upon a review of the evidence, SNWA and LVVWD concluded that current rate of groundwater withdrawals were not sustainable without adversely impacting senior Muddy River water rights and Moapa dace habitat.[193] Based upon the analysis performed by SNWA and LVVWD, examining the discharge from the Muddy River Springs Area and groundwater production within the carbonate-rock aquifer within the LWRFS, SNWA and LVVWD concluded that any groundwater development within the carbonate-rock aquifer resulted in a one-to-one (1:1) ratio of capture of Muddy River flow, and that regardless of where that pumping occurred, it still resulted in a 1:1 ratio of capture, only that the period of time that the capture was realized was longer.[194] Ultimately, SNWA and LVVWD concluded that while any amount of pumping results

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[188] SNWA Ex. 7, pp. 5-1 through 5-18, 8-1. *See also*, Tr. 953.
[189] *Closing Brief of Southern Nevada Water Authority and Las Vegas Valley Water District* (SNWA Closing), pp. 4–9, Hearing on Interim Order 1303, official records of the Division of Water Resources. *See also* SNWA Ex. 9 at sections 6, 7 and 12.
[190] SNWA Closing, pp. 9–12. *See also* SNWA Ex. 7, pp. 5-1 through 5-18, and SNWA Ex. 9, pp. 15–20.
[191] SNWA Closing, pp. 11–12. *See also* Tr. 932.
[192] SNWA Closing, pp. 12–14. *See also* SNWA Ex. 9, pp. 15–17.
[193] SNWA Ex. 7, pp. 6-3 through 6-4, 8-2 through 8-4.
[194] *Id.*, pp. 6-4 through 6-11, 8-2 through 8-4; SNWA Ex. 9, pp. 22–27.

in a conflict with senior decreed Muddy River rights, approximately 4,000 to 6,000 afa could be sustainably pumped from the aquifer.[195] In conjunction with SNWA and LVVWD's evaluation of the quantity of water that may be sustainably developed within the LWRFS, SNWA and LVVWD reviewed the interrelationship between discharge from the carbonate-rock aquifer underlying the LWRFS, groundwater pumping and the impact on the habitat and recovery of the Moapa dace.[196] SNWA and LVVWD ultimately concluded that the flow required to sustain the Moapa dace from adverse effects, including habitat loss and fish population declines was a minimum 3.2 cfs at the Warm Springs West gage.[197]

Finally, it was SNWA and LVVWD's opinion that movement of water rights from the Muddy River Springs Area alluvial aquifer to the carbonate-rock aquifer within the LWRFS may delay the capture of water serving senior decreed rights on the Muddy River, but that movement of water from the alluvial aquifer to the carbonate-rock aquifer would adversely impact the habitat of the Moapa dace.[198] Thus, SNWA and LVVWD concluded transfer of water rights from the Muddy River Springs Area alluvial aquifer to the LWRFS carbonate-rock aquifer would result in further depletion of flow to the Warm Springs area.[199]

Technichrome

Technichrome submitted a response and additional response to the Interim Order in July 2019 but did not participate in the hearing.[200] Technichrome stated that it had no objection to a "joint administrative basin" consisting of Coyote Spring Valley, Black Mountain Area, Garnet Valley, Hidden Valley, Muddy River Springs Area, and Lower Moapa Valley, expressed no comment regarding the inclusion of Kane Springs Valley, but questioned whether the entirety of the White River Flow System should be included in the State Engineer's analysis.[201] However,

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[195] Tr. 921–22. *See also* SNWA Ex. 7, pp. 8-1 through 8-5; SNWA Ex. 9, p. 27.
[196] *See* SNWA Ex. 8.
[197] *Id.*, pp. 8-1 through 8-2. *See also* SNWA Closing, pp. 17–19.
[198] *See* SNWA Closing, pp. 19–20. *See also* SNWA Ex. 7, pp. 6-3 through 6-11, 8-4; SNWA Ex. 9, pp. 21–22.
[199] SNWA Closing, p. 20. *See also* Tr. 904–05.
[200] *Response to Interim Order #1303 Submitted [sic] by Technichrome* (Technichrome Response), Hearing on Interim Order 1303, official records of the Division of Water Resources, and *Additional Comments from Technichrome* (Technichrome Addendum), Hearing on Interim Order 1303, official records of the Division of Water Resources.
[201] Technichrome Response, pp. 1–3.

Technichrome did note that it believed that combining all water rights into a single management structure reduced the State Engineer's ability to control groundwater withdrawals. Technichrome stated that it believed that the State Engineer should have the ability to control withdrawals in small areas to best manage the discharge to the Warm Springs area, and that more targeted control over the groundwater withdrawals would be more effective in managing the discharge.[202] Technichrome supported this opinion with some analysis of the results of the Order 1169 aquifer test and its opinion that pumping farther from the Warm Springs area had little to no impact on discharge to Pederson Spring.[203]

In Technichrome's additional comments, Technichrome addressed concerns regarding the injury that would result from a system-wide reduction of groundwater rights throughout the LWRFS.[204] Finally, Technichrome addressed concerns regarding reliance on the priority system, as utilization of the prior appropriation system would benefit senior irrigation uses over the junior industrial uses, and that removal of basin boundaries would remove limitations on movement of water rights between the existing hydrographic basins, which would disrupt junior uses in areas where senior rights may be moved.[205]

U.S. Fish and Wildlife Service

USFWS holds several water rights within the LWRFS and its mission is consistent with the scientific and management aspects of the LWRFS and the management area as established in Interim Order 1303.[206] USFWS opted to participate in the proceeding by submitting initial and rebuttal reports and providing testimony during the administrative hearing.[207] The approach of

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[202] *Id.*
[203] *Id.*, and Technichrome Addendum.
[204] Technichrome Addendum.
[205] *Id.*
[206] The USFWS' mission is to work with others to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people. *See also*, USFWS, *About the U.S. Fish and Wildlife Service*, https://bit.ly/aboutusfws (last accessed June 4, 2020).
[207] USFWS Ex. 5, *Report in Response to Order 1303*, Hearing on Interim Order 1303, official records of the Division of Water Resources; USFWS Ex. 7, *Rebuttal to: Water Level Decline in the LWRFS: Managing for Sustainable Groundwater Development by Cady Johnson and Martin Mifflin* [sic], *Mifflin & Associates, Inc., submitted by the Moapa Band of Paiutes in accordance with Order 1303*, Hearing on Interim Order 1303, official records of the Division of Water Resources.

USFWS was to review available data, develop a hydrogeologic conceptual model, and answer the specific questions posed in Interim Order 1303.

USFWS proposed that the boundary be based on geologic breaks rather than the surface drainage areas. The boundary would then encompass all Muddy River Springs Area, Hidden Valley, Garnet Valley, most of Coyote Spring Valley, most of California Wash, the northwest portion of the Black Mountains area, Kane Springs Valley, and most of Lower Meadow Valley Wash. The extent to which Kane Springs Valley and Lower Meadow Valley Wash are included would depend on the data from an aquifer test that has not yet been performed.[208]

Although, USFWS did not directly opine their view on recovery, their report discusses a conceptual model with insight into lag times and hydraulic connections, and how current conditions relate to sustainable pumping. An "undiminished state of decline" in water levels and spring flows indicated that the system was not in equilibrium at the end of the Order 1169 aquifer test. USFWS postulated there was generally good connectivity within the aquifer system with areas of higher and lower transmittivity. Trends in water levels and spring flows allude to the connection between high elevation springs and carbonate-rock aquifer pumping, with a time lag observed in the recovery of carbonate-rock aquifer water levels and spring flows following the cessation of the Order 1169 aquifer test. The exception is Big Muddy Spring where surface water level trends appeared to be unrelated to the carbonate-rock aquifer water levels.[209]

USFWS determined that the optimum method currently available to estimate the maximum allowable rate of pumping in the LWRFS is the average annual rate of pumping from 2015–2017.[210] USFWS considered the period from 2015 to 2017 because it found that the groundwater withdrawals, the discharge of the Muddy River Springs, and the flow of the Muddy River were all relatively constant; flow rates from Plummer, Pederson, Jones and Baldwin springs, though generally lower than before the Order 1169 aquifer test, were reasonably stable compared to earlier

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[208] *See* USFWS Ex. 5, pp. 2, 28–36.
[209] USFWS Ex. 5, pp. 3, 32–33, 35, 37–45; Tr. 266–270, 273–281, 299-301, 433-435.
[210] USFWS Ex. 5, p. 3.

periods.[211] Using the pumpage inventories for this time period, USFWS estimated the sustainable groundwater withdrawals to be 9,318 afa.[212]

Even if total carbonate-rock and alluvial aquifer pumping is maintained at a "sustainable" overall level, USFWS did not support increased carbonated-rock aquifer pumping in exchange for reductions in alluvial aquifer pumping, nor did USFWS support increased alluvial aquifer pumping in exchange for reductions in carbonate-rock aquifer pumping. USFWS suggested that carbonate-rock aquifer pumping should not be moved closer to the springs or the river. Similarly, USFWS suggests that alluvial aquifer pumping in the vicinity of the river should not be moved closer to the river. USFWS opines that any movement of water nearer to the springs or the river is anticipated to decrease the lag time for observing responses from pumping and shorten the time to respond to unfavorable impacts.[213]

Moving forward with management of the LWRFS, USFWS supported the use of the triggers at the Warm Springs West gage, as established under the 2006 MOA. Continuing to use these Warm Springs West flows as a trigger for management will protect and provide habitat for the Moapa dace; a reduction in the flow translates to a reduction in habitat.[214]

USFWS did not deny that water levels were independent of a climate response signal. Using observed data for Nevada Climate Divisions, USFWS visually inspected hydrographs for climate signals. USFWS opined that response to wet periods are observed for wells in both the carbonate-rock and alluvial aquifers and springs that discharge from the carbonate-rock aquifer but stated that response to dry periods cannot be separated from the impacts of pumping. USFWS did not observe these same climate signals in the hydrographs for Jones and Baldwin Springs or the Big Muddy Spring. USFWS disagreed with the conclusion of the MBOP regarding long-term, regional drought, as well as the analytical methods.[215]

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[211] USFWS Ex. 5, pp. 3, 37; Tr. 269–270, 433–435.
[212] USFWS Ex. 5, pp. 3, 36–38; Tr. 268–270.
[213] *See* USFWS Ex. 5, pp. 3–4, 38–39; Tr. 272–273.
[214] *See* USFWS Ex. 5, pp. 4, 39–45; Tr. 273–282; *See also*, NSE Ex. 256; NSE Ex. 244, *2006 Memorandum of Agreement Trigger Levels agreed to by the Southern Nevada Water Authority, Moapa Valley Water District, Coyotes Springs Investments LLC and Moapa Band of Paiute Indians*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[215] *See* USFWS Ex. 5, pp. 24–28, 34–35; *See* USFWS Ex. 7, pp. 2–16; Tr. 258–260, 299–322, 429–432.

Western Elite Environmental/Bedroc

Bedroc is the land holding and water-right holding entity for Western Elite Environmental, Inc., a provider of construction and recyclable waste collection and disposal in Southern Nevada.[216] Bedroc submitted an undated rebuttal report signed by Derek Muaina, General Counsel, and a closing statement.[217] Bedroc presented Jay Dixon as its expert to give a presentation and to discuss the rebuttal report.[218] Mr. Dixon stated that he contributed to the report, and that he agreed with it, but he did not sign the report because he was working for another participant in the hearing (NCA).[219] Mr. Dixon did provide testimony consistent with the report, and adopted the findings of that report, and both the testimony and the report will be considered in this Order.[220]

Bedroc presented testimony and evidence that its source of groundwater is hydraulically disconnected from the regional carbonate aquifer of the LWRFS and that additional groundwater may be available for pumping in their part of Coyote Spring Valley. Bedroc also argued that its basin fill alluvial groundwater pumping should be managed outside of the proposed LWRFS joint administrative unit.[221]

To show the hydraulic disconnect, Bedroc presented geologic information demonstrating its unique location.[222] Bedroc showed that a confining shelf of sedimentary rock was noticeably absent in the vicinity of the Bedroc site where recharge from the Sheep Range rises toward the surface between two faults, which results in shallow groundwater that is subject to ET and capture from shallow groundwater wells at the Bedroc site.[223] Recharge from the Sheep Range was estimated to be 750 afy, an average of the high and low estimates of the maximum recharge

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[216] Bedroc Ex. 2, *Interim Order 1303- Rebuttal Report- Prepared by Bedroc and Dixon Hydrologic, PLLC- August 2019*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[217] Bedroc Ex. 2; *Western Elite Environmental Inc.'s and Bedroc Limited, LLC's Closing Statement* (Bedroc Closing), Hearing on Interim Order 1303, official records of the Division of Water Resources.
[218] *See* Tr. 1718–1719.
[219] Tr. 1719, 1741.
[220] Tr. 1718–1757, 1749–1750.
[221] Bedroc Closing, pp. 13–14. Bedroc offered summary responses to the first four questions posed by Order 1303 but did no independent analysis. *See* Bedroc Closing, p. 12.
[222] Bedroc Closing, p. 2.
[223] *Id*; Tr. 1726–1733.

available.[224] SNWA challenged this calculation, pointing out that the estimated recharge could be as low as 130 acre-feet.[225]

Bedroc believes that it is capturing the recharge that would otherwise be lost to evapotranspiration.[226] Groundwater conditions at Bedroc's site show a rise in water levels between 2003 and 2006.[227] Bedroc attributed this rise in part to the installation of an unlined storage pond upgradient from the well, but also to the 2005 recharge event that was discussed by many participants to the proceeding.[228] Between 2006 and 2011, Bedroc showed that groundwater levels had been relatively stable even though pumping by Bedroc was fairly constant.[229] Bedroc showed photo evidence of evapotranspiration occurring around the Bedroc site, pointing to areas of white surface soils and green occurring in the photo as evidence of salt residue and phreatophytes, both occurring as a result of shallow groundwater evaporation.[230] The area is estimated to be about 2,200 acres, and the ET range is estimated to be 0.2 to 0.3 feet per year.[231] This results in an estimate of 400 to 600 afa of groundwater that potentially could be captured every year without pulling groundwater from storage.[232] If pumping in this area exceeded ET, water levels to the east of Bedroc would be dropping.[233]

Bedroc considered the alluvial system at its location to be a separate aquifer from the carbonate-rock aquifer in the LWRFS.[234] CBD in its report also supports this conclusion, suggesting that some groundwater can be withdrawn from the Coyote Spring Valley alluvial aquifer system because that system is disconnected from and not responsible for substantial recharge to the carbonate-rock aquifer.[235] SNWA testified similarly during the hearing.[236]

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[224] Tr. 1724–1725, 1755.
[225] Tr. 1755.
[226] Bedroc Closing, pp. 5–9.
[227] Tr. 1735.
[228] *Id.*
[229] Tr. 1735–1736.
[230] Tr. 1734, 1738.
[231] Tr. 1739.
[232] Tr. 1739.
[233] Tr. 1739. *See also* Bedroc Closing, p. 8.
[234] Tr. 1746.
[235] Bedroc Ex. 2, p. 5.
[236] Tr. 1024.

Relying on a lack of connection between pumping at Bedroc and the carbonate-rock aquifer, Bedroc asserted that there is no likely impact to the Warm Springs area caused by Bedroc.[237] Bedroc compared groundwater elevations over time in two alluvial wells, CSV-3009M and CSVM-7, and showed an upward trend in groundwater elevations.[238] But, when comparing groundwater elevations of two monitoring wells in different sources, CSVM-7 in the alluvium and CSVM-4 in the carbonate-rock aquifers, the carbonate-rock aquifer well elevations showed a decline during the Order 1169 aquifer test, but the alluvial well elevation rose during the same period and leveled off after the conclusion of the test.[239] Bedroc concluded that these data illustrate 1) the hydraulic disconnect between the local alluvial aquifer and carbonate-rock aquifer and 2) if historical alluvial pumping at Bedroc has not impacted water levels in nearby alluvial wells, then there is likely no impact to spring or streamflow in the Muddy River Springs Area.

Finally, Bedroc stated that managing all users in the region under the same system would arbitrarily impact users whose water neither comes from the regional carbonate-rock aquifer system nor impacts the springs of concern downstream.[240] It urged caution in allowing transfer of water rights between alluvial and carbonate-rock aquifers due to potential impacts on senior users that are using local recharge that may not sustain pumping from additional users.[241] Transfers of senior alluvial rights from the Muddy River Springs Area to the area near Bedroc should be considered on a case-by-case basis to protect Bedroc's senior water rights.[242]

III. PUBLIC COMMENT

WHEREAS, following the conclusion of the Interim Order 1303 hearing, opportunity for public comment was offered, including the opportunity to submit written public comment, which was due to be submitted to the Division no later than December 3, 2019. Lincoln County Board of

[237] Bedroc Closing, p.11. *See also* SNWA testimony of Andrew Burns that pumping at Bedroc wells is not likely to impact the carbonate system or the Muddy River. Tr. 1024–1025.
[238] Bedroc Closing, p. 12. *See also* Tr. 1736–1737, 1752.
[239] Tr. 1737–1738.
[240] Bedroc Ex. 2, pp. 2–4.
[241] *Id.*, p. 6.
[242] Tr. 1740.

County Commissioners submitted written public comment in addition to the closing argument submitted by LC-V.[343]

IV. AUTHORITY AND NECESSITY

WHEREAS, NRS 533.024(1)(c) directs the State Engineer "to consider the best available science in rendering decisions concerning the availability of surface and underground sources of water in Nevada."

WHEREAS, in 2017 the Nevada Legislature added NRS 533.024(1)(e), declaring the policy of the State to "manage conjunctively the appropriation, use and administration of all waters of this State regardless of the source of the water."

WHEREAS, NRS 534.020 provides that all waters of the State belong to the public and are subject to all existing rights.

WHEREAS, as demonstrated by the results of the Order 1169 aquifer test and in the data collected in the years since the conclusion of the aquifer test, the LWRFS exhibits a direct hydraulic connection that demonstrates that conjunctive management and joint administration of these groundwater basins is necessary and supported by the best available science.[344]

WHEREAS, the pre-development discharge of 34,000 acre-feet of the fully appropriated Muddy River system plus the more than 38,000 acre-feet of groundwater appropriations within the LWRFS greatly exceed the total water budget that may be developed without impairment of senior existing rights or proving detrimental to the public interest.

WHEREAS, the available groundwater supply within the LWRFS that can be continually pumped over the long-term is limited to the amount that may be developed without impairing existing senior rights, rights on the Muddy River or adversely affecting the public interest in

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[343] *See* Board of County Commissioners, Lincoln County, Nevada, *Public Comment to Interim Order #1303 Hearing, Reports, and Evidence on the Lower White River Flow System*, Hearing on Interim Order 1303, official records of the Division of Water Resources.

[344] *See, e.g.*, NSE Ex. 245; NSE Ex. 248; NSE Ex. 256; NSE Ex. 252; NSE Ex. 282, *Federal Bureaus Order 1169 Report Selected References: Comparison of Simulated and Observed Effects of Pumping from MX-5 Using Data Collected to the Endo of the Order 1169 Test, and Prediction of the Rates of Recovery from the Test, TetraTech, 2013*, Hearing on Interim Order 1303, official records of the Division of Water Resources. *See also, e.g.*, CBD Ex. 3; MVWD Exs. 3–4; MVIC Ex. 1; NCA Ex. 1, SNWA Exs. 7–9; USFWS Exs. 5–6; NPS Exs. 2–3.

protection of the endangered Moapa dace and the habitat necessary to support the management and recovery of the Moapa dace.

WHEREAS, pursuant to NRS 532.120, the State Engineer is empowered to make such reasonable rules and regulations as may be necessary for the proper and orderly execution of the powers conferred by law.

WHEREAS, pursuant to NRS 534.110(6) the State Engineer is directed to conduct investigations in groundwater basins where it appears that the average annual replenishment of the groundwater is insufficient to meet the needs of all water right holders, and if there is such a finding, the State Engineer may restrict withdrawals to conform to priority rights.

WHEREAS, within an area that has been designated by the State Engineer, as provided for in NRS Chapter 534, and specifically, NRS 534.120, where, in the judgment of the State Engineer, the groundwater basin is being depleted, the State Engineer in his or her administrative capacity may make such rules, regulations and orders as are deemed essential for the welfare of the area involved.[245]

WHEREAS, the State Engineer has the authority to hold a hearing to take evidence and the interpretation of the evidence with respect to its responsibility to manage Nevada's water resources and to allow willing participants to present evidence and testimony regarding the conclusions relating to the questions presented in Interim Order 1303. The State Engineer recognizes that the MBOP is a federally recognized tribe, and that its participation in the hearing was to facilitate the understanding of the interpretation of data with respect to the Interim Order 1303 solicitation.

V. ENDANGERED SPECIES ACT

WHEREAS, the Endangered Species Act (ESA), 16 U.S.C. §1531 et seq. is a federal law designed to serve the purpose of identifying, conserving and ultimately recovering species declining toward extinction.[246] Specifically, while the ESA is primarily a conservation program, a critical element of the conservation component seeks to encourage cooperation and coordination

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[245] *See also* NRS 534.030, NRS 534.110.
[246] 16 U.S.C. § 1531(a)–(b).

with state and local agencies.[247] The responsibility of enforcement and management under the ESA rests predominately with the federal government; however, the ultimate responsibility is shared.[248]

WHEREAS, the ESA makes it unlawful for any person to "take" an endangered species – or to attempt to commit, solicit another to commit, or cause to be committed, a taking.[249] The term "person" is broadly defined to include the State and its instrumentalities.[250] "Take" encompasses actions that "harass, harm" or otherwise disturb listed species, including indirect actions that result in a take.[251] For example, a state regulator is not exempted from the ESA for takings that occur as a result of a licensee's regulated activity. States have been faced with the impediment of their administrative management actions being subservient to the ESA. For example, the Massachusetts Division of Marine Fisheries was subject to an injunction prohibiting it from issuing commercial fishing licenses because doing so would likely lead to the taking of an endangered species.[252] In *Strahan v. Coxe*, the court's decision relied on reading two provisions of the ESA— the definition of the prohibited activity of a "taking" and the causation by a third party of a taking— "to apply to acts by third parties that allow or authorize acts that exact a taking and that, but for the permitting process, could not take place."[253] Although Massachusetts was not the one directly causing the harm to the endangered species, the court upheld the injunction because "a governmental third party pursuant to whose authority an actor directly exacts a taking of an endangered species may be deemed to have violated the provisions of the ESA."[254] At least three other circuits have held similarly.[255] In each case, "the regulatory entity purports to make lawful an activity that allegedly violates the ESA."[256] Thus the action of granting the permit for the regulated activity has been considered an indirect cause of a prohibited taking under the ESA.

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[247] 16 U.S.C. § 1531(c); 16 U.S.C. § 1536.
[248] 16 U.S.C.A. § 1536.
[249] 16 U.S.C.A. § 1538(g).
[250] 16 U.S.C.A. § 1532(13).
[251] 16 U.S.C.A. § 1532(19). The term "harm" is defined by regulation, 50 C.F.R. § 17.3 (1999).
[252] *Strahan v. Coxe*, 127 F.3d 155 (1st.Cir.1997), *cert denied* 525 U.S. 830 (1998).
[253] *Id.*, p. 163.
[254] *Id.*
[255] *See Sierra Club v. Yeutter*, 926 F.2d 429 (5th Cir.1991); *Defenders of Wildlife v. EPA*, 882 F.2d 1294 (8th Cir. 1989); *Loggerhead Turtle v. County Council*, 148 F.3d 1231 (11th Cir.1998); *Palila v. Hawaii Dept. of Land & Natural Resources*, 852 F.2d 1106 (9th Cir.1988).
[256] *Loggerhead Turtle*, 148 F.3d at 1251.

WHEREAS, the use of water in Nevada is a regulated activity.[257] It is the responsibility of the State to manage the appropriation, use and administration of all waters of the state.[258] Based on *Strahan* and similar decisions, the act of issuing a permit to withdraw groundwater that reduces the flow of the springs that form the habitat of the Moapa dace and were to result in harm to the Moapa dace exposes the Division, the State Engineer and the State of Nevada to liability under the ESA.

WHEREAS, a USFWS biological opinion for the MOA found that the reduction in spring flow from the warm springs could impact the dace population in multiple ways. First, the USFWS found that declines in groundwater levels will reduce the flow to the Warm Springs area and allow for cooler groundwater seepage into streams. With reduced spring flow, Moapa dace habitat is reduced.[259] Additionally, USFWS determined that the reduced flows of warm water from the springs will also result in cooler water available throughout the dace habitat, reducing spawning habitat and resulting in a population decline.[260]

WHEREAS, based upon the testimony and evidence offered in response to Interim Order 1303, it is clear that it is necessary for spring flow measured at the Warm Springs West gage to flow at a minimum rate of 3.2 cfs in order to maintain habitat for the Moapa dace.[261] A reduction of flow below this rate may result in a decline in the dace population. This minimum flow rate is not necessarily sufficient to support the rehabilitation of the Moapa dace.[262]

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[257] NRS 533.030; 533.325; 534.020.
[258] NRS 533.325; 533.024(1)(e); 534.020.
[259] USFWS Ex. 5, pp. 50–52.
[260] SNWA Ex. 8, pp. 6-2 through 6-3; SNWA Ex. 40, *Hatten, J.R., Batt, T.R., Scoppettone, G.G., and Dixon, C.J., 2013, An ecohydraulic model to identify and monitor Moapa dace habitat. PLoS ONE 8(2):e55551, doi:10.1371/journal.pone.0055551.*, Hearing on Interim Order 1303, official records of the Division of Water Resources; SNWA Ex. 41, *U.S. Fish and Wildlife Service, 2006a, Intra-service programmatic biological opinion for the proposed Muddy River Memorandum of Agreement regarding the groundwater withdrawal of 16,100 acre-feet per year from the regional carbonate aquifer in Coyote Spring Valley and California Wash basins, and establish conservation measures for the Moapa Dace, Clark County, Nevada. File No. 1-5-05 FW-536, January 30, 2006.*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[261] Tr. 1127–1128.
[262] Tr. 401–402, 1147, 1157–1158.

WHEREAS, the ESA prohibits any loss of Moapa dace resulting from actions that would impair habitat necessary for its survival. Some groundwater users are signatories to an MOA that authorizes incidental take of the Moapa dace; however, the State Engineer and many other groundwater users are not covered by the terms of the MOA.[263] Not only would liability under the ESA for a "take" extend to groundwater users within the LWRFS, but would so extend to the State of Nevada through the Division as the government agency responsible for permitting water use.

WHEREAS, the State Engineer concludes that it is against the public interest to allow groundwater pumping from the LWRFS that will reduce spring flow in the Warm Springs area to a level that would impair habitat necessary for the survival of the Moapa dace and could result in take of the endangered species.

VI. GEOGRAPHIC BOUNDARY OF THE LWRFS

WHEREAS, the geographic boundary of the hydrologically connected groundwater and surface water systems comprising the LWRFS, as presented in Interim Order 1303, encompasses the area that includes Coyote Spring Valley, Muddy River Springs Area, California Wash, Hidden Valley, Garnet Valley and the northwest portion of the Black Mountains Area.[264] The rationale for incorporating these areas into a single administrative unit included the presence of a distinct regional carbonate-rock aquifer that underlies and uniquely connects these areas; the remarkably flat potentiometric surface observed within the area; the diagnostic groundwater level hydrographic pattern exhibited by monitoring wells distributed across the area; and the area-wide diagnostic water level response to pumping during the Order 1169 aquifer test. Each of these characteristics were previously identified and examined in the hydrological studies and subsequent hearing that followed the completion of the Order 1169 aquifer test. Indeed, these characteristics were the foundational basis for the State Engineer's determination in Rulings 6254–6261 that the

[263] NSE Ex. 236; SNWA Ex. 8, pp. 5-1 through 5-8.
[264] *See* NSE Ex. 1, p. 6.

close hydrologic connection[265] and shared source and supply of water in the LWRFS required joint management.[266]

WHEREAS, evidence and testimony presented during the Interim Order 1303 hearing indicated a majority consensus among stakeholder participants that this originally defined area is appropriately combined into a single unit.[267] Evidence and testimony was also presented on whether to add adjacent basins, or parts of basins to the administrative unit; to modify boundaries within the existing administrative unit; or to eliminate the common administrative unit boundaries. The State Engineer has considered this evidence and testimony on the basis of a common set of criteria that are consistent with the original characteristics considered critical in demonstrating a close hydrologic connection requiring joint management in Rulings 6254–6261 and more specifically, include the following:

1) Water level observations whose spatial distribution indicates a relatively uniform or flat potentiometric surface are consistent with a close hydrologic connection.

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[265] The State Engineer notes that the terminology "*hydrologic* connection" and "*hydraulic* connection" have been used by different parties sometimes interchangeably, and commonly with nearly the same meaning. The State Engineer considers a hydraulic connection to be intrinsically tied to the behavior and movement of water. With regard to aquifers, it may be thought of as the natural or induced movement of water through permeable geologic material. The degree of hydraulic connection can be considered a measure of the interconnection between locations as defined by a cause and effect change in potentiometric surface or a change in groundwater inflow or outflow that reflects characteristics of both the aquifer material and geometry, and groundwater behavior. It is commonly characterized by a response that is transmitted through the aquifer via changes in hydraulic head, ie., groundwater levels. Hydrologic connections may include hydraulic connections but can also represent more complex system interactions that can encompass all parts of the water cycle, and in some cases may focus on flow paths, water budgets, geochemical interactions, etc. The State Engineer's use of the term "*close* hydrological connection" is intended to encompass and include a direct hydraulic connection that is reflected in changes in groundwater levels in response to pumping or other fluxes into or out of the aquifer system within a matter of days, months, or years. The closeness, strength, or directness of the response is indicated by timing, with more distinct and more immediate responses being more "close".

[266] *See* NSE Ex. 14, p. 12, 24.

[267] *See* Participant testimony from SNWA (Tr. 875–876), CNLV (Tr. 1418), and CSI (Tr. 95–96). Several other participants agreed, too, that the State Engineer's delineation of the LWRS as defined in Interim Order 1303 was acceptable. *See also* Bedroc Closing, p. 12, Church Closing, p. 1; Technichrome Response, p. 1. Other participants recommended larger areas be included within the LWRFS boundary. *See* Tr. 261–266 (USFWS), 1571–1572 (CBD), 1697–1698 (MVIC). *See also* NV Energy Closing, pp. 2–3; NPS Closing pp. 2–5.

2) Water level hydrographs that, in well-to-well comparisons, demonstrate a similar temporal pattern, irrespective of whether the pattern is caused by climate, pumping, or other dynamic is consistent with a close hydrologic connection.

3) Water level hydrographs that demonstrate an observable increase in drawdown that corresponds to an increase in pumping and an observable decrease in drawdown, or a recovery, that corresponds to a decrease in pumping, are consistent with a direct hydraulic connection and close hydrologic connection to the pumping location(s).

4) Water level observations that demonstrate a relatively steep hydraulic gradient are consistent with a poor hydraulic connection and a potential boundary.

5) Geological structures that have caused a juxtaposition of the carbonate-rock aquifer with low permeability bedrock are consistent with a boundary.

6) When hydrogeologic information indicate a close hydraulic connection (based on criteria 1-5), but limited, poor quality, or low resolution water level data obfuscate a determination of the extent of that connection, a boundary should be established such that it extends out to the nearest mapped feature that juxtaposes the carbonate-rock aquifer with low-permeability bedrock, or in the absence of that, to the basin boundary.

WHEREAS, some testimony was presented advocating to include additional areas to the LWRFS based principally on water budget considerations and/or common groundwater flow pathways.[268] Indeed, some participants advocate to include the entire White River Flow System, or other basins whose water may ultimately flow into or flow out of the system.[269] Other participants used, but did not rely on, water budget and groundwater flow path considerations to support their analysis. Like those participants, the State Engineer agrees that while water budget and groundwater flow path analysis are useful to demonstrate a hydrologic connection, additional information is required to demonstrate the relative strength of that connection. Thus, the State

[268] *See e.g.*, CNLV Ex. 3, p. 33, Tr. 1430; NPS Closing, p. 2. *See also* Tr. 253–257; Sue Braumiller, *Interpretations of available Geologic and Hydrologic Data Leading to Responses to Questions Posed by the State Engineer in Order 1303 regarding Conjunctive Management of the Lower White River Flow System* (USFWS Braumiller presentation), slide 11, Item 6., bullet 1, official records of the Division of Water Resources; MBOP Ex. 2, p. 11.
[269] *See e.g.*, GBWN Report, pp. 1–2.

Engineer recognizes that while any hydrologic connection, weak or strong, needs to be considered in any management approach, many of the connections advocated based principally on a water budget or flow path analysis, including those between nearby basins like Las Vegas Valley and Lower Meadow Valley Wash, are not demonstrated to provide for the uniquely close hydraulic connection that require joint management.

WHEREAS, in their closing statement, NPS proposes that all adjacent hydrographic areas to the original Interim Order 1303 administrative unit where a hydraulic interconnection exists, whether weak or strong, be included in the LWRFS.[270] It does so to alleviate the need for developing new management schemes for the excluded remnants and to provide for appropriate management approaches based on new information and improved understanding of differing degrees of hydraulic interconnection in various sub-basins. The State Engineer agrees with this logic, up to a point, and has applied these concepts to the extent practical as demonstrated in his criteria for determining the extent of the LWRFS. However, the State Engineer also finds that there must be reasonable and technically defensible limits to the geographic boundary. Otherwise, if management were to be based on the entire spectrum of weak to strong hydraulic interconnection, then exclusion of an area from the LWRFS would require absolute isolation from the LWRFS; every sub-basin would have its own management scheme based on some measure of its degree of connectedness; and proper joint management would be intractable.

WHEREAS, evidence and testimony was also presented by the NPS regarding the specific inclusion of the entirety of the Black Mountains Area in the LWRFS.[271] The State Engineer recognizes that there may be a hydrologic connection between the Black Mountains Area and upgradient basins that are sources of inflow, and that outflow from the LWRFS carbonate-rock aquifer may contribute to discharge from Rogers and Blue Point Springs. However, the State Engineer does not find that this supports inclusion of the entirety of the Black Mountains Area. This determination is made based on the lack of contiguity of the carbonate-rock aquifer into this

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[270] NPS Closing, pp. 3–5.
[271] NPS Closing pp. 3–4. *See also* Tr.534, 555–569; Richard K. Waddell, Jr., *Testimony of Richard K. Waddell on behalf of the National Park Service*, presentation during hearing for Interim Order 1303 (NPS Presentation), slides 32–46, official records of the Division of Water Resources.

area,[272] the difference in observed water level elevations compared to those in adjacent carbonate-rock aquifer wells to the north and west,[273] and the absence of observed diagnostic hydrographic patterns and responses that define the uniquely close hydraulic connection that characterizes the LWRFS.[274]

WHEREAS, evidence and testimony presented by USFWS relied principally on SeriesSEE analysis of water level responses submitted by the Department of Interior Bureaus following the Order 1169 aquifer test to establish the general extent of the LWRFS. This was supported by the application of hydrogeology and principles of groundwater flow to define specific boundary limits to the LWRFS. It proposed that most of the Lower Meadow Valley Wash be considered for inclusion in the LWRFS based on the potential geologic continuity between carbonate rocks underlying the Lower Meadow Valley Wash and the carbonate-rock aquifer underlying Coyote Spring Valley, the Muddy River Springs Area, and California Wash.[275] Additionally, it asserted that the alluvial aquifer system in Lower Meadow Valley Wash contributes to and is connected to both the Muddy River and the alluvial aquifer system in California Wash. The State Engineer finds that while carbonate rocks may underlie the Lower Meadow Valley Wash and be contiguous with carbonate rocks to the south and west, data are lacking to characterize the potential hydraulic connection that may exist. Regarding the hydraulic connection between the Lower Meadow Valley Wash alluvial aquifer and the LWRFS, the State Engineer agrees with USFWS that a connection exists, but finds that any impacts related to water development in the Lower Meadow Valley Wash alluvial aquifer are localized, and unrelated to the carbonate-rock aquifer, and can be appropriately managed outside the LWRFS joint management process.

WHEREAS, NCA advocated for the exclusion of the portion of the Black Mountains Area from the LWRFS that contains their individual production wells. NCA premise this primarily on testimony and analysis performed by SNWA with respect to the impact of pumping from this area

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[272] *See* CSI Ex. 14, Plate 2, Map and Plate 4, Cross section K–K', in Peter D. Rowley et. al., *Geology and Geophysics of White Pine and Lincoln Counties, Nevada and Adjacent Parts of Nevada and Utah: The Geologic Framework of Regional Groundwater Flow Systems*, Nevada Bureau of Mines and Geology Report 56.
[273] *See, e.g.*, USFWS Ex. 5, p. 30.
[274] *Id.*, p. 17.
[275] *Id.*, pp. 19–24.

on discharge to the Warm Springs area.[276] It also used hydrogeologic and water level response information to conclude that strike-slip faulting and a weak statistical correlation between water levels at NCA well EBM-3 and EH-4 in the Warm Springs area support a boundary to the north of the NCA production wells. While the State Engineer finds logic in NCA's position, other testimony describing flaws in the SNWA analysis make for a compelling argument against relying on SNWA's statistically-based results.[277] The substantial similarity in observed water level elevation and water level response at EBM-3 compared to EH-4[278] and limitations in relying on poor resolution water level measurements for statistical or comparative analysis[279] requires a more inclusive approach that places the boundary to the south of the NCA production wells to a geological location that coincides with the projection of the Muddy Mountain Thrust. This more closely coincides with the measurable drop in water levels recognized to occur south of the NCA wells, between EBM-3 and BM-ONCO-1 and 2, that is indicative of a hydraulic barrier or zone of lower permeability.[280] It also better honors the State Engineer's criteria by acknowledging the uncertainty in the data while reflecting a recognized physical boundary in the carbonate-rock aquifer. Specifically, this shall be defined to include that portion of the Black Mountains Area lying within portions of Sections 29, 30, 31, 32, and 33, T.18S., R.64E., M.D.B.&M.; portions of Sections 1, 11, 12, 14, 22, 23, 27, 28, 33, and 34 and all of Sections 13, 24, 25, 26, 35, and 36, T.19S., R.63E., M.D.B.&M.; portions of Sections 4, 6, 9, 10, and 15 and all of Sections 5, 7, 8, 16, 17, 18, 19, 20, 21, 29, 30, and 31, T.19S., R.64E., M.D.B.&M.[281]

WHEREAS, numerous participants advocated to include Kane Springs Valley in the LWRFS basins.[282] Other participants advocated to exclude Kane Springs Valley.[283] Several expert witnesses recommended the exclusion of Kane Springs Valley based on their characterization of water level elevation data, temporal hydrographic response patterns, geochemistry, and/or the

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[276] *See*, Tr. 1622, 1624; NCA Closing.
[277] *See, e.g.*, Tr. 1467–1469 CNLV presentation, slides 21–23; Tr. 1784–1786; NV Energy presentation, slides 32–33.
[278] NCA Closing, p. 18, Figure 3.
[279] NCA Closing, p. 8.
[280] *See e.g.*, USFWS Ex. 5.
[281] See map of the LWRFS Hydrographic Basin as defined by this Order, Attachment A.
[282] *See, e.g.*, NV Energy Closing, p. 2; NCA Closing, p. 10–14; MVWD Closing, p. 2–8.
[283] *See e.g.*, *Written Closing Statement of Lincoln County Water District and Vidler Water Company, Inc.* (LC-V Closing), Hearing on Interim Order 1303, official records of the Division of Water Resources, p. 3–6; CSI Closing, p. 2.

geophysically-inferred presence of structures that may act as flow barriers. Others recommended inclusion based on the same or similar set of information. Water level elevations observed near the southern edge of Kane Springs Valley are approximately 60 feet higher than those observed in the majority of carbonate-rock aquifer wells within the LWRFS to the south; consistent with a zone of lower permeability.[284] Some experts suggested that the hydrographic response pattern exhibited in wells located in the southern edge of Kane Springs Valley is different compared to that exhibited in wells in the LWRFS, being muted, lagged, obscured by climate response, or compromised by low-resolution data.[285] In this regard, the State Engineer recognizes these differences. However, he finds that the evidence and testimony supporting a similarity in hydrographic patterns and response as provided by expert witnesses, like that of the NPS, to be persuasive.[286] Namely, that while attenuated, the general hydrographic pattern observed in southern Kane Springs Valley reflects a response to Order 1169 pumping, consistent with a close hydraulic connection with the LWRFS. The State Engineer also finds that occurrence of the carbonate-rock aquifer in the southern Kane Springs Valley indicates that there is no known geologic feature at or near the southern Kane Springs Valley border that serves to juxtapose the carbonate-rock aquifer within the LWRFS with low permeability rocks in Kane Springs Valley.[287] He also finds that while geologic mapping[288] indicates that the carbonate-rock aquifer does not extend across the northern portion of the Kane Springs Valley, there is insufficient information available to determine whether the non-carbonate bedrock interpreted to underlie the northern part of the Kane Springs Valley represents low-permeability bedrock that would define a hydraulic boundary to the carbonate-rock aquifer.[289] After weighing all of the testimony and evidence relative to his criteria

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[284] LC-V Closing, p. 7.
[285] *See, e.g.*, LC-V Closing, pp. 5–6; LC-V Ex. 1, pp. 3-3–3-4; CSI Closing, pp. 5–6.
[286] *See* Tr. 524–55. *See, e.g.*, NPS presentation, slides 23–27.
[287] Pursuant to the criteria requiring joint management of hydrographic basins and the sixth criteria establishing that the boundary should extend to the nearest mapped feature that juxtaposes the carbonate-rock aquifer with low-permeability bedrock, or where a mapped feature cannot be adequately identified, to the basin boundary, the State Engineer includes the entirety of Kane Springs Valley.
[288] *See, e.g.*, NSE Ex. 12; Page, W.R., Dixon, G.L., Rowley, P.D., and Brickey, D.W., 2005, *Geologic Map of Parts of the Colorado, White River, and Death Valley Groundwater Flow Systems, Nevada, Utah, and Arizona*: Nevada Bureau of Mines and Geology Map 150, Plate plus text.
[289] *See, e.g.*, SNWA Ex. 7, pp. 2-4, 2-5, 2-10, 2-11, and 4-1, that describe volcanic rocks as important aquifers, and calderas as both flow paths and barriers depending on structural controls

for inclusion into the LWRFS, the State Engineer finds that the available information requires that Kane Springs Valley be included within the geographic boundary of the LWRFS.

WHEREAS, limited evidence and testimony were provided by participants advocating to either include or exclude the northern portion of Coyote Spring Valley. The State Engineer finds that while information such as that provided by Bedroc is convincing and supports a finding that local, potentially discrete aquifers may exist in parts of the northern Coyote Springs Valley, his criteria for defining the LWRFS calls for the inclusion of the entirety of the basin in the LWRFS. However, the State Engineer also acknowledges that there may be circumstances, like in the northern Coyote Spring Valley, where case-by-case considerations for proper management are warranted.

WHEREAS, evidence and testimony from Georgia-Pacific and Republic, and MBOP advocated against creating a single LWRFS administrative unit. Their arguments were principally based on concerns that there was insufficient consensus on defining the LWRFS geographic boundaries and that there were inherent policy implications to establishing an LWRFS administrative unit. MBOP recommended continuing to collect data and focusing on areas of scientific consensus. Georgia-Pacific and Republic asserted that boundaries are premature without additional data and without a legally defensible policy and management tools in place. They expressed concern that creating an administrative unit at this time inherently directs policy without providing for due process. The State Engineer has considered these concerns and agrees that additional data and improved understanding of the hydrologic system is critical to the process. He also believes that the data currently available provide enough information to delineate LWRFS boundaries, and that an effective management scheme will provide for the flexibility to adjust boundaries based on additional information, retain the ability to address unique management issues on a sub-basin scale, and maintain partnership with water users who may be affected by management actions throughout the LWRFS.

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to flow, citing Peter D. Rowley, and Dixon, G.L., 2011, *Geology and Geophysics of Spring, Cave, Dry Lake, and Delamar Valleys, White Pine and Lincoln Counties, and Adjacent Areas, Nevada and Utah: The Geologic Framework of Regional Flow Systems*,.

WHEREAS, evidence and testimony support the delineation of a single hydrographic basin as originally defined by the State Engineer in Interim Order 1303, with the adjustment of the Black Mountain Area boundary and the addition of Kane Springs Valley. The State Engineer acknowledges that special circumstances will exist with regard to both internal and external management. Water development both inside and outside of the perimeter of the LWRFS will continue to be evaluated on the best available data and may become subject to or excluded from the constraints or regulations of the LWRFS.

WHEREAS, the geographic extent of the LWRFS is intended to represent the area that shares both a unique and close hydrologic connection and virtually all of the same source and supply of water, and therefore will benefit from joint and conjunctive management. In that light, the State Engineer recognizes that different areas, jointly considered for inclusion into the LWRFS, have been advocated both to be included and to be excluded by the different hearing participants based on different perspectives, different data subsets, and different criteria. For the Muddy River Springs Area, California Wash, Garnet Valley, Hidden Valley, Coyote Spring Valley, and a portion of the Black Mountain Area, there is a persuasive case previously laid out in Rulings 6254–6261, and the consensus amongst the participants support their inclusion in the LWRFS. For other sub-basins such as Kane Springs Valley and the area around the NCA production wells in the Black Mountain Area, there is persuasive evidence to support their inclusion or exclusion; however, the State Engineer's criteria and available data mandate their inclusion. Their inclusion in the LWRFS provides the opportunity for conducting additional hydrologic studies in sub-basins such as these, to determine the degree to which water use would impact water resources in the LWRFS and to allow continued participation by holders of water rights in future management decisions. Thus, these sub-basins, and any other portions of the LWRFS that may benefit from additional hydrological study, can be managed more effectively and fairly within the LWRFS. For other basins whose inclusion was advocated, such as the northern portion of Las Vegas Valley and the Lower Meadow Valley Wash, the State Engineer finds that data do not exist to apply his criteria, and therefore they cannot be considered for inclusion into the LWRFS. These types of areas may require additional study and special consideration regarding the potential effects of water use in these areas on water resources within the LWRFS.

VII. AQUIFER RECOVERY SINCE COMPLETION OF THE ORDER 1169 AQUIFER TEST

WHEREAS, during the Order 1169 aquifer test an average of 5,290 afa were pumped from the carbonate-rock aquifer wells in Coyote Spring Valley and a cumulative total of 14,535 afa were pumped throughout the Order 1169 study basins. A portion of this total, approximately 3,840 acre-feet per year, was pumped from the alluvial aquifer in the Muddy River Springs Area.[290] In the years since completion of the Order 1169 aquifer test, pumping from wells in the LWRFS has gradually declined.[291] Pumping in 2013-2014 averaged 12,635 afa; pumping in 2015-2017 averaged 9,318 afa.[292] Pumpage inventories for 2018 that were published after the completion of the hearing report a total of 8,300 afa.[293] Pumping from alluvial aquifer wells in the Muddy River Spring Area has consistently declined since closure of the Reid Gardner power plant beginning in 2014, while pumping from the carbonate-rock aquifer since the completion of the aquifer test has consistently ranged between approximately 7,000 and 8,000 afa.

WHEREAS, the information obtained from the Order 1169 aquifer test and in the years since the conclusion of the test demonstrates that while, following conclusion of the aquifer test, there was a recovery of groundwater levels, the carbonate-rock aquifer has not recovered to pre-Order 1169 test levels.[294] Evidence and testimony submitted during the 2019 hearing does not refute the conclusions made by the State Engineer in Rulings 6254–6261 regarding interpretations of the Order 1169 aquifer test results, which were based on observations and analysis by multiple technical experts. Groundwater level recovery reached completion approximately two to three years after the Order 1169 aquifer test pumping ended.[295]

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[290] NSE Ex. 1, p. 4.
[291] *See, e.g.* NSE Ex. 50, *Pumpage Report Coyote Spring Valley 2017*; NSE Ex. 67, *Pumpage Report Black Mountains Area 2017*; NSE Ex. 84, *Pumpage Report Garnet Valley Area 2017*; NSE Ex. 86, *Pumpage Report California Wash Area 2017*; Ex. 88, *Pumpage Report Muddy River Springs Area 2017*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[292] *Id.*
[293] *Id.*
[294] *See, e.g.*, SNWA Ex. 7, pp. 5-17–5-18, 8-2; NPS Closing, p. 4; MVWD Closing, p. 8. *See also* Tr. 1807; NV Energy presentation, p. 11.
[295] SNWA Ex. 7, pp. 5-17–5-18; NVE Ex. 1, p. 2

WHEREAS, several participants testified about the effects of drought and climate on the recovery of groundwater levels and spring discharge after the Order 1169 aquifer test. Droughts, or periods of drier than normal conditions that last weeks, months, or years can lead to declines in groundwater levels.[296] The LWRFS is within National Oceanic and Atmospheric Administration's Nevada Climate Division 4 (Division 4). Precipitation records for Division 4 from 2006 to the 2019 season records indicate that 10 of those 14 seasons received lower than average precipitation.[297] Despite low precipitation, several participants submitted evidence that water levels continue to rise under current climate conditions in other areas with a relative lack of pumping that are tributary to the LWRFS, such as Dry Lake Valley, Delamar Valley, Garden Valley, Tule Desert, Dry Lake Valley, and other areas.[298] These rises have been attributed to efficient winter recharge that has occurred despite low cumulative precipitation.[299] Based on these observations, it was argued that the continued stress of pumping in the LWRFS carbonate-rock aquifer is limiting the recovery of water levels.[300] The State Engineer acknowledges that spring discharge is affected by both pumping and climate, and finds that groundwater levels remain a useful tool for monitoring the state of the aquifer system in the LWRFS regardless of the relative contribution of climate and drought to the measured groundwater levels. The State Engineer only has the authority to regulate pumping, not climate, in consideration of its potential to cause conflict or to be detrimental to the public interest and must do so regardless of the relative contributing effects of climate.

WHEREAS, evidence and testimony during the 2019 hearing was divided on whether water levels in the Warm Springs area and carbonate-rock aquifer indicate the system has reached or is approaching equilibrium,[301] or is still in a state of decline.[302] Hydrographs and evidence presented show that water levels at well EH-4 near the Warm Springs area have been relatively stable for several years following recovery from the Order 1169 aquifer test.[303] However, other

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[296] *See* USGS, 1993, *Drought*, US Geological Survey Open File Report 93-642, accessible at https://bit.ly/93-642, (last accessed June 6, 2020).
[297] SNWA Ex. 7, pp. 4-1–4-4.
[298] Tr. 577, 304–307.
[299] NPS Ex. 3, Appendix A.
[300] *See, e.g.*, SNWA Closing, p. 11. NPS Closing, p. 4. *See also* Tr. 642, 644–45, 1545.
[301] MVWD Closing, pp. 8–9. *See also* NV Energy Closing, p. 3; CNLV Closing, pp. 5–7.
[302] SNWA Closing, pp. 11–12. NPS Closing, pp. 4–5.
[303] SNWA Ex. 7, pp. 5–7.

carbonate-rock aquifer wells located further away from the Warm Springs area such as CSVM-1, TH-2, GV-1, and BM-DL-2 appear to have reached peak recovery from the Order 1169 aquifer test in 2015-2016 and have exhibited downward trends for the past several years.[304] The State Engineer agrees that water levels in the Warm Springs area may be approaching steady state with current pumping conditions. However, the trend is of insufficient duration to make this determination with absolute assurance and continued monitoring is necessary to determine if this trend continues or if water levels are continuing to decline slowly.

VIII. LONG-TERM ANNUAL QUANTITY OF WATER THAT CAN BE PUMPED

WHEREAS, the evidence and testimony presented at the 2019 hearing did not result in a consensus among experts of the long-term annual quantity of groundwater that can be pumped. Recommendations range from zero to over 30,000 afa, though most experts agreed that the amount must be equal to or less than the current rate of pumping. There is a near consensus that the exact amount that can be continually pumped for the long-term cannot be absolutely determined with the data available and that to make that determination will require more monitoring of spring flows, water levels, and pumping amounts over time.

WHEREAS, evidence and testimony were presented arguing that the regional water budget demonstrates that far more groundwater is available for development within the LWRFS than is currently being pumped. CSI argues that the total amount of groundwater available for extraction from the LWRFS may be up to 30,630,[305] which is an estimate of the entirety of natural discharge from the system that occurs through groundwater evapotranspiration and subsurface groundwater outflow. Nearly all other experts disagreed that pumping to that extent could occur without causing harm to the Moapa dace or conflict with senior Muddy River decreed rights. The disagreement is not about the amount of the water budget, but rather the importance of the water budget in determining the amount of groundwater in the LWRFS that can continually be pumped,[306] not the amount of inflow and outflow to the system. In addition, availability of groundwater for pumping based on water budget should consider whether the same water is appropriated for use in upgradient and downgradient basins, and CSI did not account for this.

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[304] *Id.*
[305] CSI Closing, p. 2.
[306] *See e.g.*, SNWA Ex. 9, p. 24.; MVWD Ex. 3, p. 4; NPS Ex. 3, p. 23.

The State Engineer recognizes that the water budget is important to fully understand the hydrology of the regional flow system but also agrees with nearly all participants that the regional water budget is not the limiting measure to determine water available for development in the LWRFS. The potential for conflict with senior rights and impacts that are detrimental to the public interest in the LWRFS is controlled by aquifer hydraulics and the effect of pumping on discharge at the Warm Springs area rather than the regional water budget.

WHEREAS, evidence and testimony were presented arguing that the location of pumping within the LWRFS is an important variable in the determination of the amount that can be pumped. Participants representing groundwater users in Garnet Valley and the APEX area at the south end of the LWRFS testified that pumping within Garnet Valley does not have a discernable signal at wells near the Warm Springs area and that the hydraulic gradient from north-to-south within the LWRFS indicates that there is a component of groundwater flow in Garnet Valley that does not discharge to the Warm Springs area.[307] Several participants agreed that moving pumping to more distal locations within the LWRFS will lessen the effect of that pumping on spring flows. NV Energy testified that there would be a lesser effect because pumping areas around the periphery of the main carbonate-rock aquifer are less well-connected to the springs, and because of the likelihood that some amount of subsurface outflow occurs along and southern and southeastern boundary of the LWRFS and it is possible to capture some of that subsurface outflow without a drop-for-drop effect on discharge at the Warm Springs area[308] Others drew the same conclusion based on their review of the data and characterization of a heterogeneous system[309] or on weak connectivity between peripheral locations and the Warm Springs area.[310]

CSI argues that more groundwater development can occur in the LWRFS because subsurface fault structures create compartmentalization and barriers to groundwater flow that reduce the effects of pumping on discharge at the Warm Springs area.[311] They rebut the contention by others that spring flow is affected homogeneously by pumping within the LWRFS.[312] CSI used geophysical data to map a north-south trending subsurface feature that bisects Coyote Spring

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[307] *See* CNLV Ex. 3, pp. 45–47; GP-REP Ex. 1, pp. 2–3.
[308] NVE Ex. 1, pp. 8–9.
[309] *See e.g.* MBOP Ex. 2, p. 23; GP-REP Ex. 2, pp. 4–5. *See also* Technichrome Response.
[310] *See e.g.* NCA Closing, pp. 2–10; LC-V Closing, pp. 4–6; Bedroc Closing, pp. 9–11.
[311] CSI Closing, pp. 2–5.
[312] CSI Ex. 2, pp. 40–41.

Valley. They hypothesize that this structure is an impermeable flow barrier that creates an isolated groundwater flow path on the west side of Coyote Spring Valley from which pumping would capture recharge from the Sheep Range without spring flow depletion at the Warm Springs area.[313] MBOP also contends that the system is far too complex to characterize it as a homogeneous "bathtub" and that preferential flow paths within the region mean that pumping stress will greatly differ within the LWRFS depending on where the pumping occurs.[314] Rebuttals to MBOP and CSI contend that an emphasis on complexities in geologic structure is a distraction from the question at hand, and that the hydraulic data collected during and after the Order 1169 aquifer test clearly demonstrate close connectivity and disproves CSI's hypothesis.[315]

The State Engineer finds that the data support the conclusion that pumping from locations within the LWRFS that are distal from the Warm Springs area can have a lesser impact on spring flow than pumping from locations more proximal to the springs. The LWRFS system has structural complexity and heterogeneity, and some areas have more immediate and more complete connection than others. For instance, the Order 1169 aquifer test demonstrated that pumping 5,290 afa from carbonate-rock aquifer wells in Coyote Spring Valley caused a sharp decline in discharge at the springs, but distributed pumping since the completion of the aquifer test in excess of 8,000 afa has correlated with a stabilization of spring discharge. The data collected during and after the Order 1169 aquifer test provide substantial evidence that groundwater levels throughout the LWRFS rise and fall in common response to the combined effects of climate and pumping stress, which controls discharge at the Warm Springs area.[316] The State Engineer finds that the best available data do not support the hypotheses that variable groundwater flow paths and heterogeneous subsurface geology are demonstrated to exist that create hydraulically isolated compartments or subareas within the LWRFS carbonate-rock aquifer from which pumping can occur without effect on the Warm Springs area. However, there remains some uncertainty as to the extent that distance and location relative to other capturable sources of discharge either delay, attenuate, or reduce capture from the springs.

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[313] *Id. See also* CSI Ex. 1, pp. 31–40.
[314] MBOP Closing, p. 7.
[315] *See e.g.*, SNWA Ex. 9, pp. 23–24.
[316] NSE Exs. 15–21.

WHEREAS, evidence and testimony were presented to argue that no amount of groundwater can be pumped from the carbonate-rock aquifer or from the LWRFS without conflicting with the Muddy River decree or causing harm to the Moapa dace habitat. This argument is predicated on the interpretation that lowering of groundwater level anywhere within the LWRFS, whether caused by climate or pumping, eventually has an effect on spring discharge, and that any reduction in spring discharge caused by pumping conflicts with senior decreed rights or harms the Moapa dace or both.[317] MVIC and SNWA agree that capturing discharge from the Warm Springs area springs and the Muddy River are a conflict with the Muddy River decree, which appropriates "all of the flow of the said stream, its sources of supply, headwaters and tributaries."

The Muddy River Decree was finalized in 1920, decades before any significant amount of groundwater development within the Muddy River springs area or the LWRFS. The statement quoted above, or something similar to it, is a common conclusion in decrees to establish finality to the determination of relative priority of rights. By including this statement, the decreed right holders are afforded the assurance that no future claimants will interject a new priority right. However, it is also common on decreed systems for junior rights to be appropriated for floodwater or other excess flows, provided that no conflict occurs with the senior priorities. Similarly, groundwater development almost always exists in the tributary watersheds of decreed river systems, even though groundwater in a headwater or tributary basin is part of the same hydrologic system. There is no conflict as long as the senior water rights are served.

The State Engineer disagrees with SNWA and MVIC that the above quoted statement in the decree means that any amount of groundwater pumped within the headwaters that would reduce flow in the Muddy River conflicts with decreed rights. The State Engineer finds that capture or potential capture of the waters of a decreed system does not constitute a conflict with decreed right holders if the flow of the source is sufficient to serve decreed rights. Muddy River decreed rights were defined by acres irrigated and diversion rates for each user.[318] The sum of diversion rates greatly exceeds the full flow of the River, but all users are still served through a rotation schedule managed by the water master. The total amount of irrigated land in the decree is 5,614 acres.[319]

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[317] *See, e.g.*, CBD Ex. 3, p. 23; SNWA Ex. 7, p. 8-4; MVIC Ex. 1, p. 3.
[318] NSE Ex. 333.
[319] *Id.*

Flow in the Muddy River at the Moapa Gage has averaged approximately 30,600 afa since 2015,[320] which is less than the predevelopment baseflow of about 33,900.[321] If all decreed acres were planted with a high-water use crop like alfalfa, the net irrigation water requirement would be 28,300 afa, based on a consumptive use rate of 4.7 afa.[322] Conveyance loss due to infiltration is an additional consideration to serve all decreed users; however, this is limited in the Muddy River because the alluvial corridor is narrow and well defined so water stays within the shallow groundwater or discharges back to the river. The State Engineer finds that the current flow in the Muddy River is sufficient to serve all decreed rights in conformance with the Muddy River Decree, and that reductions in flow that have occurred because of groundwater pumping in the headwaters basins is not conflicting with Decreed rights.

WHEREAS, the majority of experts agree that there is an intermediate amount of pumping approximated by recent pumping rates that can continue to occur in the LWRFS and still protect the Moapa dace and not conflict with decreed rights. USFWS and NCA endorsed the use of average pumping over the years 2015-2017 (9,318 afa as reported by State Engineer pumpage inventories) as a supportable amount that can continue to be pumped, because the system appears to have somewhat stabilized.[323] CSI also endorsed this approach as an initial phase, though they suggested 11,400 afa, which was the average pumping reported by State Engineer inventories over the years 2010-2015 that included the period of the Order 1169 aquifer test.[324] CNLV makes a rough estimate that no more than 10,000 afa can be supported throughout the entire region, based on their professional judgment and review of the data.[325] NV Energy concludes that 7,000–8,000 afa can continue to be pumped, based on the amount of pumping in recent years from carbonate-rock aquifer wells and the observation that steady-state conditions in Warm Springs area spring

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[320] NSE Ex. 211, *USGS 09416000 Muddy River Moapa 1914-2013*, Hearing on Interim Order 1303, official records of the Division of Water Resources.
[321] SNWA Ex. 7, p. 5-4.
[322] *See, e.g.*, Huntington, J.L. and R. Allen, (2010), *Evapotranspiration and Net Irrigation Water Requirements for Nevada*, Nevada State Engineer's Office Publication, accessible at https://bit.ly/etniwr, (last accessed June 7, 2020), official records of the Division of Water Resources.
[323] USFWS Ex. 5, p. 3; NCA Ex. 1, p. 19.
[324] CSI Closing, p. 2.
[325] CNLV Ex. 3, p. 2.

flow are being reached.[326] SNWA estimates that only 4,000–6,000 afa of carbonate-rock aquifer pumping can continually occur within the LWRFS.[327]

WHEREAS, the State Engineer finds that the evidence and testimony projecting continual future decline in spring flow at the current rate of pumping is compelling but not certain. Several participants pointed out rising trends in groundwater levels at many locations in Southern Nevada, outside of the LWRFS, that are distant from pumping[328] even though total precipitation has been below average and since 2006 has been described as a drought.[329] This suggests that climate and recharge efficiency may have actually buffered the full effect of pumping on discharge at the Warm Springs area, and that the system could not support the current amount of groundwater pumping during an extended dry period with lesser recharge. In addition, slight declining trends that are observed in Garnet Valley monitoring wells are not evident in wells close to the Warm Springs area.[330] If drawdown in Garnet Valley has not yet propagated to the Muddy Springs area, then the resilience of the apparent steady state of spring flow is in doubt. Projections of continued future decline in spring discharge suggests that the current amount of pumping in the LWRFS is a maximum amount that may need to be reduced in the future if the stabilizing trend in spring discharge does not continue.

WHEREAS, there is an almost unanimous agreement among experts that data collection is needed to further refine with certainty the extent of groundwater development that can be continually pumped over the long term. The State Engineer finds that the current data are adequate to establish an approximate limit on the amount of pumping that can occur within the system, but that continued monitoring of pumping, water levels, and spring flow is essential to refine and validate this limit.

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[326] NVE Ex. 1, p. 8.
[327] SNWA Ex. 7, p. 8-4.
[328] NPS Ex. 3, Appendix A. *See also* Tr. 304–307, 577.
[329] Tr. 1292–1300. *See, also* LC-V Ex. 11, *PowerPoint Presentation of Todd G. Umstot, entitled Drought and Groundwater*, Hearing on Interim Order 1303, official records of the Division of Water Resources, slides 3–10.
[330] CNLV Ex. 3, pp. 45–46.

WHEREAS, pumping from wells in the LWRFS has gradually declined since completion of the Order 1169 aquifer test and is approaching 8,000 afa. This coincides with the period of time when spring discharge may be approaching steady state. The State Engineer finds that the maximum amount of groundwater that can continue to be developed over the long term in the LWRFS is 8,000 afa. The best available data at this time indicate that continued groundwater pumping that consistently exceeds this amount will cause conditions that harm the Moapa dace and threaten to conflict with Muddy River decreed rights.

IX. MOVEMENT OF WATER RIGHTS

WHEREAS, the data and evidence are clear that location of pumping within the LWRFS relative to the Warm Springs area and the Muddy River can influence the relative impact to discharge to the Warm Springs area and/or senior decreed rights on the Muddy River. The transfer of groundwater pumping from the Muddy River Springs Area alluvial wells to carbonate-rock aquifer wells may change the timing of any impact to Muddy River flows and amplify the effect on discharge to the Warm Springs area, thus potentially adversely impacting habitat for the Moapa dace. And the transfer of groundwater withdrawals from the carbonate-rock aquifer into the Muddy River alluvial aquifer may reduce the impact to the Moapa dace habitat but increase the severity of impact to the senior decreed rights on the Muddy River. The State Engineer recognizes that the LWRFS is fundamentally defined by its uniquely close hydrologic interconnection and shared source and supply of water. However, the State Engineer also recognizes that there can be areas within the LWRFS that have a greater or lesser degree of hydraulic connection due to distance, local changes in aquifer properties, or proximity to other potential sources of capturable water.

WHEREAS, Rulings 6254–6261 acknowledge that one of the main goals of Order 1169 and the associated pumping test at well MX-5 was to observe the effects of increased pumping on groundwater levels and spring flows. Coyote Spring Valley carbonate-rock aquifer pumping during the Order 1169 aquifer test was the largest localized carbonate-rock aquifer pumping in the LWRFS. In addition, concurrent carbonate-rock aquifer and alluvial aquifer pumping in Garnet Valley, Muddy River Springs Area, California Wash, and the northwest portion of the Black Mountains Area occurred during the test period. Rulings 6254–6261 described the data and analysis used to determine that additional pumping at the MX-5 well contributed significantly to decreases in high elevation springs (Pederson Springs) and other springs that are the sources to the

Muddy River. Evidence and reports provided under Interim Order 1303 do not challenge the findings in Rulings 6254–6261 that pumping impacts were witnessed. There is a strong consensus among participants that pumping during the Order 1169 aquifer test along with concurrent pumping caused drawdowns of water levels throughout the LWRFS.[331] However, the effects of pumping from different locations within the LWRFS on discharge at the Warm Springs area is not homogeneous.[332] The State Engineer finds that movement of water rights that are relatively distal from the Warm Springs area into carbonate-rock aquifer wells that have a closer hydraulic connection to the Warm Springs area is not favorable.

WHEREAS, evidence and testimony provided by participants during the Interim Order 1303 hearing provides a strong consensus that alluvial aquifer pumping in the Muddy River Springs Area affects Muddy River discharge.[333] There is also strong evidence that carbonate-rock aquifer pumping throughout the LWRFS affects spring flow but can also be dependent on proximity of pumping to springs.[334] No participant is a proponent of moving additional water rights closer to the headwaters of the Muddy River within the Muddy River Springs Area, and most participants agree that carbonate-rock aquifer and alluvial aquifer pumping in the Muddy River Springs Area captures Muddy River flow. The State Engineer finds that any pumping within close proximity to the Muddy River could result in capture of the Muddy River. The State Engineer also finds that any movement of water rights into carbonate-rock aquifer and alluvial aquifer wells in the Muddy River Springs Area that may increase the impact to Muddy River decreed rights is disfavored.

WHEREAS, the Order 1169 aquifer test demonstrated that impacts from the test along with concurrent pumping was widespread within the LWRFS encompassing 1,100 square miles and supported the conclusion of a close hydrologic connection among the basins.[335] While the effects of movement of water rights between alluvial aquifer wells and carbonate-rock aquifer wells on deliveries of senior decreed rights to the Muddy River or impacts to the Moapa dace may not be uniform across the entirety of the LWRFS, the relative degree of hydrologic connectedness

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[331] *See* SNWA Closing, pp. 10, 16; MVIC Closing, p. 6.
[332] *See, e.g.*, SNWA Closing, p. 10.
[333] CNLV Closing, p. 8; Tr. 1456–1457, 1458. *See also* SNWA Closing, p. 16; MVWD Closing, p. 11; MVIC Closing, p. 6.
[334] CNLV Closing, pp. 8–10; Tr. 1457, 1458; NV Energy Closing, p. 4; MVIC Closing, p. 6.
[335] NSE Ex. 256. *See also* NSE Ex. 14, pp. 20–21; NSE Ex. 17, p. 19; SNWA Closing pp. 2, 3.

in the LWRFS will be the principle factor in determining the impact of movement of water rights. The State Engineer recognizes that there may be discrete, local aquifers within the LWRFS with an uncertain hydrologic connection to the Warm Springs area. Determining the effect of moving water rights into these areas may require additional scientific data and analysis. Applications to move water rights under scenarios not addressed in this Order will be evaluated on their individual merits to determine potential impact to existing senior rights, potential impact to the Warm Springs area and Moapa dace habitat, and impacts to the Muddy River.

X. ORDER

NOW THEREFORE, the State Engineer orders:

1. The Lower White River Flow System consisting of the Kane Springs Valley, Coyote Spring Valley, Muddy River Springs Area, California Wash, Hidden Valley, Garnet Valley, and the northwest portion of the Black Mountains Area as described in this Order, is hereby delineated as a single hydrographic basin. The Kane Springs Valley, Coyote Spring Valley, Muddy River Springs Area, California Wash, Hidden Valley, Garnet Valley and the northwest portion of the Black Mountains Area are hereby established as sub-basins within the Lower White River Flow System Hydrographic Basin.

2. The maximum quantity of groundwater that may be pumped from the Lower White River Flow System Hydrographic Basin on an average annual basis without causing further declines in Warm Springs area spring flow and flow in the Muddy River cannot exceed 8,000 afa and may be less.

3. The maximum quantity of water that may be pumped from the Lower White River Flow System Hydrographic Basin may be reduced if it is determined that pumping will adversely impact the endangered Moapa dace.

4. All applications for the movement of existing groundwater rights among sub-basins of the Lower White River Flow System Hydrographic Basin will be processed in accordance with NRS 533.370.

5. The temporary moratorium on the submission of final subdivision or other submission concerning development and construction submitted to the State Engineer for review established under Interim Order 1303 is hereby terminated.

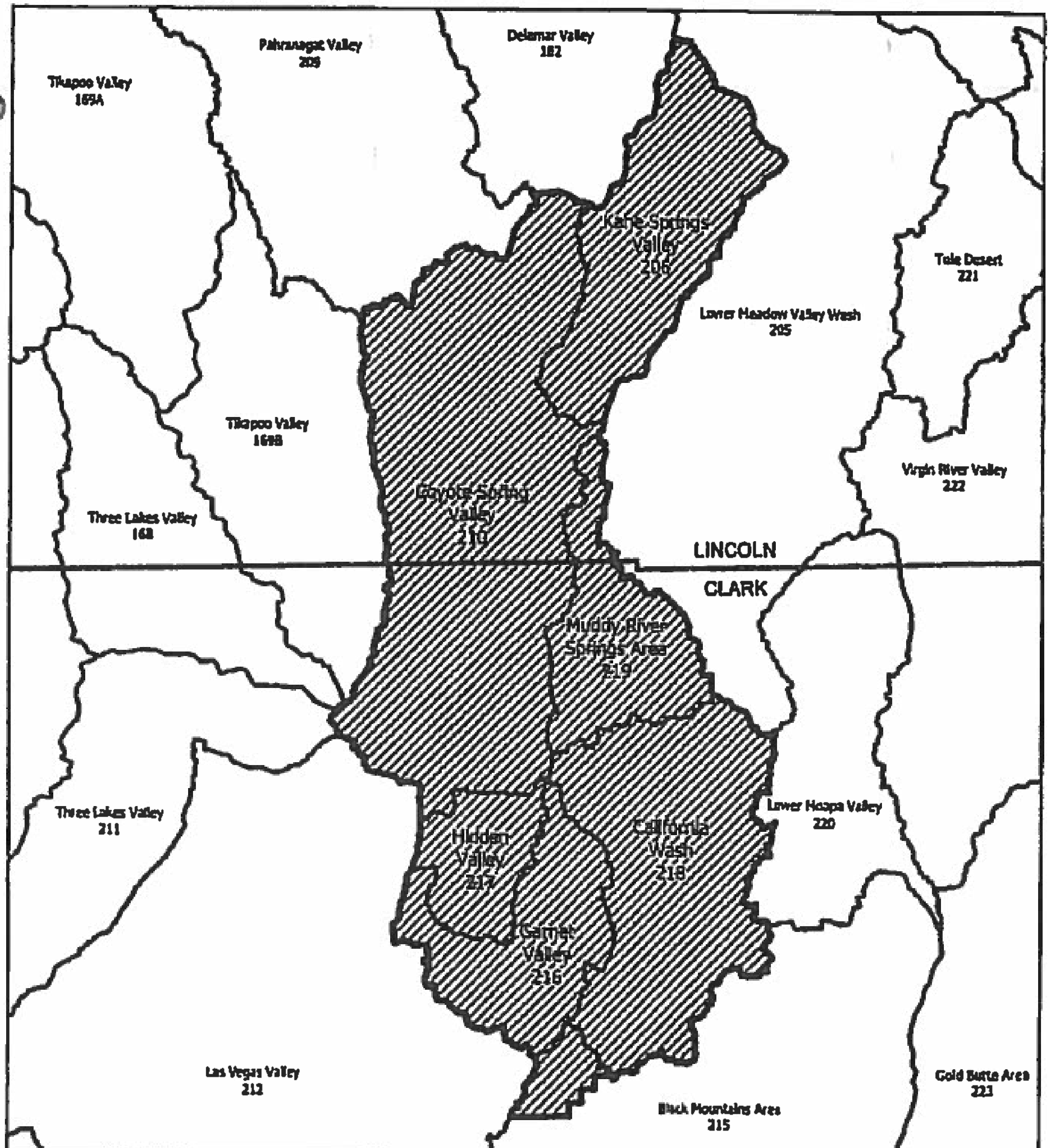
6. All other matters set forth in Interim Order 1303 that are not specifically addressed herein are hereby rescinded.

Tim Wilson, P.E.
TIM WILSON, P.E.
State Engineer

Dated at Carson City, Nevada this

15th day of June, 2020.

ATTACHMENT A



Location and Extent of LWRFS Hydrographic Basin, Clark and Lincoln Counties, Nevada

State of Nevada
Department of Conservation and Natural Resources
Office of the State Engineer
Division of Water Resources

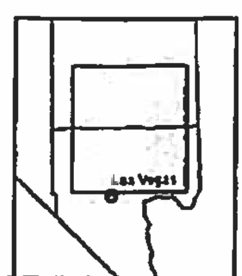
Tim Wilson PE
State Engineer

June 2020

LWRFS Boundary
Hydrographic Basin Boundary
County Boundary

N W E S

0 10 Miles



SE ROA 69

IN THE OFFICE OF THE STATE ENGINEER
OF THE STATE OF NEVADA

INTERIM ORDER **#1303**

DESIGNATING THE ADMINISTRATION OF ALL WATER RIGHTS WITHIN COYOTE SPRING VALLEY HYDROGRAPHIC BASIN (210), A PORTION OF BLACK MOUNTAINS AREA BASIN (215), GARNET VALLEY BASIN (216), HIDDEN VALLEY BASIN (217), CALIFORNIA WASH BASIN (218), AND MUDDY RIVER SPRINGS AREA (AKA UPPER MOAPA VALLEY) BASIN (219) AS A JOINT ADMINISTRATIVE UNIT, HOLDING IN ABEYANCE APPLICATIONS TO CHANGE EXISTING GROUNDWATER RIGHTS, AND ESTABLISHING A TEMPORARY MORATORIUM ON THE REVIEW OF FINAL SUBDIVISION MAPS

I. PURPOSE

WHEREAS, the purpose of this Interim Order is to designate a multi-basin area known to share a close hydrologic connection as a joint administrative unit, which shall be known as the Lower White River Flow System (LWRFS).

WHEREAS, an adequate and predictable supply of groundwater within the LWRFS supports the health, safety and welfare of the area, and this Interim Order aims to protect existing senior rights and the public interest in an endangered species, recognize existing beneficial use, and limit development actions that are dependent on a supply of water that may not be available in the future.

WHEREAS, during the interim period that this Order is in effect, holders of existing rights and other interested parties are encouraged to submit reports to the Nevada Division of Water Resources (NDWR) analyzing the data available regarding sustainable groundwater development in the LWRFS, the geographic extent of the LWRFS, and considerations relating to groundwater pumping within the LWRFS and its effects on the fully decreed Muddy River. This collected and analyzed data is an essential step to optimize the beneficial use of the available water supply in the LWRFS.

WHEREAS, concurrent with this interim order, holders of existing rights and other interested parties are encouraged to participate in the public process to develop a conjunctive management plan.

I. BASIN DESIGNATIONS PURSUANT TO NRS § 534.030

WHEREAS, the Coyote Spring Valley Hydrographic Basin was designated pursuant to Nevada Revised Statute (NRS) § 534.030 by Order 905 dated August 21, 1985, which also declared municipal, power, industrial and domestic uses as preferred uses of the groundwater resource pursuant to NRS § 534.120.

WHEREAS, the Black Mountains Area Hydrographic Basin was designated pursuant to NRS § 534.030 by Order 1018 dated November 22, 1989, which also declared municipal, industrial, commercial and power generation purposes as preferred uses of the groundwater resource pursuant to NRS § 534.120, declared irrigation of land using groundwater to be a non-preferred use, and ordered that applications to appropriate groundwater for irrigation purposes would be denied.

WHEREAS, the Garnet Valley Hydrographic Basin was designated pursuant to NRS § 534.030 by Order 1025 dated April 24, 1990, which also declared municipal, quasi-municipal, industrial, commercial, mining, stockwater and wildlife purposes as preferred uses pursuant to NRS § 534.120, and declared irrigation of land using groundwater to be a non-preferred use, and ordered that applications to appropriate groundwater for irrigation purposes would be denied.

WHEREAS, the California Wash Hydrographic Basin was designated pursuant to NRS § 534.030 by Order 1026 dated April 24, 1990, which also declared municipal, quasi-municipal, industrial, commercial, mining, stockwater and wildlife purposes as preferred uses pursuant to NRS § 534.120, and declared irrigation of land using groundwater to be a non-preferred use, and ordered that applications to appropriate groundwater for irrigation purposes would be denied.

WHEREAS, the Hidden Valley Hydrographic Basin was designated pursuant to NRS § 534.030 by Order 1024 dated April 24, 1990, which also declared municipal, quasi-municipal, industrial, commercial, mining, stockwater and wildlife purposes as preferred uses pursuant to NRS § 534.120, and declared irrigation of land using groundwater to be a non-preferred use, and ordered that applications to appropriate groundwater for irrigation purposes would be denied.

WHEREAS, the Muddy River Springs Area was partially designated pursuant to NRS § 534.030 by Order 392 dated July 14, 1971, and was fully designated by Order 1023 dated April 24, 1990, which also declared municipal, quasi-municipal, industrial, commercial, mining, stockwater and wildlife purposes as preferred uses pursuant to NRS § 534.120, and declared irrigation of land using groundwater to be a non-preferred use, and ordered that applications to appropriate groundwater for irrigation purposes would be denied.

II. ORDERS 1169 AND 1169A

WHEREAS, on March 8, 2002, the State Engineer issued Order 1169 holding in abeyance carbonate-rock aquifer system groundwater applications either pending or to be filed in Coyote Spring Valley (Basin 210), Black Mountains Area (Basin 215), Garnet Valley (Basin 216), Hidden Valley (Basin 217), Muddy River Springs Area (Basin 219), and Lower Moapa Valley (Basin 220) and ordering an aquifer test of the carbonate-rock aquifer system, which was not well understood, to determine whether additional appropriations could be developed from the carbonate-rock aquifer system. The Order required that at least 50%, or 8,050 acre-feet annually (afa), of the water rights then currently permitted in Coyote Spring Valley be pumped for at least two consecutive years.

WHEREAS, on April 18, 2002, in Ruling 5115, the State Engineer added the California Wash (Basin 218) to the Order 1169 aquifer test basins.

WHEREAS, prior to the Order 1169 aquifer test beginning, there were significant concerns that pumping 8,050 afa from the Coyote Spring Valley as part of the aquifer test would adversely impact the water resources at the Muddy River Springs, and consequently the Muddy River. Ultimately, the Order 1169 study participants agreed that even if the minimum 8,050 afa was not pumped, sufficient information would be obtained to inform future decisions relating to the study basins.

WHEREAS, on November 15, 2010, the Order 1169 aquifer test began, whereby the study participants began reporting to NDWR on a quarterly basis the amounts of water being pumped from wells in the carbonate and alluvial aquifer during the pendency of the aquifer test.

WHEREAS, on December 21, 2012, the State Engineer issued Order 1169A declaring the completion of the aquifer test to be December 31, 2012, after a period of 25½ months. The

State Engineer provided the study participants the opportunity to file reports with NDWR until June 28, 2013, addressing the information gained from the aquifer test and the water available to support applications in the aquifer test basins.

WHEREAS, during the Order 1169 aquifer test, an average of 5,290 acre-feet per year was pumped from carbonate wells in Coyote Spring Valley, and a cumulative total of approximately 14,535 acre-feet per year of water was pumped throughout the LWRFS. Of this total, approximately 3,840 acre-feet per year was pumped from the Muddy River Springs Area alluvial aquifer.[1]

WHEREAS, during the aquifer test, pumpage was measured and reported from 30 other wells in the Muddy River Springs Area, Garnet Valley, California Wash, Black Mountains Area, and Lower Meadow Valley Wash. Stream diversions from the Muddy River were reported, and measurements of the natural discharge of the Muddy River and several of the Muddy River's headwater springs were collected daily. Water-level data were collected from a total of 79 monitoring and pumping wells within the LWRFS. All of the data collected during the aquifer test was made available to each of the study participants and the public.

WHEREAS, during the Order 1169 aquifer test, the resulting water-level decline encompassed 1,100 square miles and extended from northern Coyote Spring Valley through the Muddy River Springs Area, Hidden Valley, Garnet Valley, California Wash, and the northwestern part of the Black Mountains Area.[2,3] The water-level decline was estimated to be 1 to 1.6 feet in this area with minor drawdowns of 0.5 feet or less in the northern part of Coyote Spring Valley north of the Kane Springs Wash fault zone.

WHEREAS, results of the two-year test demonstrated that pumping 5,290 acre-feet annually from the carbonate aquifer in Coyote Spring Valley, in addition to the other carbonate pumping in Garnet Valley, Muddy River Springs Area, California Wash and the northwest part

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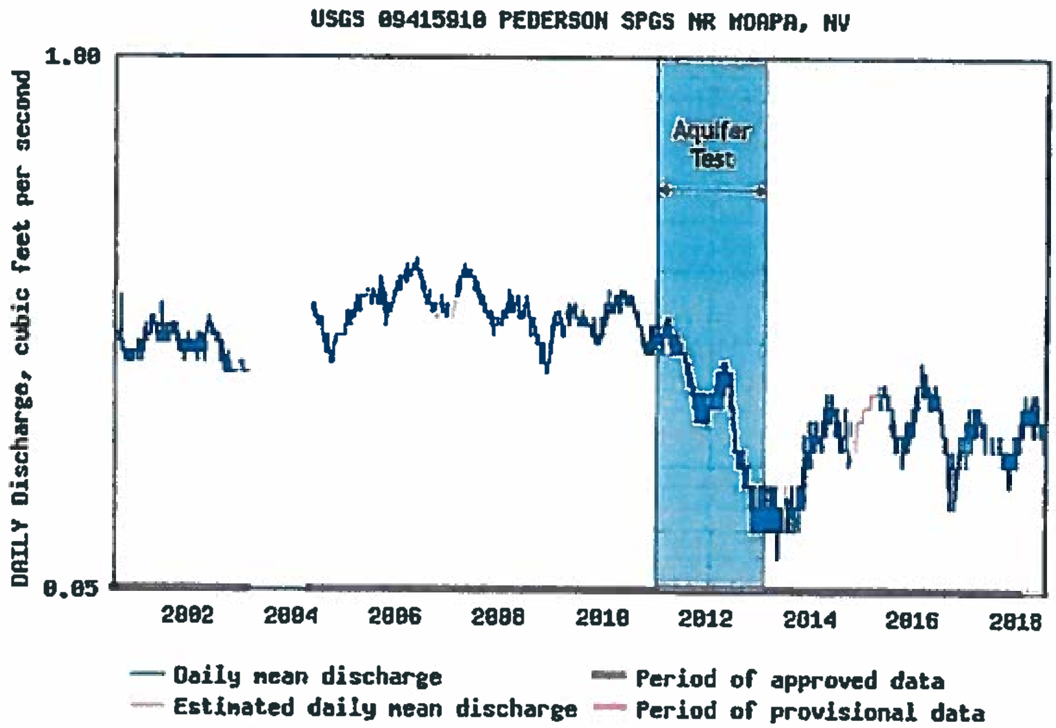
[1] *See, e.g.*, Ruling 6254, p. 17; Appendix B.

[2] *See, e.g.*, Ruling 6254. *See also* U.S. Fish and Wildlife Service, U.S. Bureau of Land Management and U.S. National Park Service Order 1169A Report, *Test Impacts and Availability of Water Pursuant to Applications Pending Under Order 1169*, June 28, 2013, official records in the Office of the State Engineer.

[3] There was no groundwater pumping in Hidden Valley but effects were still observed in the Hidden Valley monitor well.

of the Black Mountains Area, caused sharp declines in groundwater levels and flows in the Pederson and Pederson East springs. These two springs are considered to be sentinel springs for the overall condition of the Muddy River because they are at a higher altitude than other Muddy River source springs, and therefore are proportionally more affected by a decline in groundwater level in the carbonate aquifer.[4] The Pederson spring flow decreased from 0.22 cubic feet per second (cfs) to 0.08 cfs and the Pederson East spring flow decreased from 0.12 cfs to 0.08 cfs. The following hydrograph at Pederson spring illustrates the decline in discharge during the aquifer test and also demonstrates that in the five years since the end of the aquifer test, spring flow has not recovered to pre-test flow rates.



[4] *See* the 2006 Memorandum of Agreement among the Southern Nevada Water Authority, United States Fish and Wildlife Service, Coyote Springs Investments, Moapa Band of Paiutes, and the Moapa Valley Water District.

Additional headwater springs at lower altitude, the Baldwin and Jones springs, declined approximately 4% during the test.[5] All of the headwater springs contribute to the decreed and fully appropriated Muddy River and are the predominant source of water that supplies the habitat of the endangered Moapa dace, a fish federally listed as an endangered species since 1967.

WHEREAS, based upon the analysis of the carbonate aquifer test, it was asserted that pumping at the Order 1169 rate at well MX-5 in Coyote Spring Valley could result in both of the high-altitude Pederson and Pederson East springs going dry in 3 years or less.[6]

WHEREAS, based upon the findings of the aquifer test, the carbonate aquifer underlying Coyote Spring Valley, Garnet Valley, Hidden Valley, Muddy River Springs Area, California Wash and the northwest part of the Black Mountains Area[7] (the LWRFS as depicted in Appendix A) was acknowledged to have a unique hydrologic connection and share the same supply of water.[8]

III. RULINGS 6254, 6255, 6256, 6257, 6258, 6259, 6260, AND 6261

WHEREAS, on January 29, 2014, the State Engineer issued Ruling 6254 on pending applications of the Las Vegas Valley Water District (LVVWD) and Coyote Springs Investment, LLC (CSI) in the Coyote Spring Valley; Ruling 6255 on pending applications of Dry Lake Water, LLC (Dry Lake), and CSI in Coyote Spring Valley; Ruling 6256 on pending applications of Bonneville Nevada Corporation, Nevada Power Company (Nevada Power), Dry Lake, and the Southern Nevada Water Authority (SNWA) in the Garnet Valley; Ruling 6257 on pending applications of Nevada Power, Dry Lake, and SNWA in the Hidden Valley; Ruling 6258 on

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[5] U.S. Fish and Wildlife Service, U.S. Bureau of Land Management and U.S. National Park Service Order 1169A Report, *Test Impacts and Availability of Water Pursuant to Applications Pending Under Order 1169*, pp. 43-46, 50-51, June 28, 2013, official records in the Office of the State Engineer. *See also,* http://waterdata.usgs.gov/nv/nwis/.

[6] *See, e.g.*, Ruling 6254. *See also* U.S. Fish and Wildlife Service, U.S. Bureau of Land Management and U.S. National Park Service Order 1169A Report, *Test Impacts and Availability of Water Pursuant to Applications Pending Under Order 1169*, p. 85, June 28, 2013, official records in the Office of the State Engineer.

[7] That portion of the Black Mountains Area lying within the Lower White River Flow System is defined as those portions of Sections 29, 30, 31, 32, and 33, T.18S., R.64E., M.D.B.&M.; Section 13 and those portions of Sections 1, 11, 12, and 14, T.19S., R.63E., M.D.B.&M.; Sections 5, 7, 8, 16, 17, and 18 and those portions of Sections 4, 6, 9, 10, and 15, T.19S., R.64E., M.D.B.&M.

[8] *See, e.g.*, State Engineer Ruling 6254, p. 24, official records in the Office of the State Engineer.

pending applications by LVVWD, Nevada Power, Dry Lake, and the Moapa Band of Paiute Indians in the California Wash; Ruling 6259 on pending applications by the Moapa Valley Water District in the Muddy River Springs Area; and Ruling 6260 on pending applications by Nevada Cogeneration Associates #1, Nevada Cogeneration Associates #2, and Dry Lake, in the Black Mountains Area, upholding in part the protests to said applications and denying the applications on the grounds that there was no unappropriated groundwater at the source of supply, the proposed use would conflict with existing rights, and the proposed use of the water would threaten to prove detrimental to the public interest because it would threaten the water resources upon which the endangered Moapa dace are dependent.

IV. LOWER WHITE RIVER FLOW SYSTEM

WHEREAS, the total long-term average water supply to the LWRFS, from subsurface groundwater inflow and local precipitation recharge, is not more than 50,000 acre-feet annually.[9]

WHEREAS, the Muddy River, a fully appropriated surface water source, has its headwaters in the Muddy River Springs Area and has the most senior rights in the LWRFS. Spring discharge in the Muddy River Springs Area is produced from the regional carbonate aquifer. Prior to groundwater development, the Muddy River flows at the Moapa gage were approximately 34,000 acre-feet annually.[10]

WHEREAS, the alluvial aquifer surrounding the Muddy River ultimately derives virtually all of its water supply from the carbonates, either through spring discharge that infiltrates into the alluvium or through subsurface hydraulic connectivity between the carbonate rocks and the alluvium.[11]

WHEREAS, the State Engineer has determined that pumping of groundwater within the LWRFS has a direct interrelationship with the flow of the decreed and fully appropriated Muddy River, which has the most-senior rights.[12]

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[9] *Id.*
[10] United States Geological Survey Surface-Water Annual Statistics for the Nation, USGS 09416000 MUDDY RV NR MOAPA, NV, accessed at https://waterdata.usgs.gov/nwis/annual/?search_site_no=09416000&agency_cd=USGS&referred_module=sw&format=sites_selection_links.
[11] *See, e.g.*, State Engineer Ruling 6254, p. 24, official records in the Office of the State Engineer.
[12] *Id.*

WHEREAS, since the conclusion of the Order 1169 aquifer test, the State Engineer has jointly managed the groundwater rights within LWRFS.

WHEREAS, the State Engineer, under the joint management of the LWRFS, has not distinguished pumping from wells in the Muddy River Springs Area alluvium from pumping carbonate wells within the LWRFS.

WHEREAS, within the LWRFS, there exist more than 38,000 acre-feet of groundwater appropriations. Groundwater pumping from 2007 forward is included in Appendix B and is significantly less than the total appropriations.

WHEREAS, groundwater levels within the LWRFS have been relatively flat in the five years since the end of the Order 1169 aquifer test, but groundwater levels have not recovered to pre-test levels.[13]

IV. PUMPAGE INVENTORIES

WHEREAS, annual groundwater pumpage inventories in the Coyote Spring Valley have been published by the State Engineer since 2005. In the years 2005 through 2017 pumping has ranged from 665 acre-feet to 5,606 acre-feet, averaging 2,605 acre-feet. The average pumping in Coyote Spring Valley, excluding the years 2011 and 2012 when the aquifer test was being conducted, is 2,068 acre-feet.[14]

WHEREAS, annual groundwater pumpage inventories in the Black Mountains Area have been published by the State Engineer since 2001. In the years 2001 through 2017 pumping in the northwest portion of the basin has ranged from 1,137 acre-feet to 1,591 acre-feet, with an average of 1,476 acre-feet.[15]

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[13] *See, e.g., USGS water level data for Site 364650114432001 219 S13 E65 28BDBA1 USGS CSV-2.* waterdata.usgs.gov/nwis.
[14] *See, e.g., Nevada Division of Water Resources, Coyote Spring Valley Hydrographic Basin 13-210 Groundwater Pumpage Inventory*, 2017.
[15] *See, e.g., Nevada Division of Water Resources, Black Mountains Area Hydrographic Basin 13-215 Groundwater Pumpage Inventory*, 2017.

WHEREAS, annual groundwater pumpage inventories in the Garnet Valley have been published by the State Engineer since 2001. In the years 2001 through 2017 pumping has ranged from 797 acre-feet to 2,181 acre-feet, averaging 1,358 acre-feet.[16]

WHEREAS, the State Engineer does not conduct annual groundwater pumpage inventories in the Hidden Valley basin because there is no groundwater pumping in the basin.

WHEREAS, annual groundwater pumpage inventories in the California Wash have been published by the State Engineer since 2016. In the years 2016 and 2017 pumping has ranged from 88 acre-feet to 252 acre-feet, averaging 170 acre-feet.[17] Groundwater pumpage data have been reported by water right holders since 2009.

WHEREAS, annual groundwater pumpage inventories in the Muddy River Springs Area have been published by the State Engineer since 2016. In the years 2016 and 2017 pumping has ranged from 3,553 acre-feet to 4,048 acre-feet, with an average of 3,801 acre-feet.[18] Groundwater pumpage data have been reported by water right holders since 1976.

WHEREAS, total groundwater pumpage in Coyote Spring Valley, Muddy River Springs Area (MRSA), California Wash, Hidden Valley, Garnet Valley, and the northwest portion of the Black Mountains Area in calendar years 2007 through 2017, ranged from 9,090 acre-feet to 14,766 acre-feet. Pumpage in years 2011-2012 during the aquifer test averaged 14,535 afa. Pumpage in years 2015 through 2017, when alluvial pumping in the MRSA was greatly reduced because of the Reid Gardner Generating Station closure, ranged from 9,090 afa to 9,637 afa.

V. AUTHORITY AND NECESSITY

WHEREAS, NRS § 533.024(1)(c) directs the State Engineer "to consider the best available science in rendering decisions concerning the availability of surface and underground sources of water in Nevada."

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[16] *See, e.g., Nevada Division of Water Resources, Garnet Valley Hydrographic Basin 13-216 Groundwater Pumpage Inventory*, 2017.
[17] *See, e.g., Nevada Division of Water Resources, California Wash Hydrographic Basin 13-218 Groundwater Pumpage Inventory*, 2017.
[18] *See, e.g., Nevada Division of Water Resources, Muddy River Springs Area (AKA Upper Moapa Valley) Hydrographic Basin 13-219 Groundwater Pumpage Inventory*, 2017.

WHEREAS, NRS § 533.024(1)(e) was added in 2017 to declare the policy of the State to "manage conjunctively the appropriation, use and administration of all waters of this State regardless of the source of the water."

WHEREAS, given that the State Engineer must use the best available science and manage conjunctively the water resources in the LWRFS, consideration of any development of long-term, permanent, uses that could ultimately be curtailed due to water availability will be examined with great caution.

WHEREAS, as demonstrated by the results of the aquifer test, Coyote Spring Valley, Muddy River Springs Area, Hidden Valley, Garnet Valley, California Wash, and the northwestern part of the Black Mountains Area have a direct hydraulic connection, and as a result must be administered as a joint administrative unit, including the administration of all water rights based upon the date of priority of such rights in relation to the priority of rights in the other basins.[19]

WHEREAS, the pre-development discharge of 34,000 acre-feet of the Muddy River system, which is fully appropriated, plus the more than 38,000 acre-feet of groundwater appropriations within the LWRFS greatly exceed the total water budget within the flow system.

WHEREAS, the results from the aquifer test, the data from groundwater level recovery and spring flow, and climate data indicate to the State Engineer that the quantity of water that may be pumped within the LWRFS without conflicting with senior rights on the Muddy River or adversely affecting the habitat of the Moapa dace is less than the quantity pumped during the aquifer test.

WHEREAS, the current amount of pumping corresponds to a period of time in which spring flows have remained relatively stable and have not demonstrated a continuing decline.

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[19] *See, e.g.*, Southern Nevada Water Authority, *Nevada State Engineer Order 1169 and 1169A Study Report*, June 2013; Tom Meyers, Ph.D., *Technical Memorandum Comments on Carbonate Order 1169 Pump Test Data and Groundwater Flow System in Coyote Springs and Muddy River Springs Valley, Nevada*, June 25, 2013; U.S. Fish and Wildlife Service, U.S. Bureau of Land Management and U.S. National Park Service Order 1169A Report, *Test Impacts and Availability of Water Pursuant to Applications Pending Under Order 1169*, June 28, 2013; Johnson and Mifflin, *Summary of Order 1169 Testing Impacts, per Order 1169A*, June 28, 2013; Tetra Tech, *Comparison of Simulated and Observed Effects of Pumping from MX-5 Using Data Collected to the End of the Order 1169 Test, and Prediction of Recovery from the Test*, June 10, 2013, official records in the Office of the State Engineer.

WHEREAS, the precise extent of the development of existing appropriations of groundwater within the LWRFS that may occur without conflicting with the senior rights of the fully decreed Muddy River has not been determined.

WHEREAS, recognizing that there exists a need for further analysis of the historic and ongoing groundwater pumping data, the relationship of groundwater pumping within the LWRFS to spring discharge and flow of the fully decreed Muddy River, the extent of impact of climate conditions on groundwater levels and spring discharge, and the ultimate determination of the sustainable yield of the LWRFS, the State Engineer finds that input by means of reports by the stakeholders in the interpretation of the data from the aquifer test and from the years since the conclusion of the aquifer test is important to fully inform the State Engineer prior to setting a limit on the quantity of groundwater that may be developed in the LWRFS or to developing a long-term Conjunctive Management Plan for the LWRFS and Muddy River.

WHEREAS, the State Engineer finds that it is necessary to carefully monitor the effects of groundwater development within the LWRFS under current conditions, toward the goal of collaboratively (with stakeholders) evaluating the amount of groundwater that may ultimately be developed within the LWRFS without conflicting with senior decreed rights on the Muddy River or adversely affecting the public interest in maintaining the habitat of the endangered Moapa dace. The evaluation process will include public meetings, meetings of a stakeholder representative working group, and coordination with the Hydrologic Review Team (HRT) developed under the 2006 Memorandum of Agreement among the Southern Nevada Water Authority, United States Fish and Wildlife Service, Coyote Springs Investments, Moapa Band of Paiutes, and the Moapa Valley Water District. The process will provide the opportunity for the stakeholders to engage in the development of a conjunctive management plan that will be informed by the determination of the total quantity of groundwater that may be developed within the LWRFS and that will facilitate the continued use of groundwater by junior priority groundwater rights holders whom have perfected their water rights while protecting the senior decreed rights on the Muddy River.

WHEREAS, recognizing that an amount less than the full quantity of the appropriated groundwater rights within the LWRFS may be developed in a manner that will provide for a reasonably certain supply of water for future permanent uses without jeopardizing the economies of the communities reliant on the water supply within the LWRFS, the health and safety of those whom are either presently reliant the water, existing public interests, or those who may in the future become reliant on a reliable and sustainable source of supply, the State Engineer, with the following exception, finds that it is necessary to issue a temporary moratorium on the review and decision by the Division of Water Resources regarding any final subdivision map or other construction or development submission requiring a finding that adequate water is available to support the proposed development. During the pendency of this Interim Order, the State Engineer may review and grant approval of a subdivision or other submission if a showing of an adequate and sustainable supply of water to meet the anticipated life of the subdivision, other construction or development can be made to the State Engineer's satisfaction.

WHEREAS, through continued monitoring of the LWRFS during the effective period of this Interim Order, the State Engineer seeks to maintain recent groundwater pumping amounts, while providing time for the submission of additional scientific data and analysis regarding the total quantity of water that may be sustainably withdrawn from the LWRFS over the long-term without conflicting with senior Muddy River decreed rights or jeopardizing the communities, water users, or public interests identified above.

WHEREAS, the State Engineer is empowered to make such reasonable rules and regulations as may be necessary for the proper and orderly execution of the powers conferred by law.[20]

WHEREAS, within an area that has been designated by the State Engineer, as provided for in NRS Chapter 534, where, in the judgment of the State Engineer, the groundwater basin is being depleted, the State Engineer in his or her administrative capacity may make such rules, regulations and orders as are deemed essential for the welfare of the area involved.[21]

WHEREAS, the State Engineer finds that additional data relating to the impacts of groundwater pumping from the LWRFS coupled with the public process will allow his office to make a determination as to the appropriate long-term management of groundwater pumping that may occur in the LWRFS by existing holders of water rights without conflicting with existing senior decreed rights or adversely affecting the endangered Moapa dace.

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[20] NRS § 532.120.
[21] *Id.*

VI. ORDER

NOW THEREFORE, the State Engineer orders:

1. The Lower White River Flow System consisting of the Coyote Spring Valley, Muddy River Springs Area, California Wash, Hidden Valley, Garnet Valley, and the portion of the Black Mountains Area as described in this Order, is herewith designated as a joint administrative unit for purposes of administration of water rights. All water rights within the Lower White River Flow System will be administered based upon their respective date of priorities in relation to other rights within the regional groundwater unit.
2. Any stakeholder with interests that may be affected by water right development within the Lower White River Flow System may file a report in the Office of the State Engineer in Carson City, Nevada, no later than the close of business on Monday, June 3, 2019.[22] Reports filed with the Office of the State Engineer should address the following matters:
    a. The geographic boundary of the hydrologically connected groundwater and surface water systems comprising the Lower White River Flow System;
    b. The information obtained from the Order 1169 aquifer test and subsequent to the aquifer test and Muddy River headwater spring flow as it relates to aquifer recovery since the completion of the aquifer test;
    c. The long-term annual quantity of groundwater that may be pumped from the Lower White River Flow System, including the relationships between the location of pumping on discharge to the Muddy River Springs, and the capture of Muddy River flow;

[22] For any stakeholder affected by the shut-down of the United States government beginning in December 2018, upon a request and showing of good cause to the satisfaction of the State Engineer, an extension of time may be granted to those affected parties.

d. The effects of movement of water rights between alluvial wells and carbonate wells on deliveries of senior decreed rights to the Muddy River; and,

e. Any other matter believed to be relevant to the State Engineer's analysis.

3. Any stakeholder with interests that may be affected by water right development within the Lower White River Flow System may file with the Office of the State Engineer no later than the close of business on Thursday July 18, 2019, a rebuttal to the Reports filed on June 3, 2019.

4. The State Engineer will schedule an administrative hearing within the month of September 2019 to take comment on the submitted reports.

5. During the pendency of this Interim Order:

a. Permanent applications to change existing groundwater rights shall be held in abeyance pending the submission of the reports as required by Paragraph 2 of this Order and as authorized by NRS §§ 532.165(1), 533.368 and 533.370(4)(d). Temporary applications to change existing groundwater rights will be processed pursuant to NRS § 533.345.

b. A temporary moratorium is issued regarding any final subdivision or other submission concerning development and construction submitted to the State Engineer for review, and such submissions shall be held in abeyance pending the conclusion of the public process to determine the total quantity of groundwater that may be developed within the Lower White River Flow System. The State Engineer may review and grant approval of a subdivision or other submission if a showing of an adequate and sustainable supply of water to meet the anticipated life of the subdivision, other construction or development can be made to the State Engineer's satisfaction.

c. Holders of water rights who maintain their water rights in good standing by filing all required applications for extension of time in conformity with the requirements of NRS §§ 533.390, 533.395 and 533.410 may cite this order in support of their applications for extension of time.

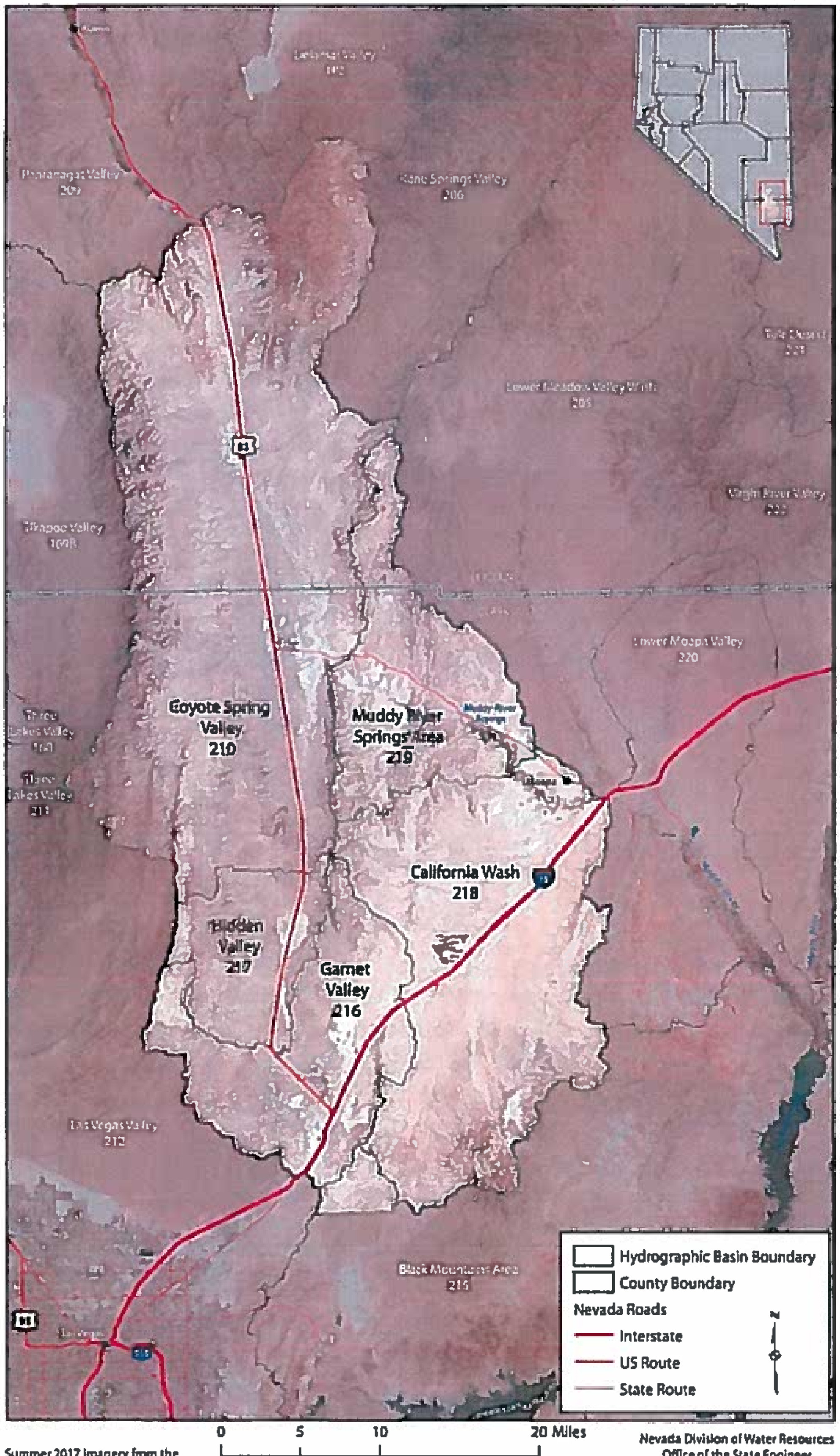
d. Holders of water rights who file all required applications for extension of time in conformity with the requirements of NRS § 534.090 may cite this order in support of their applications for extension of time to prevent the working of a forfeiture.

P.E.
JASON KING, P.E.
State Engineer

Dated at Carson City, Nevada this
11TH day of JANUARY, 2019.

Order 1303, Appendix A : LOWER WHITE RIVER FLOW SYSTEM

Coyote Spring Valley, Muddy River Springs Area, Hidden Valley, Garnet Valley, California Wash, and a portion of Black Mountains Area



Summer 2017 Imagery from the National Agriculture Imagery Program

Nevada Division of Water Resources
Office of the State Engineer
Jason King P.E.
State Engineer

SE ROA 85

Order 1303, APPENDIX B: Groundwater Pumping in the Lower White River Flow System, 2007–2017

Basin No.	219				215		210	216	218	217	Total pumping in the LWRFS
Basin Name	Muddy River Springs Area				Black Mountains Area		Coyote Spring Valley	Garnet Valley	California Wash	Hidden Valley	
Year	Carbonate pumping (reported by MVWD)	Alluvial pumping (reported by NV Energy)	All other Alluvial Pumping[1]	Total Pumping in Basin 219[1]	Carbonate pumping in the Northwest Portion of Basin 215	Total Pumping in Basin 215					
2007	2,079	4,744	253	7,076	1,585	1,732	3,147	1,412	27[2]	0	13,247
2008	2,272	4,286	253	6,811	1,591	1,759	2,000	1,552	27[2]	0	11,981
2009	2,034	4,092	253	6,379	1,137	1,159	1,792	1,427	21[3]	0	10,756
2010	1,826	4,088	253	6,167	1,561	1,572	2,923	1,373	26[3]	0	12,050
2011	1,837	4,212	253	6,302	1,398	1,409	5,606	1,427	33[3]	0	14,766
2012	2,638	2,961	253	5,852	1,556	1,564	5,516	1,351	28[3]	0	14,303
2013	2,496	3,963	253	6,712	1,585	1,776	3,407	1,484	66[3]	0	13,254
2014	1,442	4,825	253	6,520	1,429	1,624	2,258	1,568	241[3]	0	12,016
2015	2,396	1,249	253	3,898	1,448	1,708	2,064	1,520	460	0	9,390
2016	2,795	941	312	4,048	1,434	1,641	1,722	2,181	252	0	9,637
2017	2,824	535	194	3,553	1,507	1,634	1,961	1,981	88	0	9,090

The LWRFS includes basins 210, 216, 217, 218, 219 and the northwest portion of 215.

All values in this table are from State Engineer basin pumpage inventory reports except as noted in the footnotes below:

1. Alluvial Pumping not reported by NV Energy for years 2007–2015 estimated as the average of inventoried years 2016–2017.
2. Estimated as the average of groundwater pumping in years 2009–2012.
3. Reported to the State Engineer but not published in a basin inventory report.

IN THE OFFICE OF THE STATE ENGINEER
OF THE STATE OF NEVADA

ADDENDUM TO INTERIM ORDER #1303

DESIGNATING THE ADMINISTRATION OF ALL WATER RIGHTS WITHIN COYOTE SPRING VALLEY HYDROGRAPHIC BASIN (210), A PORTION OF BLACK MOUNTAINS AREA (BASIN 215), GARNET VALLEY (BASIN 216), HIDDEN VALLEY (BASIN 217), CALIFORNIA WASH (BASIN 218), AND MUDDY RIVER SPRINGS AREA (AKA UPPER MOAPA VALLEY) (BASIN 219) AS A JOINT ADMINISTRATIVE UNIT, HOLDING IN ABEYANCE APPLICATIONS TO CHANGE EXISTING GROUNDWATER RIGHTS, AND ESTABLISHING A TEMPORARY MORATORIUM ON THE REVIEW OF FINAL SUBDIVISION MAPS

WHEREAS, the purpose of this Addendum is to modify the schedule for the submission of reports and rebuttal reports of interested stakeholders analyzing the data available regarding sustainable groundwater development in the Lower White River Flow System (LWRFS), the geographic extent of the LWRFS, and considerations relating to the movement of groundwater pumping between the alluvial wells and carbonate wells and its effects on the fully decreed Muddy River.

WHEREAS, NRS § 533.024(1)(c) directs the State Engineer "to consider the best available science in rendering decisions concerning the availability of surface and underground sources of water in Nevada."

WHEREAS, NRS § 533.024(1)(e) was added in 2017 to declare the policy of the State to "manage conjunctively the appropriation, use and administration of all waters of this State regardless of the source of the water."

WHEREAS, based upon the recognition that a need exists for further analysis of the groundwater pumping data, the relationship of groundwater pumping within the LWRFS to spring discharge and flow of the fully decreed Muddy River, the extent of impact of climate conditions on groundwater levels and spring discharge, and the ultimate determination of the sustainable yield of the LWRFS, and the interest in the stakeholders having sufficient time to prepare reports, the State Engineer finds that it is reasonable and appropriate to modify the schedule originally established in Interim Order 1303.

WHEREAS, the State Engineer is empowered to make such reasonable rules and regulations as may be necessary for the proper and orderly execution of the powers conferred by law.[1]

WHEREAS, within an area that has been designated by the State Engineer, as provided for in NRS Chapter 534, where, in the judgment of the State Engineer, the groundwater basin is being depleted, the State Engineer in his or her administrative capacity may make such rules, regulations and orders as are deemed essential for the welfare of the area involved.[2]

ORDER

NOW THEREFORE, the State Engineer orders:

1. The deadline for any stakeholder with interests that may be affected by water right development within the Lower White River Flow System to file a report in the Office of the State Engineer in Carson City, Nevada, is extended to no later than the close of business on Wednesday, July 3, 2019. The substance of the reports should include the same elements as established originally in Interim Order 1303.
2. Any rebuttal report to the Reports filed on July 3, 2019, to be submitted by a stakeholder with interests that may be affected by water right development within the Lower White River Flow System shall be submitted to the Office of the State Engineer no later than the close of business on Friday August 16, 2019.
3. All other matters contained in Interim Order 1303 remain unaltered.

Tim Wilson, P.E.

TIM WILSON, P.E.
State Engineer

Dated at Carson City, Nevada this

13th day of May, 2019.

[1] NRS § 532.120.
[2] *Id.*

Environmental Technologies; Great Basin Water Network; Lincoln County Water District and Vidler Water Company; Moapa Band of Paiutes; Moapa Valley Water District; United States National Park Service; Southern Nevada Water Authority and Las Vegas Valley Water District; Technichrome; and the United States Fish and Wildlife Service. Rebuttal reports were filed by Bedroc Limited and Western Elite Environmental, Inc.; Center for Biological Diversity; City of North Las Vegas; Coyote Springs Investment, LLC; Dry Lake Water, LLC, Georgia Pacific Gypsum and Republic Environmental Technologies; Lincoln County Water District and Vidler Water Company; Moapa Band of Paiutes; Moapa Valley Water District; Muddy Valley Irrigation Company; the United States National Park Service; Nevada Cogeneration Associates; Nevada Energy; Southern Nevada Water Authority and Las Vegas Valley Water District; and the United States Fish and Wildlife Service.

On August 9, 2019, the State Engineer held a pre-hearing conference regarding the hearing on the submission of reports and evidence as solicited in Order 1303. At the pre-hearing conference, the State Engineer set forth the purpose of the Order 1303 hearing, addressed the timing and length of the hearing, discussed the sequence of the presentation of evidence by the participants, addressed the procedures and other administrative matters relating to Order 1303, discussed the timing for disclosures of witnesses and evidence, including expert witnesses, and addressed other matters relating to the hearing. The State Engineer established that the purpose of the hearing on the Order 1303 reports was to provide the participants an opportunity to explain the positions and conclusions expressed in the reports and/or rebuttal reports submitted in response to the Order 1303 solicitation. The State Engineer directed the participants to limit the offer of evidence and testimony to the salient conclusions, including directing the State Engineer and his staff to the relevant data, evidence and other information supporting those conclusions. The State Engineer further noted that the hearing on the Order 1303 reports was the first step in determining to what extent, if any, and in what manner the State Engineer would address future management decisions, including policy decisions, relating to the Lower White River Flow System basins. On that basis, the State Engineer then addressed other related matters pertaining to the hearing on the Order 1303 reports, including addressing the date and sequence of the hearing, as set forth in this Notice of Hearing.

II. NOTICE OF HEARING

Please take notice, the State Engineer hereby sets the hearing on Order 1303, to begin at **8:30 a.m., on Monday, September 23, 2019, continuing through Friday, September 27, 2019, ending each day by 4:30 p.m. The hearing will reconvene at 8:30 a.m. on Monday, September 30, 2019, continuing through Friday, October 4, 2019, ending each day by 4:30 p.m., with the exception of October 3, 2019, where the hearing will reconvene at 11:00 a.m. and end at 4:30 p.m., at the Nevada State Legislature, 401 South Carson Street, Room 2135, Carson City, Nevada and will video be conferenced to the Legislative Counsel Bureau, Sawyer Office Building, 555 E. Washington Ave., Suite 4400, Las Vegas, Nevada.**

Environmental Technologies; Great Basin Water Network; Lincoln County Water District and Vidler Water Company; Moapa Band of Paiutes; Moapa Valley Water District; United States National Park Service; Southern Nevada Water Authority and Las Vegas Valley Water District; Technichrome; and the United States Fish and Wildlife Service. Rebuttal reports were filed by Bedroc Limited and Western Elite Environmental, Inc.; Center for Biological Diversity; City of North Las Vegas; Coyote Springs Investment, LLC; Dry Lake Water, LLC, Georgia Pacific Gypsum and Republic Environmental Technologies; Lincoln County Water District and Vidler Water Company; Moapa Band of Paiutes; Moapa Valley Water District; Muddy Valley Irrigation Company; the United States National Park Service; Nevada Cogeneration Associates; Nevada Energy; Southern Nevada Water Authority and Las Vegas Valley Water District; and the United States Fish and Wildlife Service.

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So this is the time set for the hearing, the prehearing conference for the Order 1303 reports that have been solicited by the State Engineer's office.

And as we've spoken at the last public workshop, the hearing on the Order 1303 reports is going to commence on September 23rd, but prior to issuing a scheduling order, there's obviously a bunch of logics we need to work out and want to make sure we have a clear playing field which will be outlined also in that scheduling order for all the parties and participants to this proceeding.

As we've kind of noted all a long, this is a different format than most of our protested hearings. There's not necessarily -- there's not an Applicant and a Protestant.

But what this is is really an opportunity for the participants and those stakeholders in the Lower White River Flow System to come forth and have an opportunity to present their reports that they've submitted or rebuttal reports that have been submitted to allow the State Engineer to go ahead and take that under advisement in making further determinations with respect to the issues.

So, just to go ahead and get started, I'm just going to state we're a little bit limited in time this morning, so we have to complete this by the noon hour because this room is actually being occupied this afternoon as well.

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So we're not going to extend past the lunch hour. And so I'm going to go ahead and give us a quick road map of what we are intending to accomplish during this meeting this morning, or this hearing this morning.

So the purpose of this conference is to go over the purpose of the Order 1303 hearing. So what are our expectations and what our goals for the State Engineer's office for having that hearing?

To address the timing and length of the hearing. To discuss the sequence of presentation by the different participants.

To go over procedures and other administrative matters relating to the Order 1303 hearing and to determine the time for disclosures of witnesses and evidence anticipated to be filed and relied upon during the hearing. And then to address any other questions.

So, just to kind of provide a summary for the purpose of the hearing. The purpose of the hearing is to consider the reports solicited pursuant to Order 1303.

And so the State Engineer views the purpose of Order 1303 and the report submitted in response to the solicitation as an opportunity for the participants who have or will have filed reports, rebuttal reports an opportunity to explain their positions and conclusions and to respond to any

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criticism of those positions and conclusions presented by other parties through rebuttal reports.

The participants are the stakeholders who have submitted either a report or rebuttal report or both a report and rebuttal report.

Individuals who do not submit a report will be allowed to provide public comment, but they're not participants for the purpose of presenting testimony, evidence or cross-examining.

And just because a participant has submitted a report or rebuttal report does not require to party to something evidence beyond their reports.

So the State Engineer will consider all reports and opinions submitted, regardless of whether there's -- actual parties proffer witnesses or testimony.

Participants will be limited to offering testimony and evidence relating to the most salient conclusions, including data, evidence and other information supporting those conclusions.

So, the idea is that participants who have submitted reports, the State Engineer and staff, we will have reviewed those reports prior to the commencement of the hearing and the State Engineer staff within the Division of Water Resources, we are well qualified to review, consider,

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analyze reports, including the data and evidence relied upon in preparing opinions and rendering those -- and rendering the conclusions within the reports.

And the State Engineer's expectation and intention for this hearing is that the parties who have submitted either a report or rebuttal reports will be permitted an opportunity to provide limited testimony and to submit evidence identifying those salient conclusions and findings contained in those reports.

And really the purpose is to direct the State Engineer and our staff to the data, information and relevant evidence within the State Engineer's administrative record or to provide that evidence in support of those conclusions.

So, this isn't -- the hearing is not intended to have everybody and every participant to go through each and every sub detail of their reports.

The idea is that we want you to go ahead and hit the high points, point us to those conclusions, point us in the direction what do you think is substantive and important for our office to really consider, but the intent is that we're trying to go ahead and keep this relatively limited and focused. We have the capability to go ahead and examine all the detail and such.

So the hearing is not and the State Engineer will

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not permit participants to address each and every detail. And the purpose is to afford participants the opportunity to highlight the points and to direct staff components which are the most significant matters as is addressed in the Order 1303 solicitation which are the geographic boundary of hydrologically connected groundwater and surface water systems comprising the Lower White Water River Flow System.

The information obtained from the Order 1169 aquifer test, and subsequent to the aquifer test, the Muddy River Headwater Spring Flow as it relates to aquifer recovery since the completion of the aquifer test.

The long term annual quantity of groundwater that maybe pumped from the Lower White River Flow System, including relationships between location of pumping on discharge to the Muddy River Springs and the capture of Muddy River flow.

The effects of movement on water rights between alluvial wells and carbonate wells on deliveries of senior decreed rights in the Muddy River and other matters participants have included in their reports that they believe to be relevant in the State Engineer's analysis.

MR. FLANGAS: A question?

HEARING OFFICER FAIRBANK: Yes.

MR. FLANGAS: When you say "other matters relevant", are you limiting to that to the hydrology, other

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matters relevant to the hydrology or any other matter relevant period?

HEARING OFFICER FAIRBANK: So it's not -- it's not any other matter relevant period. It's relevant to these particular issues and questions that we're asking.

And so, and I'm going to talk about this and we've spoken about this before, is that really this is a threshold reporting aspect, that this is part of a multi-tiered process in terms of determining the appropriate management strategy to the Lower River Flow System.

And in order for the office to go ahead and start to engage in working with the -- with the community, working with water right holders and determining what an appropriate management strategy is, there's threshold matters that have to be decided and determined.

And that is those particular, those four components that we've solicited in the Order 1303 report. This larger substantive policy determinations is not part of this particular proceeding.

That's part of later proceedings, but this is what has to occur in order to inform those future policy determinations and decisions.

And while some people have addressed some policy interplays, because there are some policy interplays into some

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of these findings and determinations, really this is more about a scientific analysis and data analysis.

MR. FLANGAS: Thank you for that clarification.

HEARING OFFICER FAIRBANK: So second, the purpose of the hearing is limited to those issues I've outlined and these particular issues must be addressed to decide the threshold matter.

So, kind of to follow up on Alex's question, to the extent participants intend or desire to spend time addressing future policy considerations which are not encompassed within the issues specifically identified in the solicitation of the reports, those matters will not be considered during these proceedings.

The State Engineer anticipates that any future decision will address -- that the future decision coming out of this Order 1303 hearing will address the following issues.

The geographic boundary of the hydrologically connected water system comprising the Lower White River Flow System. To whether or not that's a singular basin, whether or not it's encompassing multiple basins, that's going to be a decision that is ultimately determined by the State Engineer following this hearing.

The quantity of water that may be sustainably developed within the Lower White River Flow System without

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conflicting with senior rights, and whether there should be any restrictions or limitations on the movement of points of diversion within the LWRFS and other issues which will provide the framework for making future management decisions within the LWRFS.

And the purpose of the hearing is not to resolve or address allegations of conflict between groundwater pumping within the LWRFS and Muddy River decreed rights. That is not the purpose of this hearing and that's not what we are going to be deciding at this point in time.

The purpose of the hearing is to determine what the sustainability is, what the impact is on decreed rights, and then addressing and resolving allegations of conflict should that be a determination that will be addressed in, at a future point in time.

Also, I want to provide a little bit of kind of a framework for parties to understand what our office is looking at when we're reviewing the reports received in response to our solicitation.

Our office is looking for the following, and this is not a comprehensive list, but this is just kind of a framework.

We're looking for how conclusions are supported by the available data.

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not continue the hearing into the second week of October which would be the 7th, 8th.

If it's necessary in order to provide all the opportunities an adequate opportunity, we will continue -- the hearing will extend into that following week.

And so, I appreciate the feedback, because those are the type of things and, obviously, there's a bit of uncertainty not knowing how many rebuttal reports are going to be submitted.

MR. TAGGART: Well, and if I can, just to build on that, if -- if we go to day one and whoever that first party is can't get done, but we're all being, you know, efficient, we may find out quickly that this schedule, this time allocation isn't working completely and that's when we start talking about whether to continue on into the next week.

HEARING OFFICER FAIRBANK: Right. Well, so when we issued the scheduling order, the scheduling order will set out the days and times. And part of that is what we're going to try to talk about today is get an understanding of what the parties, you know, I understand that Moapa Valley Water District feels that a half of day would be unduly restrictive for their purposes.

I understand that SNWA believes that a day is unduly restrictive. And so we're going to take some of that

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feedback and we are going to develop the sequencing of the report of the participants' participation that is going to be set forth in the schedule order.

The scheduling order will also indicate that as necessary the hearing will continue, you know, day to day beyond that, as, you know, if necessary.

Yes, Mr. Robison.

MR. ROBISON: Rebuttal will overlap with cross-examination, so that provides some incentive to be succinct.

We are customarily and frequently restricted in time limitations in courtrooms, but that said, any major player that gets a day and a half, we want the same.

HEARING OFFICER FAIRBANK: And I also understand that's one of the other balancing interests.

MR. ROBISON: Thank you.

MR. TAGGART: And, again, just when we talk about rebuttal, we mean, like if I have a witness who had done a report and has a report, an initial report and rebuttal report, that witness will testify about both of those reports at the same time and then be subjected to cross-examination and then redirect and then questions of staff and then that witness would be done.

HEARING OFFICER FAIRBANK: Yes, that's correct.

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MR. DONNELLY: Patrick Donnelly, Center for Biological Diversity. I think -- I'm checking with our hydrologist about half day and whether that's adequate. I would think a half day plus, probably.

But I think we would be as -- as or more concerned about the structure and equity of the cross-examination process, particularly because there would be a week and a half before we get to go and could probably elicit a lot of our points during that process if it is structured properly. So, what is that going to look like?

HEARING OFFICER FAIRBANK: Well, the idea is that the cross-examination process will be not less than the amount of time that a participant -- that a particular witness was subject to their direct examination.

MR. ROBISON: By all parties.

HEARING OFFICER FAIRBANK: What?

MR. ROBISON: I'm sorry, by all parties.

HEARING OFFICER FAIRBANK: By all parties.

MR. ROBISON: Thank you.

HEARING OFFICER FAIRBANK: And, again, that's why we're encouraging the parties to go ahead and, you know, be cognitive of what the other questions and to the extent that there's parties that have similar perspectives, similar conclusions, similar opinions that, you know, perhaps that,

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you know, certainly can't tell people how to go ahead and manage their own cases, but coordination and communication amongst the parties is certainly encouraged.

But at the same time, there are going to be a lot more individuals intending to cross-examine a witness or an expert at any given time.

So there's probably going to be, again, it's we're trying to provide an opportunity for everybody to have -- have an opportunity to do that -- to have -- to have an opportunity to elicit and challenge the conclusions and evidence relied upon by a particular witness if that's so necessary for their positions and how they believe the State Engineer should be evaluating the conclusions.

But it's not going to be a free for all, and so we're going to be trying to balance that to the best of our ability.

In terms of assigning the number of minutes per each party, I just don't -- I think that's just unduly impossible. It's not going to happen at that point in time. So we're just going to have to work it out, and our -- our role and responsibility is to go ahead and try to manage the progress of the hearing to assure that the parties are all given an opportunity, you know, a fair opportunity.

Yes, Mr. Flangas.

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HEARING OFFICER FAIRBANK: We'll have them Bate stamped and numbered out.
MR. TAGGART: Okay. And then will they be available, I think it's important that they be made available, and I don't want to burden your office more than it already is, but you know, if it was put on a website and all, not only is there the list, but then on a website someone could go in and every one of those documents is there on the website, then we don't have to serve everyone, or you don't have to serve everyone.
Is that what you contemplate, or --
HEARING OFFICER FAIRBANK: We're hoping to accomplish that. Again, it's a very voluminous record at this point in time, and so hoping to get everything that ties in a formatted manner.
I'll be completely candid with you, some it is a bunch data spread sheets and we're having a hard time getting those formatted into a mechanism that you can actually have them in a readable format.
MR. TAGGART: Okay.
HEARING OFFICER FAIRBANK: So to the extent where possible, we're trying to get everything into a digitized format and make it available. So that's the intent that it will be available prior to September 23rd.

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Is it all going to be available when we issue the scheduling order, probably not all of it because it's proving to be quite the task.
So, we are endeavoring to do so, but it's going to -- it may not all be complete by the time that the scheduling order comes out.
But it will be -- it will be coming up and it be will be part of our hearing under that news tab in LWRFS.
MR. TAGGART: For -- I'm just exploring how this is going can work. Is it possible that you could make things available here at your office if people wanted to come and look at it if it was just digital.
HEARING OFFICER FAIRBANK: Um-hum.
MR. TAGGART: And had you a hard time, you know, making it, replicating it for a PDF, then if it was available here for people to come look at, that might be one way of dealing with that.
And so if there's additional documents, then we would provide those to your office and to who? I guess, from a notice standpoint, how should we handle that?
HEARING OFFICER FAIRBANK: Right. So what we're going to do, and that's down a little bit --
MR. TAGGART: Okay.
HEARING OFFICER FAIRBANK: -- disclosure of

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witnesses and evidence. And so we're going to establish a deadline for the parties to disclose their witnesses, the anticipated testimony and to exchange any documents and evidence and so -- and it's going to have to be shared amongst all the parties.
MR. TAGGART: Okay. And can I just clarify one thing, is that when we submit exhibits, they are intended to be documents that support our expert reports. And will new expert opinions and new expert reports are not authorized to be submitted when exhibits are submitted?
HEARING OFFICER FAIRBANK: Correct.
MR. TAGGART: Okay.
HEARING OFFICER FAIRBANK: The expert reports, those deadlines are established pursuant to the order and the addendum to the order, or the amendment -- the amended order.
MR. TAGGART: All right.
HEARING OFFICER FAIRBANK: So, correct. New expert reports or new rebuttal reports beyond those deadlines will not be accepted.
The additional evidence is if there's supporting documentation for those things, you know, those things that are relevant to the point equally that you believe that the State Engineer should take it into consideration.
But there -- the administrative record should be

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relatively complete we believe, particularly with the inclusion of the expert report.
But, somebody may have something out there that they think is incredibly important for us to consider that's not there, and so we want to make sure everybody is afforded an opportunity to get that in front of you prior to the commencement of the hearing so that the State Engineer can consider that as part of his decision making process.
MR. ROBISON: Is there a definitive service list of who would be served with whatever additional documents we identify?
HEARING OFFICER FAIRBANK: It will be attached to the scheduling order.
MR. ROBISON: Thank you.
HEARING OFFICER FAIRBANK: So the scheduling order will establish that service list, and so then, just as everybody understands is we also have for the purposes is we have an email list which is really kind of a, more of an informal notification list, but for the purpose of the hearing, the scheduling order will have a service list attached to it.
MR. FLANGAS: Service meaning mailing?
HEARING OFFICER FAIRBANK: Mailing, yes.
MR. ROBISON: Does email suffice?

Order 1303 Hearing Schedule Matrix

	9/23/2019	9/24/2019	9/25/2019	9/26/2019	9/27/2019
8:30					
9:30	[illegible]	[illegible]	[illegible]	MBPI	SNWA
10:30					
11:30					
12:30	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
1:30					
2:30	[illegible]	[illegible]	[illegible]	MBPI	SNWA
3:30					

	9/30/2019	10/1/2019	10/2/2019	10/3/2019	10/4/2019
8:30	SNWA				MVIE
9:30		[illegible]	[illegible]		
10:30	[illegible]				Bedroc
11:30		[illegible]		Dry Lake	
12:30	LUNCH	LUNCH	LUNCH	Technichome	LUNCH
1:30	[illegible]				[illegible]
2:30		[illegible]	Dry Lake	NV Cogen	
3:30	[illegible]				Public Comment

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2. The scope of witness testimony in the hearing that commences on Monday, September 23, 2019, shall be limited to the four issues identified in Order 1303, and other information that the participants can demonstrate is useful to the State Engineer in his evaluation of those four issues, and the testimony of experts shall be limited to their area of qualification and previously provided written testimony contained in their expert reports.

3. All documentary evidence, except the expert reports, received by the State Engineer is hereby admitted, and the State Engineer shall consider the documentary evidence with the appropriate weight given the concerns raised by the participants, including but not limited to, hearsay, relevance and foundation.

4. All expert reports properly affirmed that the report is true and correct and that the affiant personally prepared or directed its preparation, and submitted to cross-examination, shall be admitted.

Micheline N. Fairbank
MICHELINE N. FAIRBANK
Deputy Administrator

Dated this 16th day of

September, 2019.

IN THE OFFICE OF THE STATE ENGINEER

STATE OF NEVADA **1169A**

ORDER

WHEREAS, on March 8, 2002, the State Engineer issued State Engineer's Order No. 1169.

WHEREAS, Order No. 1169 was issued after an administrative hearing was held before the Nevada State Engineer regarding protested Applications 54055 through 54059 held by the Las Vegas Valley Water District, and protested Applications 63272 through 63276 and 63867 through 63876 held by Coyote Springs Investment, LLC.

WHEREAS, Order No. 1169 indicated that there was insufficient information to determine if additional water was available for appropriation under the applications and additional study was needed in order to make that determination.

WHEREAS, pursuant to Order No. 1169, the State Engineer ordered that all applications pending and any new filings for the appropriation of water from the carbonate-rock aquifer system within Coyote Spring Valley (Basin 210), Black Mountains Area (Basin 215), Garnet Valley (Basin 216), Hidden Valley (North) (Basin 217), Muddy River Springs Area a.k.a. Upper Moapa Valley (Basin 219), and Lower Moapa Valley (Basin 220) would be held in abeyance until further information was obtained by stressing the aquifer by pumping water under those water right permits already issued to appropriate water from the system.

WHEREAS, Order No. 1169 ordered that a study covering a minimum five-year period of time during which at least 50% of the water rights then currently permitted in Coyote Spring Valley be pumped for at least two consecutive years. The amount of water to be pumped was 8,050 acre-feet annually for two consecutive years.

WHEREAS, Order No. 1169 included as study participants those certain entities identified as having applications for additional water rights or as currently holding water rights in the referenced basins, specifically, the Las Vegas Valley Water District, Southern Nevada Water Authority, Coyote Springs Investment, LLC, Nevada Power Company and Moapa Valley Water District.

WHEREAS, on April 18, 2002, the State Engineer issued State Engineer's Ruling No. 5115 that addressed Applications 54075 and 54076 then held by the Las Vegas Valley Water District in California Wash (Basin 218). Pursuant to Ruling No. 5115, the State Engineer indicated that additional information was necessary before large quantities of groundwater could be appropriated from California Wash. Application 54075 was approved subject to a monitoring program to be prepared in conjunction with the study ordered under Order No. 1169 and Application 54076 was held in abeyance until the Order No. 1169 study was completed.

WHEREAS, by letter dated April 16, 2010, the State Engineer granted the Moapa Band of Paiute Indians' request to participate in the Order No. 1169 study. The Moapa Band of Paiute Indians' reservation is located within California Wash. The letter noted that the intent of Ruling No. 5115 was to include California Wash within the study area as the current evidence strongly supports a hydrologic connection between California Wash and the other hydrographic basins included in Order No. 1169.

WHEREAS, by letter dated May 26, 2010, the Moapa Band of Paiute Indians indicated their concern that the pumping test itself was likely to impact resources at the Muddy River Springs. On June 22, 2010, the State Engineer held a meeting to discuss the pumping test and the Tribe's concerns.

WHEREAS, by letter dated July 1, 2010, the State Engineer expressed his concern that it had been eight years since the pumping test was ordered and the pumping requirements of the Order No. 1169 study had not even begun. The State Engineer noted that the final reports ordered under Section 7 of Order No. 1169 and updating the groundwater model under Section 8 of the Order were only required after completion of the pumping test. However, the State Engineer indicated that decisions regarding future appropriations in the basins subject to Order No. 1169 could not be deferred indefinitely. Therefore, regardless of whether the 8,050 acre-feet minimum requirement was met or not, the study participants were ordered to comply with Sections 7 and 8 of Order No. 1169. The two-year pumping period was to commence when pumping and water export from well MX-5 commenced and the Section 7 report(s) were to be filed in the Office of the State Engineer within 180 days of completion of the first two years of pumping. The pumping test was expected to begin in August or September 2010 and actually began on November 15, 2010. The Southern Nevada Water Authority was also ordered to submit model simulation results showing the predicted effects of pumping both existing rights and current applications in Lower Meadow Valley Wash (Basin 205), Kane Springs Valley (Basin 206), Coyote Spring Valley (Basin 210), Black Mountains Area (Basin 215), Garnet Valley (Basin 216), Hidden Valley (North) (Basin 217), California Wash (Basin 218), Muddy River Springs Area a.k.a. Upper Moapa Valley (Basin 219), and Lower Moapa Valley (Basin 220). The State Engineer notified all study participants that monitoring activities were to be in place no later than August 1, 2010.

WHEREAS, the State Engineer has maintained information related to the pumping test on the Nevada Division of Water Resources website http://water.nv.gov/mapping/order1169/ and can be viewed by any member of the public.

WHEREAS, the State Engineer believes that sufficient information has been obtained through the pumping test and related monitoring in order to make a determination on the applications pending in these basins.

NOW THEREFORE, the State Engineer orders:

1. The pumping test is declared completed as of December 31, 2012.
2. In recognition of the information that has already been provided pursuant to the pumping test, the provisions of Section 8 of Order No. 1169 that required an update of Exhibit No. 54 from the July 2001 hearing is hereby rescinded.
3. Any study participant, which includes the Las Vegas Valley Water District, Southern Nevada Water Authority, Coyote Springs Investment, LLC, Nevada Power Company, Moapa Valley Water District and Moapa Band of Paiute Indians, may file a report in the Office of the State Engineer in Carson City, Nevada, by June 28, 2013, addressing the information obtained from the study/pumping test, impacts of pumping under the pumping test and the availability of water pursuant to the pending applications.

JASON KING, P.E.
State Engineer

Dated at Carson City, Nevada

this 21st day of December, 2012

CERTIFICATE OF SERVICE

I hereby certify that a copy of ____Amended Order No. 1169____ was served:

By U.S. certified mail, postage prepaid, on _December 21, 2012_, on the following:

Coyote Springs Investment, LLC
Attn.: Carl Savely
6600 N. Wingfield Pkwy.
Sparks, NV 89436
Certified Mail
#7106 7808 0630 0051 4231

Las Vegas Valley Water District
1001 S. Valley View Blvd., MS #485
Las Vegas, NV 89153
Certified Mail
#7106 7808 0630 0051 4262

Las Vegas Valley Water District
Attn.: John Entsminger
1001 S. Valley View Blvd., MS #485
Las Vegas, NV 89153
Certified Mail
#7106 7808 0630 0051 4378

Las Vegas Valley Water District
Attn.: Dana Walsh
1001 S. Valley View Blvd., MS #485
Las Vegas, NV 89153
Certified Mail
#7106 7808 0630 0051 4385

By U.S. regular mail, postage prepaid, on _December 21, 2012_, on the following:

Law Office of George N. Benesch
Attn.: George Benesch
190 W. Huffaker Lane, Ste. 408
Reno, NV 89511-2092

Christopher A. Brown
2014 Crawford Street, Apt. 1
North Las Vegas, NV 89030

Chemical Lime Company of Arizona
P.O. Box 363068
North Las Vegas, Nevada 89036

City of Caliente
Attn: Mayor
P.O. Box 1006
Caliente, NV 89008-1006

Dry Lake Water, LLC
2701 N. Tenaya Way, Suite 200
Las Vegas, NV 89102

Dyer, Lawerence, Penrose,
Flaherty and Donaldson
Attn.: Frank Flaherty
2805 Mountain St.
Carson City, NV 89703

James H. Fincher
2410 Bonita Lane
Henderson, NV 89014

Ely Shoshone Tribe
#16 Shoshone Circle
Ely NV 89301

Charles F. Hilfenhaus, Jr.
4465 Denia Circle
Las Vegas, NV 89108

High Country News
Attn.: Matt Jenkins
2832 Regent Street
Berkeley, CA 81428

INMC Mortgage Holdings, Inc.
Construction Lending Division
155 N. Lake Ave. CLCA-B 11th Floor
Pasadena, CA 91101

Las Vegas Fly Fishing Club
2728 Tidewater Ct.
Las Vegas, NV 89117

Lionel Sawyer & Collins
Attn.: Brian H. Schusterman
50 W. Liberty Street, Suite 1100
Reno, NV 89501

Moapa Band of Paiute Indians
Attn.: William Anderson, Chairman
P.O. Box 340
Moapa, NV 89025

Moapa Valley Water District
Attn.: Joe Davis
P. O. Box 257
Logandale, NV 89021

Carolyn Morrison
895 Ripple Way
Las Vegas, NV 89110

Nevada Cogeneration Associates
420 N. Nellis Blvd., #A3-117
Las Vegas, NV 89110

Nevada Cogeneration Associates
Attn.: Executive Director
P.O. Box 81378
Bakersfield, CA 93380

Nevada Power Company
Craig York
P.O. Box 230
Las Vegas, NV 89151

Republic Environmental Technologies, Inc.
770 East Sahara Ave.
Las Vegas, NV 89104

Debra Richardson
3601 Cambridge St. #151
Las Vegas, NV 89109

Southern Nevada Water Authority
Attn.: Bill Rinne
1001 South Valley View Blvd.,
Mail Stop #485
Las Vegas, NV 89153

Southern Nevada Water Authority
Attn.: Jeff Johnson
1001 South Valley View Blvd.,
Mail Stop #485
Las Vegas, NV 89153

Stewart Title of Nevada
Attn.: Linda Jones
3800 Howard Hughes Pkwy, Ste. 500
Las Vegas, NV 89109-0913

Taggart & Taggart, Ltd.
Attn.: Paul Taggart
108 N. Minnesota Street
Carson City, NV 89703

U.S. Bureau of Indian Affairs
Western Regional
Attn.: Barry Welch
2600 N. Central Avenue, 4th floor
Phoenix, AZ 85004

U.S. Bureau of Land Management
4701 N. Torrey Pines Drive
Las Vegas, NV 89130

U.S. Fish and Wildlife Service
Attn.: Tim Mayer
911 NE 11th Ave.
Portland, OR 97232-4181

U.S. Fish and Wildlife Service
Attn.: Michael Eberle
911 NE 11th Ave.
Portland, OR 97232-4181

United States of America
National Park Service
Attn.: Bill Hansen
1201 Oakridge Dr., Suite 250
Fort Collins, CO 80525

U.S. National Park Service
Attn.: Gary Karst
601 Nevada Way
Boulder City, NV 89005

U.S. Department of the Interior
Office of the Solicitor
Attn.: Peter Fahmy
755 Parfet St., Suite 151
Lakewood, CO 80215

U.S. Department of the Interior
Office of the Solicitor
Attn.: Steven Palmer
2800 Cottage Way, Room E-1712
Sacramento, CA 95825-1890

Ziontz, Chestnut, Varnell, Berley & Slonim
Attn.: Richard Berley
2101 Fourth Ave., Suite 1230
Seattle, WA 98121

Juanita Mordhorst
Juanita Mordhorst, AAII
Division of Water Resources
Hearings Section

IN THE OFFICE OF THE STATE ENGINEER

OF THE STATE OF NEVADA

1169

ORDER

HOLDING IN ABEYANCE CARBONATE-ROCK AQUIFER SYSTEM GROUNDWATER APPLICATIONS PENDING OR TO BE FILED IN COYOTE SPRINGS VALLEY (BASIN 210), BLACK MOUNTAINS AREA (BASIN 215), GARNET VALLEY (BASIN 216), HIDDEN VALLEY (BASIN 217), MUDDY RIVER SPRINGS aka UPPER MOAPA VALLEY (BASIN 219), LOWER MOAPA VALLEY (BASIN 220), AND FOR FURTHER STUDY OF THE APPROPRIATION OF WATER FROM THE CARBONATE-ROCK AQUIFER SYSTEM, LINCOLN AND CLARK COUNTIES, NEVADA.

WHEREAS, the Nevada State Engineer is designated by the Nevada Legislature to perform the duties related to the management of the water resources belonging to the people of the State of Nevada.[1]

WHEREAS, the State Engineer is empowered to make such reasonable rules and regulations as may be necessary for the proper and orderly execution of the powers conferred by law.[2]

WHEREAS, the State Engineer is empowered to conduct such studies as are necessary.[3]

WHEREAS, a large portion of the State of Nevada consisting of approximately 50,000 square miles of sparsely populated land is underlain by significant carbonate-rock sequences.[4]

WHEREAS, the carbonate-rock sequences contain groundwater aquifers, which are believed to contain significant, but undetermined, quantities of ground water.

WHEREAS, many persons or entities have filed water right applications requesting permission to appropriate substantial quantities of underground water from the carbonate-rock aquifer system.

WHEREAS, in 1984, the Water Resources Division of the United States Department of Interior, Geological Survey proposed a 10-year investigation of the entire Carbonate Terrane, which includes the carbonate-rock aquifers of the areas referenced above. This study was proposed because the water resources of the Carbonate Terrane were not well defined, the hydrology and geology of the area are complex, and data was sparse.[5]

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[1] See, Nevada Revised Statutes chapters 532, 533, 534, 535 and 536.

[2] NRS § 532.120.

[3] NRS § 532.165(1), 533.368 and 533.370(2).

[4] Michael D. Dettinger, Distribution of Carbonate-Rock Aquifers in Southern Nevada and the Potential for their Development, Summary of Findings, 1985-1988, Summary Report No. 1, United States Geological Survey, Department of Interior and Desert Research Institute, University of Nevada System, p. 3, 1989. See also, Memorandum dated August 3, 1984, from Terry Katzer, Nevada Office Chief, Water Resources Division, United States Department of Interior Geologic Survey, Carson City, Nevada, to Members of the Carbonate Terrane Study, Attachment p. 8, which indicates that the area underlain by significant carbonate-rock sequences in Nevada is over 40,000 square miles of sparsely populated land, and includes 106 hydrographic areas and basins.

[5] Memorandum dated August 3, 1984, from Terry Katzer, Nevada Office Chief, Water Resources Division, United States Department of Interior Geologic Survey, Carson City, Nevada, to

WHEREAS, it has been known since 1984 that to arrive at some reasonable understanding of the carbonate-rock aquifer system, substantial amounts of money would be required to develop the science, a significant period of study would be required, and that "unless this understanding is reached, the development of carbonate water is risky and the resultant effects may be disastrous for the developers and current users."[6]

WHEREAS, the United States Geological Survey has indicated that given the multiple possible avenues of hydrologic connection between the various aquifers and flow systems, and the uncertainties of recharge and discharge mechanisms and processes, an investigation of the hydrology of the carbonate-rock aquifer system in Nevada is undoubtedly a difficult undertaking.

WHEREAS, an investigation of the carbonate-rock aquifer system is additionally complicated by factors including:[7]

- basic hydrologic data such as groundwater levels in the basin-fill aquifers and the carbonate-rock aquifers, and reliable flow measurements for important springs and major streams are scarce or infrequently obtained in much of the area;
- secondary hydrologic and other data, such as hydraulic parameters, geophysical and geochemical, are lacking in many areas;
- the geometry, properties, and boundaries of the carbonate-rock and basin-fill reservoirs are generally unknown, and definition of these properties can be expensive and difficult;
- climatic conditions today are inadequately defined (particularly at higher altitudes) and conditions during the development of the flow paths within the deep-rock aquifers and flow paths within the carbonate-rock aquifer are even more uncertain;
- uncertainties and inaccuracies exist in current methods of estimating precipitation;
- uncertainties and inaccuracies exist in current methods of estimating groundwater inflow and recharge;
- uncertainties and inaccuracies exist in current methods of estimating groundwater outflow and evaporative discharge;
- only a small number of wells tap the deep carbonate-rock aquifer system;
- because there has been no significant historical pumping of ground water from the carbonate-rock aquifer system, groundwater models can only be used as a limited predictive tool for estimating the principle location and magnitude of the impacts of pumping ground water from the system;
- limited stresses on the water resources of the area under current development conditions allow hydrologists information only on the narrow band of system responses to natural conditions; and
- the relationship between geothermal systems and the deep carbonate-rock aquifers and groundwater flow systems is not well understood.

WHEREAS, in 1985, the Nevada Legislature authorized a program for the study and testing of the carbonate-rock aquifer system of eastern and southern Nevada. The program was a cooperative effort between the State of Nevada and the Federal Government. The overall plan for the program was to study the carbonate-rock aquifers of southern, east-central, and northeastern Nevada as separate phases of work, with a summary of findings to be prepared at the end of each

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Members of the Carbonate Terrane Study.

[6] Ibid.

[7] Id., Attachment p. 7.

phase. A report, Distribution of Carbonate-Rock Aquifers in Southern Nevada and the Potential for their Development, Summary of Findings, 1985-1988,[8] summarized the findings of the first phase of the study, which assessed the resources of the carbonate-rock aquifers of southern Nevada. The summary brought together results from more than 20 technical reports produced during the study. The summary indicated that:

> The rocks that compose the carbonate-rock aquifers are layers of limestone and dolomite that were deposited hundreds of millions of years ago in much of the eastern Great Basin. Subsequently, the carbonate rocks were much deformed; as a result, they no longer exist as continuous layers beneath the region. Instead, they have been pulled apart to form a few large areas of thick and relatively continuous carbonate rocks. Separating these areas are noncarbonate rocks, within which are isolated mountain-sized blocks of carbonate rock.
>
> Beneath southern Nevada, the thick carbonate-rock layers are continuous enough to transmit ground water at regional scales only beneath a north-south "corridor" 60-90 miles wide that extends southward from east-central Nevada to and beyond the Spring Mountains area west of Las Vegas. Within this corridor are the two major regional flow systems of southern Nevada: the Ash Meadows-Death Valley system and the White River-Muddy River Springs system. These flow systems link the ground water beneath dozens of valleys and over distances exceeding 200 miles. Flow in these systems probably is concentrated along highly transmissive zones associated with (1) recently active faults and (2) confluences of flow near major warm-water springs. Outside of the corridor, the carbonate rocks are present primarily as isolated blocks that form aquifers of limited extent, recharged mostly by local precipitation.
>
> * * *
>
> Large-scale development (sustained withdrawals) of water from the carbonate-rock aquifers would result in water-level declines and cause the depletion of large quantities of stored water. Ultimately, these declines would cause reductions in the flow of warm-water springs that discharge from the regional aquifers. Storage in other nearby aquifers also might be depleted, and water levels in those other aquifers could decline. In contrast, isolated smaller ground-water developments, or developments that withdraw ground water for only a short time, may result in water-level declines and springflow reductions of manageable or acceptable magnitude.
>
> Confidence in predictions of the effects of development, however, is low; and it will remain low until observations of the initial hydrologic results of development are analyzed. A strategy of staging developments gradually and adequately monitoring the resulting hydrologic conditions would provide information that eventually could be used to improve confidence in the predictions.[9]

WHEREAS, because assurances that the adverse effects of development will not overshadow the benefits cannot be made with a high degree of confidence, development of the carbonate-rock aquifer system must be undertaken in gradual stages together with adequate

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[8] Michael D. Dettinger, Distribution of Carbonate-Rock Aquifers in Southern Nevada and the Potential for their Development, Summary of Findings, 1985-1988, Summary Report No. 1, United States Geological Survey, Department of Interior and Desert Research Institute, University of Nevada System, Forward, 1989.

[9] Id, pp. 1-2.

monitoring in order to predict, through the use of a calibrated model, the effects of continued or increased development with a higher degree of confidence.

WHEREAS, staging development gradually means not developing the resources in one large step, but rather starting with small projects that are possibly augmented gradually if conditions and confidence warrant. This approach allows the effects of development to be observed and analyzed continually, so that the benefits and adverse effects of development can be judged and the effects reversed or mitigated if they prove to be detrimental to existing rights and the environment. This approach would hopefully avoid the havoc that could be created by the curtailment of water use by those who have come to rely on it if impacts occur requiring curtailment of the water use.

WHEREAS, the 1995 Water-Resources Investigations Report 91-4146[10] estimates the total water budget of all southern Nevada aquifers from the natural recharge to the mountains and subsurface inflow to the study area[11] to be about 160,000 acre-feet annually, and discharges from major discharge areas to be about 77,000 acre-feet annually.[12]

WHEREAS, it is believed that all of the recharge and subsurface inflow cannot be captured for use.

WHEREAS, in July and August of 2001 nearly four weeks of public administrative hearings were conducted on applications filed by the Las Vegas Valley Water District (Applications 54055 - 54059, inclusive) and Coyote Springs Investment, LLC (Applications 63272 - 63276, inclusive, and 63867 -63876, inclusive), which together request to appropriate approximately 135,000 acre-feet of water annually from the carbonate-rock aquifer system within the Coyote Springs Valley Hydrographic Basin.[13]

WHEREAS, testimony and evidence from the administrative hearing on the Las Vegas Valley Water District's applications indicates that using the standard Maxey-Eakin technique for estimation of groundwater recharge from precipitation, the recharge for the Coyote Springs Valley, Muddy River Springs, Hidden Valley, Garnet Valley, Black Mountains and Lower Moapa Valley

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[10] Michael D. Dettinger, et al., Distribution of Carbonate-Rock Aquifers and the Potential for Their Development, Southern Nevada and Adjacent Parts of California, Arizona and Utah, U.S. Geological Survey, Water-Resources Investigations Report 91-4146, p. 50, 1995.

[11] The study area is defined on p. 5 of Water-Resources Investigations Report 91-4146 to be most of southern Nevada south of Tonopah and Pioche.

[12] Discharge areas are identified as Muddy River Springs 36,000 acre-feet annually (afa) of spring flow, Blue Point Spring 240 afa of spring flow, Rogers Spring 920 afa of spring flow, Frenchman Mountain 2,100 afa of underflow toward Colorado River, Pahrump Valley 18,000 afa of underflow to California, Ash Meadows 17,000 afa of spring flow and evapotranspiration, Amargosa Desert 3,000 afa of underflow to Death Valley, and Grapevine Canyon 400 afa of underflow to Death Valley. Water-Resources Investigations Report 91-4146 at 53.

[13] It is noted that at the administrative hearing on Coyote Springs Investment, LLC Applications 63272 - 63276, inclusive, and 63867 -63876, inclusive, the applicant indicated they are requesting the State Engineer "to issue the permits as requested but limit their full use until the monitoring and mitigation program is in effect." Transcript, public administrative hearing before the State Engineer, August 20, 2001, p. 58. However, the applicant further indicated that it requested that a minimum of four permits be issued, two in each county, with the second permit in each county to be used to stress the aquifer. Two permits for a total amount of 14,478 afa would be for development, two permits for a total amount of 14,478 afa would be to stress the aquifer under some temporary development. Transcript, public administrative hearing before the State Engineer, August 20, 2001, pp. 91-96. This is after the 27,504 afa requested by the Las Vegas Valley Water District.

areas combined is approximately 3,550 acre-feet annually. Using the modified Maxey-Eakin technique introduced at the administrative hearing (known as the Donovan-Katzer 2000 technique), the recharge is estimated at approximately 6,761 acre-feet annually for the combined areas.[14]

WHEREAS, testimony and evidence from the administrative hearing on the Las Vegas Valley Water District's applications indicates that approximately 50,000 acre-feet of groundwater inflow comes into the Coyote Springs Valley from northern groundwater basins and approximately 53,000 acre-feet annually outflows[15] from Coyote Springs Valley of which a portion may be available for capture from that groundwater underflow. While testimony presented indicated a belief that significant quantities of water may be available for capture from storage, it is unknown what quantity that would be and if any underground water could be appropriated without unreasonable and irreversible impacts.[16]

WHEREAS, testimony and evidence from the administrative hearing on the Las Vegas Valley Water District's applications indicates that a portion of the ground water outflow from Coyote Springs Valley is believed to discharge at a rate of approximately 37,000 acre-feet annually at the Muddy River Springs area and approximately 16,000 to 17,000 acre-feet annually flows to groundwater basins further south.[17] This 37,000 acre-feet is counted as part of the 53,000 acre-feet outflow from Coyote Springs Valley resulting in 16,000-17,000 acre-feet annual flow that by-passes the Muddy River Springs area.

WHEREAS, these referenced large springs located near the central part of the Upper Moapa Valley, which that collectively discharge approximately 37,000 acre-feet annually of underground water, are fully appropriated pursuant to the Muddy River Decree.[18] It is believed that the source of water discharged originates mainly from the carbonate-rock aquifer system, but it is unknown if the discharge originates solely from the White River Flow System or is also influenced by discharge from the Meadow Valley Flow System or if there is influence from the alluvial aquifer.

WHEREAS, listed endangered and/or potential threatened species exist in the Muddy Springs/Muddy River area.

WHEREAS, testimony and evidence from the administrative hearing on the Las Vegas Valley Water District's applications indicates that their own expert witnesses are unable to make a suggestion to the State Engineer as to what part of the water budget could be captured without a great deal of uncertainty, and that the question cannot be resolved without stressing the system.[19]

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[14] See, testimony of Terry Katzer and David Donavan; Exhibit 54, p. 4-25, public administrative hearing before the State Engineer, July 16-24, 2001.

[15] Taking into account for 4,000 afa of in-basin recharge and 1,000 afa of evapotranspiration.

[16] See, testimony of Terry Katzer and David Donavan, public administrative hearing before the State Engineer, July 16-24, 2001.

[17] See, testimony of Terry Katzer and David Donavan, public administrative hearing before the State Engineer, July 16-24, 2001.

[18] Judgment and Decree, In the Matter of the Determination of the Relative Rights In and To the Waters of the Muddy River and Its Tributaries in Clark County, State of Nevada, March 12, 1920, Tenth Judicial District Court of the State of Nevada, In and For the County of Clark.

[19] See, testimony of Terry Katzer and David Donavan, public administrative hearing before the State Engineer, June 16-24, 2001.

WHEREAS, testimony and evidence from the administrative hearing on the Las Vegas Valley Water District's applications indicates that the State Engineer's ability to determine if development of the carbonate-rock aquifer system will impact existing rights is dependent on how the water rights are brought "on-line" and monitored.[20]

WHEREAS, testimony and evidence from the administrative hearing on the Las Vegas Valley Water District's applications indicates that little is known about the hydrologic connectivity between the groundwater basins, that virtually nothing is known about the mountain blocks, estimates of recharge to the area can vary by a factor of two, there is probably some connectivity between the water in the carbonate-rock aquifers and the alluvial groundwater basins,[21] there is still little data available and not much has changed from the information known in 1984.

WHEREAS, the State Engineer has been provided several different models, which though based on little pumping data, all provide the State Engineer with different analyses, and which all indicate that the pumping of substantial amounts of carbonate-rock aquifer water will likely impact the sources of the Muddy River.

WHEREAS, the State Engineer has previously granted groundwater permits, which authorize use of underground water in the area underlain by the carbonate-rock aquifer system or directly from the carbonate-rock aquifer system in the following quantities:

Coyote Springs Valley (Basin 210)	16,300 acre-feet
Black Mountain (Basin 215)	10,216 acre-feet
Garnet Valley (Basin 216)	3,380 acre-feet
Hidden Valley (Basin 217)	2,200 acre-feet[22]
Muddy River Springs aka Upper Moapa Valley (Basin 219)	14,756 acre-feet
Lower Moapa Valley (Basin 220)	5,813 acre-feet
	50,465 acre-feet

WHEREAS, of all the water rights issued from the carbonate-rock aquifer system, to date very few have actually been pumped.

WHEREAS, if 16,000 to 17,000 acre-feet is believed to by-pass the Muddy River Springs area, the water right permits already issued in Coyote Springs Valley alone equal the estimate of the amount of carbonate flow that by-passes the region and is not part of the flow discharged from the Muddy River Springs area.

WHEREAS, Nevada Revised Statute § 533.370(2)(b) provides that the State Engineer may postpone action on an application in areas where studies of water supplies are necessary.

WHEREAS, Nevada Revised Statute § 533.368 provides that if the State Engineer determines that a hydrological study, an environmental study or any other study is necessary before he makes a final determination on an application, and the applicant, a governmental agency or other person has not conducted such a study or the required study is not available, the State Engineer shall advise the applicant of the need for the study and the type of study required.

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[20] Ibid.

[21] Ibid.

[22] This 2,200 acre-feet is combined with 2,200 acre-feet issued in Garnet Valley for a total of 2,200 afa between the two basins.

WHEREAS, Nevada Revised Statute § 533.368(4) provides that the State Engineer shall consult with the applicant and the governing body of the county or counties in which the point of diversion and place of use are located concerning the scope and progress of the study.

WHEREAS, the State Engineer believes it is prudent to work with a model, and the appropriate model will be determined in conjunction with the parties identified below who are responsible for participating in the study.

WHEREAS, the State Engineer does not believe it is prudent to issue any additional water rights to be pumped from the identified portions of the carbonate-rock aquifer until a significant portion of the water rights which have already been issued are pumped for a substantial period of time in order to determine if the pumping of those water rights will have any detrimental impacts on existing water rights or the environment.

NOW THEREFORE, the State Engineer orders:

1. All applications pending and any new filings for the appropriation of water from the carbonate-rock aquifer system in Coyote Springs Valley (Basin 210), Black Mountains Area (Basin 215), Garnet Valley (Basin 216), Hidden Valley (Basin 217), Muddy River Springs aka as Upper Moapa Valley (Basin 219), and Lower Moapa Valley (Basin 220) will be held in abeyance until further information is obtained by stressing the aquifer by those water right permits already issued to appropriate water from the carbonate-rock aquifer system.

2. While the studies proposed in 1985 were a beginning, those studies indicated that large-scale developments with sustained withdrawals of water from the carbonate-rock aquifers would result in water-level declines and depletion of stored water, but that isolated smaller groundwater developments or developments of limited duration may result in water-level declines and springflow reductions of manageable and acceptable magnitudes. However, very little additional information based on hard science has been produced since that time. Nevada Revised Statute § 533.368 provides the State Engineer with the authority to withhold action on pending applications and to advise the applicant of the need for additional study. The State Engineer finds that further hydrological study is needed before a final determination can be made on carbonate-rock aquifer system water right applications in the referenced basins.

3. The State Engineer, in conjunction with those identified below as applying for additional water rights and already having an interest in water rights permitted from the carbonate-rock aquifer system, or their successors in interest, will conduct a study to provide information on the effect of pumpage of those water rights which have already been issued from the carbonate-rock aquifer.

The entities that shall participate in the study must at a minimum include:

Las Vegas Valley Water District
Southern Nevada Water Authority
Coyote Springs Investment, LLC
Nevada Power Company
Moapa Valley Water District.

The study must cover a 5-year minimum period during which at least 50% of the water rights currently permitted in the Coyote Springs Valley groundwater basin are pumped for at least 2 consecutive years.

4. These referenced applicants or permittees shall bear the cost of the study, and a cash deposit divided pro rata among them will be required as set forth in NRS § 533.368(3) after a determination of the estimate of cost to complete the study.

5. The State Engineer will arrange meetings between the State Engineer and the Las Vegas Valley Water District, Southern Nevada Water Authority, Coyote Springs Investment, LLC, Nevada Power Company, and Moapa Valley Water District, or their successors, and the governing bodies of the counties in which there are proposed points of diversion and places of use under their pending applications concerning the scope of the study.

6. The State Engineer orders the Las Vegas Valley Water District, Southern Nevada Water Authority, Coyote Springs Investment, LLC, Nevada Power Company, Moapa Valley Water District, Dry Lake Water Company, LLC, Republic Environmental Technologies, Inc., Chemical Lime Co., Nevada Cogeneration Associates, or their successors, who presently hold water rights authorized for appropriation from the carbonate-rock aquifer, to provide the other parties to the study and the State Engineer with data on a quarterly basis as to the rate at which water was diverted under the specific water right permits issued, total acre-feet diverted per month, and monthly water level measurements

7. After the study period, the Las Vegas Valley Water District; Southern Nevada Water Authority; Coyote Springs Investment, LLC; Nevada Power Company; and Moapa Valley Water District are ordered to file with the State Engineer, within 180 days of the end of the fifth consecutive year, a report as to the information obtained and any impacts seen to the groundwater or surfacewater resources of the carbonate-rock aquifer or alluvial aquifer systems from the pumping of those rights presently permitted.

8. At the end of the study period, the Las Vegas Valley Water District/Southern Nevada Water Authority will update Exhibit 54 from the July 2001 hearings in order to show the State Engineer the effects, if any, of the water it requested for appropriation under Applications 54055 - 54059, inclusive, as they are filed. The State Engineer will then make a determination if he has sufficient information to proceed with ruling on those applications for which hearings have already been conducted, i.e., Las Vegas Valley Water District (Applications 54055 - 54059, inclusive) and Coyote Springs Investment, LLC (Applications 63272 - 63276, inclusive, and 63867 -63876, inclusive), and other applications pending for the appropriation of water from the carbonate-rock aquifer system.

Hugh Ricci, P.E.

HUGH RICCI, P.E.
State Engineer

Dated at Carson City, Nevada,

this 8th day of March, 2002

CERTIFICATE OF SERVICE

I, the undersigned, declare under penalty of perjury, that I am an employee of the Nevada Division of Water Resources, that I am over the age of eighteen (18) years, and that I am not a party to, nor interested in, this action. On this date, I mailed a true and correct copy of Nevada Division of Water Resources' Order No. 1169, addressed to the following:

Las Vegas Valley Water District
Attn: Kay Brothers
1001 S. Valley View
Las Vegas, NV 89153
Cert. Mail #7000 0520 0023 8555 9034

Coyote Springs Investment, L.L.C.
7755 Spanish Springs Road
Sparks, NV 89436
Cert. Mail #7000 0520 0023 8555 9041

C.S. Inc.
Judy Kuban
1625 Wendy Way
Reno, NV 89509
Cert. Mail #7000 0520 0023 8555 9058

Dry Lake Water, LLC
2701 North Tenaya Way, Suite 200
Las Vegas, NV 89128
Cert. Mail #7000 0520 0023 8555 9065

Bonneville Nevada Corp.
257 East 200 South, Suite 800
Salt Lake City, UT 84111
Cert. Mail #7000 0520 0023 8555 9072

C.O. Myers, Exec. Dir.
Nevada Cogeneration Ass.
P.O. Box 81378
Bakersfield, CA 93380
Cert. Mail #7000 0520 0023 8555 9089

Nevada Power Co.
Attn: Craig York
P.O. Box 230
Las Vegas, NV 89151-0001
Cert. Mail #7000 0520 0023 8555 9096

Oxford Energy of Nevada, Inc.
3510 Unocal Place
Santa Rosa, CA 95403
Cert. Mail #7000 0520 0023 8555 9102

James W. Adams
7439 La Palma Ave., Suite 234
Buena Park, CA 90620
Cert. Mail #7000 0520 0023 8555 9119

Stallion Sand & Gravel, LLC
624 Casa del Norte
North Las Vegas, NV 89031
Cert. Mail #7000 0520 0023 8555 9126

Moapa Band of Paiute Indians
P.O. Box 340
Moapa, NV 89025
Cert. Mail #7000 0520 0023 8558 4562

Moapa Valley Water District
P.O. Box 257
Logandale, NV 89021
Cert. Mail #7000 0520 0023 8558 4579

Three Kids Enterprises
4055 S. Spencer St., Suite 106
Las Vegas, NV 89119
Cert. Mail #7000 0520 0023 8558 4586

Sandia Construction Inc.
c/o Cameron Adams
Box 1297
Susanville, CA 96103
Cert. Mail #7000 0520 0023 8558 4593

Nevada Cogneration Associates
420 N. Nellis Blvd., #A3-148
Las Vegas, NV 89110
Cert. Mail #7000 0520 0023 8558 4609

N. Burgess
420 N. Nellis Blvd., #A3-117
Las Vegas, NV 89110
Cert. Mail #7000 0520 0023 8558 4616

North Valley Holdings
500 Damonte Ranch Parkway, Suite 1056
Reno, NV 89511
Cert. Mail #7000 0520 0023 8558 4623

Michael Buschelman
P.O. Box 51371
Sparks, NV 89435
Cert. Mail #7000 0520 0023 8558 4630

William Penn
CMS Generation Co.
330 Town Center Drive, Ste. 1100
Dearborn, MI 48126
Cert. Mail #7000 0520 0023 8558 4647

Thomas Shelton
CMS Generation Co.
2154 Hastings Ct.
Santa Rosa, CA 95495-8577
Cert. Mail #7000 0520 0023 8558 4654

Wyman Engineering Consultants
P.O. Box 60473
Boulder City, NV 89006-0473
Cert. Mail #7000 0520 0023 8558 4661

John E. Hiatt
8180 Placid St.
Las Vegas, NV 89123
Cert. Mail #7000 0520 0023 8558 4678

City of Caliente
Attn: George T. Rowe, Mayor
P.O. Box 158
Caliente, NV 89008
Cert. Mail #7000 0520 0023 8558 4685

County of Nye
P.O. Box 1767
Tonopah, NV 89049
Cert. Mail #7000 0520 0023 8558 4692

Ely Shoshone Tribe
16 Shoshone Circle
Ely, NV 89301
Cert. Mail #7000 0520 0023 8558 4708

Lincoln County, Board of Commissioners
P.O. Box 90
Pioche, NV 89043
Cert. Mail #7000 0520 0023 8558 4715

Clark County Commissioners
500 S. Grand Central Parkway
Las Vegas, NV 89106-4506
Cert. Mail #7000 0520 0023 8558 4807

Muddy Valley Irrigation District
P.O. Box 160
Logandale, NV 89021
Cert. Mail #7000 0520 0023 8558 4722

U.S. Bureau of Indian Affairs
Attn: Barry Welch
P.O. Box 10
Phoenix, Az. 85001
Cert. Mail #7000 0520 0023 8558 4739

U.S.D.I., B.L.M.
Attn: Ben F. Collins, District Manager
P.O. Box 26569
Las Vegas, NV 89126
Cert. Mail #7000 0520 0023 8558 4746

U.S. Fish and Wildlife Service
911 NE 11th Ave.
Portland, OR 97232-4184
Cert. Mail #7000 0520 0023 8558 4753

U.S. National Park Service
Dan McGlothlin
1201 Oak Ridge Drive, Suite 250
Fort Collins, CO 80525
Cert. Mail #7000 0520 0023 8558 4760

Republic Environmental Technologies, Inc.
770 E. Sahara Ave.
Las Vegas, NV 89104
Cert. Mail #7000 0520 0023 8558 4777

Chemical Lime Co.
P.O. Box 3609
North Las Vegas, NV 89036
Cert. Mail #7000 0520 0023 8558 4784

Nevada Cogeneration Associates
420 N. Nellis Blvd., A3-148 and 117
Las Vegas, NV 89110
Cert. Mail #7000 0520 0023 8558 4791

Richard Berley/Mark Slonim
Ziontz, Chestnut, Varnell, Berley and Slonim
2101 4th Ave., Suite 1230
Seattle, WA 98121

Robert Johnston
Kilpatrick, Johnston & Adler
412 North Division St.
Carson City, NV 89703

Ross de Lipkau
Marshall Hill Cassas & de Lipkau
P.O. Box 2790
Reno, NV 89505

Peter Fahmy
U.S. Dept. of Interior
755 Parfet St., Suite 151
Lakewood, CO 80215

Robert Marshall
Marshall Hill Cassas & deLipkau
P.O. Box 2790
Reno, NV 89505

Byron Mills
732 S. 6th St.
Las Vegas, NV 89101

Steve Palmer
Office of the Regional Solicitor
U.S. Dept. of Interior
2800 Cottage Way, Room E-2753
Sacramento, CA 95825-1890

Karen Peterson
Allison, MacKenzie, Hartman, et. al.
P.O. Box 646
Carson City, NV 89702

Peggy Twedt
Frank Flaherty
Dyer, Lawrence, Cooney & Penrose
2805 N. Mountain St.
Carson City, NV 89703

Harvey Whittemore
Carl Savely
Lionel, Sawyer & Collins
50 West Liberty St. Suite 1100
Reno, NV 89501

Don Winter
Agent C.S. Inc.
P.O. Box 35136
Las Vegas, NV 89133

Charles Cave
2325 W. Charleston Blvd.
Las Vegas, NV 89102

Dale Ferguson
Woodburn & Wedge
6100 Neil Road, Ste. 500
Reno, NV 89511

Mark Stock
Global Hydrologic Services, Inc.
561 Keystone Ave. #200
Reno, NV 89503

Linda Bowman
540 Hammil Lane
Reno, NV 89511

George Benesch
P.O. Box 3498
Reno, NV 89505

Dated this 8 day of March, 2002.

Sandra Allec

IN THE OFFICE OF THE STATE ENGINEER

OF THE STATE OF NEVADA

O R D E R

DESIGNATING AND DESCRIBING CALIFORNIA WASH (BASIN NUMBER 218) GROUND WATER BASIN IN CLARK COUNTY, NEVADA

The State Engineer finds that conditions warrant the designation of the California Wash Ground Water Basin, Clark County, Nevada, and by this Order designates the following described area of land as a ground water basin coming under the provisions of NRS Chapter 534 (Conservation and Distribution of Underground Water).

T.14S., R.64E., M.D.B.&M.

That portion of Sections 23, 33, 34, 35 and 36 lying within the Natural Drainage Basin of California Wash.

T.14S., R.65E., M.D.B.&M.

All of Section 36 and that poriton of Sections 25, 26, 27, 30, 31, 32, 33, 34 and 35 lying within the Natural Drainage Basin of California Wash.

T.14S., R.66E., M.D.B.&M.

All of Sections 30, 31 and 32 and that portion of Sections 19, 20, 28, 29, 33 and 34 lying within the Natural Drainage Basin of California Wash.

T.15S., R.63E., M.D.B.&M.

That portion of Sections 12, 13, 23, 24, 25 and 36 lying within the Natural Drainage Basin of California Wash.

T.15S., R.64E., M.D.B.&M.

All of Sections 1, 2, 3, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35 and 36 and that portion of Sections 4, 5, 6, 7, 9, and 31 lying within the Natural Drainage Basin of California Wash.

T.15S., R.65E., M.D.B.&M.

All Sections.

T.15S., R.66E., M.D.B.&M.

All of Sections 4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22, 28, 29, 30, 31 and 32 and that portion of

Sections 2, 3, 11, 14, 23, 26, 27, 33 and 34 lying within the Natural Drainage Basin of California Wash.

T.16S., R.64E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 10, 11, 12, 13, 14, 23, 24, 25, and 36 and that portion of Sections 5, 6, 8, 9, 15, 16, 22, 26, 27, 34 and 35 lying within the Natural Drainage Basin of California Wash.

T.16S., R.65E., M.D.B.&M.

All Sections.

T.16S., R.66E., M.D.B.&M.

All of Sections 5, 6, 7, 8, 9, 16, 17, 18, 19, 20, 29, 30, 31 and 32 and that portion of Sections 3, 4, 10, 11, 14, 15, 21, 22, 23, 28 and 33 lying within the Natural Drainage Basin of California Wash.

T.17S., R.64E., M.D.B.&M.

All of Sections 12, 13, 24, 25, and 36 and that portion of Sections 10, 11, 14, 15, 23, 26 and 35 lying within the Natural Drainage Basin of California Wash.

T.17S., R.65E., M.D.B.&M.

All Sections.

T.17S., R.66E., M.D.B.&M.

All of Sections 7, 8, 17, 18, 19, 20, 21, 27, 28, 29, 30, 31, 32, 33 and 34 and that portion of Sections 9, 10, 15, 16, 22, 23, 26 and 35 lying within the Natural Drainage Basin of California Wash.

T.18S., R.64E., M.D.B.&M.

All of Sections 1, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 28, 34, 35 and 36 and that portion of Sections 2, 3, 4, 9, 10, 16, 20, 21, 29, 32 and 33 lying within the Natural Drainage Basin of California Wash.

T.18S., R.65E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, 30, 31, 32, 33 and 34 and that portion of Sections 24, 25, 26 and 35 lying within the Natural Drainage Basin of California Wash.

T.18S., R.66E., M.D.B.&M.

All of Sections 3, 4 and 6 and that portion of Sections 2, 5, 7, 8, 9, 10, 11, 18 and 19 lying within the Natural Drainage Basin of California Wash.

T.19S., R.64E., M.D.B.&M.

All of Sections 1, 2, 3, 11 and 12 and that portion of Sections 4, 9, 10, 13, 14, 15 and 23 lying within the Natural Drainage Basin of California Wash.

T.19S., R.65E., M.D.B.&M.

All of Sections 3, 4, 5, and 6 and that portion of Sections 2, 7, 8, 9, 10, 11, 12, 14, 15 and 18 lying within the Natural Drainage Basin of California Wash.

A public hearing as required under NRS 534.030, in the matter of the designation of California Wash was held in Las Vegas, Nevada, on January 29, 1990. Based on information received at the hearing and other data and information available to the State Engineer, it is determined that this ground water basin is in need of additional administration under the provisions of NRS Chapter 534.

The designated California Wash Ground Water basin is depicted and defined on Nevada Division of Water Resources, State Engineer's office maps.

In accordance with NRS 534.120, subsection 2, the irrigation of land using ground water is not considered to be a preferred use of the limited resource and applications to appropriate underground water for irrigation will be denied in the above described area. Further, appropriation of ground water for municipal, quasi-municipal, industrial, commercial, mining, stockwater and wildlife purposes are to be considered a preferred use in California Wash.

R. Michael Turnipseed P.E.

R. MICHAEL TURNIPSEED, P.E.
State Engineer

Dated at Carson City, Nevada,

this 24th day of April, 1990

IN THE OFFICE OF THE STATE ENGINEER

OF THE STATE OF NEVADA

ORDER

DESIGNATING AND DESCRIBING GARNET VALLEY (BASIN NUMBER 216) GROUND WATER BASIN IN CLARK COUNTY, NEVADA

The State Engineer finds that conditions warrant the designation of the Garnet Valley Ground Water Basin, Clark County, Nevada, and by this Order designates the following described area of land as a ground water basin coming under the provisions of NRS Chapter 534 (Conservation and Distribution of Underground Water).

T.15S., R.63E., M.D.B.&M.

That portion of Sections 23, 24, 25, 26, 35 and 36 lying within the Natural Drainage Basin of Garnet Valley.

T.15S., R.64E., M.D.B.&M.

That poriton of Section 31 lying within the Natural Drainage Basin of Garnet Valley.

T.16S., R.61E., M.D.B.&M.

That portion of Sections 25 and 36 lying within the Natural Drainage Basin of Garnet Valley.

T.16S., R.62E., M.D.B.&M.

All of Section 31 and that portion of Sections 20, 21, 28, 29, 30, 32 and 33 lying within the Natural Drainage Basin of Garnet Valley.

T.16S., R.63E., M.D.B.&M.

All of Sections 1, 12, 13, 23, 24, 25, 26, 34, 35 and 36 and that portion of Sections 2, 10, 11, 14, 15, 22, 27, 28 and 33 lying within the Natural Drainage Basin of Garnet Valley.

T.16S., R.64E., M.D.B.&M.

All of Sections 7, 17, 18, 19, 20, 21, 28, 29, 30, 31, 32 and 33 and that portion of Sections 5, 6, 8, 9, 15, 16, 22, 26, 27, 34 and 35 lying witin the Natural Drainage Basin of Garnet Valley.

T.17S., R.61E., M.D.B.&M.

That portion of Sections 13, 24 and 25 lying within the

Natural Drainage Basin of Garnet Valley.

T.17S., R.62E., M.D.B.&M.

All of Sections 8, 17, 19, 20, 27, 34, 35 and 36 and that portion of Sections 7, 9, 16, 18, 21, 22, 23, 25, 26, 28, 29, 30 and 33 lying within the Natural Drainage Basin of Garnet Valley.

T.17S., R.63E., M.D.B.&M.

All of Sections 11, 12, 13, 14, 23, 24, 25, 26, 27, 31, 32, 33, 34, 35 and 36 and that portion of Sections 9, 10, 15, 16, 21, 22, 28, 29 and 30 lying within the Natural Drainage Basin of Garnet Valley.

T.17S., R.64E., M.D.B.&M.

All of Sections 7, 8, 9, 16, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 31, 32, 33 and 34 and that portion of Sections 10, 14, 15, 23, 26 and 35 lying within the Natural Drainage Basin of Garnet Valley.

T.18S., R.62E., M.D.B.&M.

All of Sections 1, 2, 3, 10, 11, 12, 13, 14, 15 and 24 and that portion of Sections 4, 5, 8, 9, 16, 17, 21, 22, 23, 25, 26 and 36 lying within the Natural Drainage Basin of Garnet Valley.

T.18S., R.63E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 34, 35 and 36 and that portion of Sections 31, 32, and 33 lying within the Natural Drainage Basin of Garnet Valley.

T.18S., R.64E., M.D.B.&M.

All of Sections 5, 6, 7, 8, 17, 18 and 19 and that portion of Sections 2, 3, 4, 9, 10, 16, 20, 21, 29, 30 and 31 lying within the Natural Drainage Basin of Garnet Valley.

T.19S., R.63E., M.D.B.&M.

That portion of Sections 1, 2, 3, 4, 11, and 12 lying within the Natural Drainage Basin of Garnet Valley.

T.19S., R.64E., M.D.B.&M.

That portion of Section 6 lying within the Natural Drainage Basin of Garnet Valley.

A public hearing as required under NRS 534.030, in the matter of the designation of Garnet Valley was held in Las Vegas, Nevada, on January 29, 1990. Based on information received at the hearing and other data and information available to the State Engineer, it is determined that this ground water basin is in need of additional administration under the provisions of NRS Chapter 534.

The designated Garnet Valley Ground Water basin is depicted and defined on Nevada Division of Water Resources, State Engineer's office maps.

In accordance with NRS 534.120, subsection 2, the irrigation of land using ground water is not considered to be a preferred use of the limited resource and applications to appropriate underground water for irrigation will be denied in the above described area. Further, appropriation of ground water for municipal, quasi-municipal, industrial, commercial, mining, stockwater and wildlife purposes are to be considered a preferred use in Garnet Valley.

R. Michael Turnipseed P.E.

R. MICHAEL TURNIPSEED, P.E.
State Engineer

Dated at Carson City, Nevada,

this 24th day of April, 1990

IN THE OFFICE OF THE STATE ENGINEER

OF THE STATE OF NEVADA

O R D E R

DESIGNATING AND DESCRIBING HIDDEN VALLEY (NORTH) (BASIN NUMBER 217) GROUND WATER BASIN IN CLARK COUNTY, NEVADA

The State Engineer finds that conditions warrant the designation of the Hidden Valley (North) Ground Water Basin, Clark County, Nevada, and by this Order designates the following described area of land as a ground water basin coming under the provisions of NRS Chapter 534 (Conservation and Distribution of Underground Water).

T.15S., R.62E., M.D.B.&M.

All of Sections 35 and 36 and that portion of Sections 25, 26, 27, 32, 33 and 34 lying within the Natural Drainage Basin of Hidden Valley (North).

T.15S., R.63E., M.D.B.&M.

All of Sections 31, 32, 33 and 34 and that portion of Sections 22, 23, 26, 27, 28, 29, 30 and 35 lying within the Natural Drainage Basin of Hidden Valley (North).

T.16S., R.62E., M.D.B.&M.

All of Sections 1, 2, 4, 9, 10, 11, 12, 13, 14, 15, 16, 17, 22, 23, 24, 25, 26, 27, 34, 35 and 36 and that portion of Sections 3, 5, 7, 8, 18, 19, 20, 21, 28, 29, 30, 32 and 33 lying within the Natural Drainage Basin of Hidden Valley (North).

T.16S., R.63E., M.D.B.&M.

All of Sections 3, 4, 5, 6, 7, 8, 9, 16, 17, 18, 19, 20, 21, 29, 30, 31 and 32 and that portion of Sections 2, 10, 11, 14, 15, 22, 27, 28 and 33 lying within the Natural Drainage Basin of Hidden Valley (North).

T.17S., R.62E., M.D.B.&M.

All of Sections 10, 11, 12, 13, 14, 15 and 24 and that portion of Sections 9, 16, 21, 22, 23, 25 and 26 lying within the Natural Drainage Basin of Hidden Valley (North).

T.17S., R.63E., M.D.B.&M.

All of Sections 7, 8, 17, 18, 19 and 20 and that portion of Sections 9, 10, 15, 16, 21, 22, 28, 29 and 30 lying within the Natural Drainage Basin of Hidden Valley (North).

A public hearing as required under NRS 534.030, in the matter of the designation of Hidden Valley (North) was held in Las Vegas, Nevada, on January 29, 1990. Based on information received at the hearing and other data and information available to the State Engineer, it is determined that this ground water basin is in need of additional administration under the provisions of NRS Chapter 534.

The designated Hidden Valley (North) Ground Water basin is depicted and defined on Nevada Division of Water Resources, State Engineer's office maps.

In accordance with NRS 534.120, subsection 2, the irrigation of land using ground water is not considered to be a preferred use of the limited resource and applications to appropriate underground water for irrigation will be denied in the above described area. Further, appropriation of ground water for municipal, quasi-municipal, industrial, commercial, mining, stockwater and wildlife purposes are to be considered a preferred use in Hidden Valley (North).

R. Michael Turnipseed P.E.

R. MICHAEL TURNIPSEED, P.E.
State Engineer

Dated at Carson City, Nevada,

this 24th day of April, 1990

All of Sections 7, 8, 17, 18, 19 and 20 and that portion of Sections 9, 10, 15, 16, 21, 22, 28, 29 and 30 lying within the Natural Drainage Basin of Hidden Valley (North).

A public hearing as required under NRS 534.030, in the matter of the designation of Hidden Valley (North) was held in Las Vegas, Nevada, on January 29, 1990. Based on information received at the hearing and other data and information available to the State Engineer, it is determined that this ground water basin is in need of additional administration under the provisions of NRS Chapter 534.

The designated Hidden Valley (North) Ground Water basin is depicted and defined on Nevada Division of Water Resources, State Engineer's office maps.

In accordance with NRS 534.120, subsection 2, the irrigation of land using ground water is not considered to be a preferred use of the limited resource and applications to appropriate underground water for irrigation will be denied in the above described area. Further, appropriation of ground water for municipal, quasi-municipal, industrial, commercial, mining, stockwater and wildlife purposes are to be considered a preferred use in Hidden Valley (North).

R. Michael Turnipseed P.E.

R. MICHAEL TURNIPSEED, P.E.
State Engineer

Dated at Carson City, Nevada,

this 24th day of April, 1990

IN THE OFFICE OF THE STATE ENGINEER

OF THE STATE OF NEVADA

ORDER

DESIGNATING AND DESCRIBING THE MUDDY RIVER SPRINGS AREA (BASIN NUMBER 219) GROUND WATER BASIN IN CLARK COUNTY, NEVADA

The State Engineer finds that conditions warrant the designation of the heretofor undesignated portion of the Muddy River Springs Area Ground Water Basin, Clark County, Nevada, and by this Order designates the following described area of land as a ground water basin coming under the provisions of NRS Chapter 534 (Conservation and Distribution of Underground Water).

T.11S., R.64E., M.D.B.&M.

All of Section 28 and that portion of Sections 15, 16, 20, 21, 22, 27, 29, 32, 33 and 34 lying within the Natural Drainage Basin of the Muddy River Springs Area.

T.12S., R.64E., M.D.B.&M.

All of Sections 16, 17, 20, 21, 28, 29, 33 and 34

and that portion of Sections 2, 3, 4, 5, 7, 8, 9, 10, 15, 18, 19, 22, 26, 27, 30, 31, 32 and 35 lying within the Natural Drainage Basin of the Muddy River Springs Area.

T.13S., R.63E., M.D.B.&M.

That portion of Sections 25 and 36 lying within the Natural Drainage Basin of the Muddy River Springs Area.

T.13S., R.64E., M.D.B.&M.

All of Sections 3, 4, 9, 10, 11, 13, 14, 15, 16, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35 and 36 and that portion of Sections 1, 2, 5, 8, 12, 17, 19, 20 and 30 lying within the Natural Drainage Basin of the Muddy River Springs Area.

T.13S., R.65E., M.D.B.&M.

All of Sections 17, 18, 19, 20, 21, 27, 28, 29, 30, 31, 32, 33 and 34 and that portion of Sections 6, 7, 8, 9, 15, 16, 22, 23, 26, 35 and 36 lying within the Natural Drainage Basin of the Muddy River Springs Area.

T.13 1/2S., R.63E., M.D.B.&M.

That portion of Section 36 lying within the Natural Drainage Basin of the Muddy River Springs Area.

T.13 1/2S., R.64E., M.D.B.&M.

All Sections.

T.14S., R.63E., M.D.B.&M.

That portion of Sections 1, 12, 13, 24, 25, 35 and 36 lying within the Natural Drainage Basin of the Muddy River Springs Area.

T.14S., R.64E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31 and 32 and that portion of Sections 25, 33, 34, 35 and 36 lying within the Natural Drainage Basin of the Muddy River Springs Area.

T.14S., R.65E., M.D.B.&M.

All of Sections 3, 6, 7, 18, 19, 20, 28 and 29 and that portion of Sections 1, 2, 12, 26, 27, 30, 31, 32, 33 and 35 lying within the Natural Drainage Basin of the Muddy River Springs Area.

T.14S., R.66E., M.D.B.&M.

That portion of Section 19 lying within the Natural Drainage Basin of the Muddy River Springs Area.

T.15S., R.63E., M.D.B.&M.

That portion of Sections 1, 2 and 12 lying within the Natural Drainage Basin of the Muddy River Springs Area.

T.15S., R.64E., M.D.B.&M.

That portion of Sections 4, 5, 6, 7, 8 and 9 lying within the Natural Drainage Basin of the Muddy River Springs Area.

A public hearing as required under NRS 534.030, in the matter of the designation of Muddy River Springs Area was held in Moapa, Nevada, on January 30, 1990. Based on information received at the hearing and other data and information available to the State Engineer, it is determined that this ground water basin is in need of additional administration under the provisions of NRS Chapter 534.

The designated Muddy River Springs Area Ground Water basin is depicted and defined on Nevada Division of Water Resources, State Engineer's office maps.

In accordance with NRS 534.120, subsection 2, the irrigation of land using ground water is not considered to be a preferred use of the limited resource and applications to appropriate underground water for irrigation will be denied in the above described area. Further, appropriation of ground water for municipal, quasi-municipal, industrial, commercial, mining, stockwater and wildlife purposes are to be considered a preferred use in the Muddy River Springs Area.

R. Michael Turnipseed P.E.

R. MICHAEL TURNIPSEED, P.E.
State Engineer

Dated at Carson City, Nevada,

this 24th day of April, 1990

IN THE OFFICE OF THE STATE ENGINEER

OF THE STATE OF NEVADA

ORDER

DESIGNATING AND DESCRIBING THE BLACK MOUNTAINS AREA
(BASIN NUMBER 215) GROUND WATER BASIN IN
CLARK COUNTY, NEVADA

The State Engineer finds that conditions warrant the designation of the Black Mountains Area Ground Water Basin, Clark County, Nevada, and by this Order designates the following described area of land as a ground water basin coming under the provisions of NRS Chapter 534 (Conservation and Distribution of Underground Water).

T.16S., R.67E., M.D.B.&M.

That portion of Section 36 lying within the natural drainage basin of Black Mountains Area.

T.16S., R.68E., M.D.B.&M.

All of Section 32 and that portion of Sections 29, 30, 31 and 33 lying within the natural drainage basin of Black Mountains Area.

T.17S., R.66E., M.D.B.&M.

All of Sections 25 and 36 and that portion of Sections 23, 24, 26 and 35 lying within the natural drainage basin of Black Mountains Area.

T.17S., R.66-1/2E., M.D.B.&M.

All of Sections 30 and 31 and that portion of Section 19 lying within the natural drainage basin of Black Mountains Area.

T.17S., R.67E., M.D.B.&M.

All of Sections 13, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36, and that portion of Sections 1, 11, 12, 14, 15, 16, 18, 19, 20 and 21 lying within the natural drainage basin of Black Mountains Area.

T.17S., R.68E., M.D.B.&M.

All of Sections 4, 5, 6, 7, 8, 9, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33 and 34, and that portion of Sections 3, 10, 11, 14, 24, 25, 35 and 36 lying within the natural drainage basin of Black Mountains Area.

T.18S., R.64E., M.D.B.&M.

That portion of Sections 29, 30, 31 and 32 lying within the natural drainage basin of Black Mountains Area.

T.18S., R.65E., M.D.B.&M.

All of Section 36 and that portion of Sections 24, 25, 26 and 35 lying within the natural drainage basin of Black Mountains Area.

T.18S., R.66E., M.D.B.&M.

All of Sections 1, 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36, and that portion of Sections 2, 7, 8, 9, 10, 11, 18 and 19 lying within the natural drainage basin of Black Mountains Area.

T.18S., R.66-1/2E., M.D.B.&M.

All Sections.

T.18S., R.67E., M.D.B.&M.

All Sections.

T.18S., R.68E., M.D.B.&M.

All of Sections 3, 4, 5, 6, 7, 8, 9, 17, 18, 19, 20, 29, 30, 31 and 32, and that portion of Sections 2, 10, 11, 15, 16, 21, 28 and 33 lying within the natural drainage basin of Black Mountains Area.

T.19S., R.63E., M.D.B.&M.

All of Sections 13, 24, 25, 26, 35 and 36, and that portion of Sections 1, 11, 12, 14, 22, 23, 27, 28, 33 and 34 lying within the natural drainage basin of Black Mountains Area.

T.19S., R.64E., M.D.B.&M.

All of Sections 5, 7, 8, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36, and that portion of Sections 4, 6, 9, 10, 13, 14, 15 and 23 lying within the natural drainage basin of Black Mountains Area.

T.19S., R.65E., M.D.B.&M.

All of Sections 1, 12, 13, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36, and that portion of Sections 2, 7, 8, 9, 10, 11, 14, 15 and 18 lying within the natural drainage basin of Black Mountains Area.

T.19S., R.66E., M.D.B.&M.

All Sections.

T.19S., R.66-1/2E., M.D.B.&M.

All Sections.

T.19S., R.67E., M.D.B.&M.

All Sections.

T.19S., R.68E., M.D.B.&M.

All of Sections 5, 6, 7, 8, 17, 18, 19, 20, 29, 30, 31 and 32, and that portion of Sections 4, 9, 16, 21, 22, 28 and 33 lying within the natural drainage basin of Black Mountains Area.

T.20S., R.62E., M.D.B.&M.

That portion of Sections 24 and 25 lying within the natural drainage basin of Black Mountains Area.

T.20S., R.63E., M.D.B.&M.

All of Sections 1, 2, 3, 9, 10, 11, 12, 13, 14, 15, 16, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35 and 36, and that portion of Sections 4, 5, 7, 8, 17, 18, 19, 30 and 31 lying within the natural drainage basin of Black Mountains Area.

T.20S., R.64E., M.D.B.&M.

All Sections.

T.20S., R.65E., M.D.B.&M.

All Sections.

T.20S, R.66E., M.D.B.&M.

All Sections.

T.20S., R.66-1/2E., M.D.B.&M.

All Sections.

T.20S., R.67E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 34, 35 and 36, and that portion of Sections 31, 32 and 33 lying within the natural drainage basin of Black Mountains Area.

T.20S., R.68E., M.D.B.&M.

All of Sections 6, 7, 18, 19, 30 and 31, and that portion of Sections 4, 5, 8, 17, 20, 29 and 32 lying within the natural drainage basin of Black Mountains Area.

T.21S., R.63E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 34, 35 and 36, and that portion of Sections 5, 6, 8, 9, 16, 17, 20, 21, 28 and 33 lying within the natural drainage basin of Black Mountains Area.

T.21S., R.63-1/2E., M.D.B.&M.

All Sections.

T.21S., R.64E., M.D.B.&M.

All Sections.

T.21S., R.65E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 and 21, and that portion of Sections 22, 23, 24, 26, 27, 28, 29, 30, 31 and 32 lying within the natural drainage basin of Black Mountains Area.

T.21S., R.66E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6 and 7, and that portion of Sections 8, 9, 10, 11, 12, 15, 16, 17, 18 and 19 lying within the natural drainage basin of Black Mountains Area.

T.21S., R.67E., M.D.B.&M.

That portion of Sections 1, 2, 3 and 4 lying within the natural drainage basin of Black Mountains Area.

T21S., R.68E., M.D.B.&M.

That portion of Sections 5, 6 and 7 lying within the natural drainage basin of Black Mountains Area.

T.22S., R.63E., M.D.B.&M.

All of Section 1 and that portion of Sections 2, 3, 4, 11, 12 and 13 lying within the natural drainage basin of Black Mountains Area.

T.22S., R.63-1/2E., M.D.B.&M.

All of Sections 1 and 12 and that portion of Sections 13 and 36 lying within the natural drainage basin of Black Mountains Area.

T.22S., R.64E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 21, 22, 23, 24, 26, 27, 28 and 33, and that portion of Sections 18, 19, 20, 25, 29, 31, 32, 34, 35 and 36 lying within the natural drainage basin of Black Mountains Area.

T.22S., R.65E., M.D.B.&M.

All of Sections 7, 18 and 19 and that portion of Sections 5, 6, 8, 16, 17, 20, 29 and 30 lying within the natural drainage basin of Black Mountains Area.

T.23S., R.64E., M.D.B.&M.

That portion of Sections 3, 4, 5, 6 and 8 lying within the natural drainage basin of Black Mountains Area.

A public hearing, as required under NRS 534.030, in the matter of the designation of Black Mountains Area was held in Las Vegas, Nevada, on October 30, 1989. Based on information received at the hearing and other data and information available to the State Engineer, it is determined that this ground water basin is in need of additional administration under the provisions of NRS Chapter 534.

The designated Black Mountains Area Ground Water basin is depicted and defined on Nevada Division of Water Resources, State Engineer's office maps.

In accordance with NRS 534.120, subsection 2, the irrigation of land using ground water is not considered to be a preferred use of the limited resource and applications to appropriate underground water for irrigation will be denied in the above described area. Further, appropriation of ground water for municipal, industrial, commercial and power generation purposes is to be considered a preferred use in the Black Mountains Area.

Peter G. Morros
State Engineer

Dated at Carson City, Nevada,
this 22nd day of NOVEMBER, 1989.

IN THE OFFICE OF THE STATE ENGINEER

OF THE STATE OF NEVADA

O R D E R

DESIGNATING AND DESCRIBING
THE COYOTE SPRING VALLEY (BASIN NUMBER 13-210)
GROUND WATER BASIN AND ALSO NOTICE OF
DESIGNATION OF PREFERRED USE OF A
LIMITED GROUND WATER RESOURCE IN
CLARK AND LINCOLN COUNTIES, NEVADA

The State Engineer finds that conditions warrant the designation of the Coyote Spring Valley Ground Water Basin, Clark and Lincoln Counties, Nevada, and by this Order designates the following described area of land as a ground water basin coming under the provisions of NRS Chapter 534 (Conservation and Distribution of Underground Waters).

T.8S., R.63E., M.D.B.&M.

All of Sections 13, 24, 25, 26, 34, 35 and 36 and that portion of Sections 11, 12, 14, 22, 23, 27, 28 and 33 lying within the natural drainage basin of Coyote Spring Valley.

T.8S., R.64E., M.D.B.&M.

All of Sections 19, 20, 30 and 31 and that portion of Sections 7, 15, 16, 17, 18, 21, 28, 29 and 32 lying within the natural drainage basin of Coyote Spring Valley.

T.9S., R.61E., M.D.B.&M.

All of Sections 25, 35 and 36 and that portion of Sections 23, 24, 26, 27 and 34 lying within the natural drainage basin of Coyote Spring Valley.

T.9S., R.62E., M.D.B.&M.

All of Sections 12, 13, 14, 15, 21, 22, 23, 24, 25, 26, 27, 28, 31, 32, 33, 34, 35 and 36 and that portion of Sections 1, 2, 3, 9, 10, 16, 17, 19, 20, 29 and 30 lying within the natural drainage basin of Coyote Spring Valley.

T.9S., R.63E., M.D.B.&M.

All of Sections 1, 2, 3, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36 and that portion of Sections 4, 5 and 6 lying within the natural drainage basin of Coyote Spring Valley.

T.9S., R.64E., M.D.B.&M.

All of Sections 5, 6, 7, 8, 17, 18, 19, 20, 30 and 31 and that portion of Sections 4, 9, 10, 16, 21, 28, 29 and 32 lying within the natural drainage basin of Coyote Spring Valley,.

T.10S., R.61E., M.D.B.&M.

All of Sections 1, 2, 11, 12, 13, 14, 23, 24, 25, 26, 35 and 36 and that portion of Sections 3, 10, 15, 22, 27 and 34 lying within the natural drainage basin of Coyote Spring Valley.

T.10S., R.62E., M.D.B.&M.

All Sections.

T.10S., R.63E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, 30, 31, 32, 33 and 34 and that portion of Sections 12, 13, 24, 25, 26, 35 and 36 lying within the natural drainage basin of Coyote Spring Valley.

T.10S., R.64E., M.D.B.&M.

That portion of Sections 5, 6 and 7 lying within the natural drainage basin of Coyote Spring Valley.,

T.11S., R.61E., M.D.B.&M.

All of Sections 1, 2, 11, 12, 13, 24, 25 and 36 and that portion of Sections 3, 10, 14, 15, 22, 23, 26 and 35 lying within the natural drainage basin of Coyote Spring Valley.

T.11S., R.62E., M.D.B.&M.

All Sections.

T.11S., R.63E., M.D.B.&M.

All of Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36 and that portion of Section 1 lying within the natural drainage basin of Coyote Spring Valley.

T.11S., R.64E., M.D.B.&M.

All of Sections 7, 17, 18, 19, 30 and 31 and that portion of Sections 5, 6, 8, 9, 10, 15, 16, 20, 21, 29, 32 and 33 lying within the natural drainage basin of Coyote Spring Valley.

T.12S., R.61E., M.D.B.&M.

All of Sections 1, 12, 13, 25 and 36 and that portion of Sections 2, 11, 14, 23, 24, 26 and 35 lying within the natural drainage basin of Coyote Spring Valley.

T.12S., R.62E., M.D.B.&M.

All Sections.

T.12S., R.63E., M.D.B.&M.

All Sections.

T.12S., R.64E., M.,D.B.&M.

All of Section 6 and that portion of Sections 4, 5, 7, 8, 9, 18, 19, 30, 31 and 32 lying within the natural drainage basin of Coyote Spring Valley.

T.12½S., R.61E., M.D.B.&M.

All of Sections 36 and that portion of Section 35 lying within the natural drainage basin of Coyote Spring Valley.

T.12½S., R.62E., M.D.B.&M.

All of Sections 31, 32, 33, 34, 35 and 36 lying within the natural drainage basin of Coyote Spring Valley.

T.13S., R.61E., M.D.B.&M.

All of Sections 24, 25, 35 and 36 and that portion of Sections 1, 2, 12, 13, 14, 23, 26, 27 and 34 lying within the natural drainage basin of Coyote Spring Valley.

T.13S., R.62E., M.D.B.&M.

All Sections.

T.13S., R.63E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34 and 35 and that portion of Sections 25 and 36 lying within the natural drainage basin of Coyote Spring Valley.

T.13S., R.64E., M.D.B.&M.

All of Sections 6, 7 and 18 and that portion of Sections 5, 8, 17, 19, 20 and 30 lying within the natural drainage basin of Coyote Spring Valley.

T.13½S., R.63E., M.D.B.&M.

All of Sections 31, 32, 33, 34 and 35 and that portion of Section 36 lying within the natural drainage basin of Coyote Spring Valley.

T.14S., R.61E., M.D.B.&M.

All of Sections 1, 2, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 28, 29, 33, 34, 35 and 36 and that portion of Sections 3, 9, 10, 16, 17, 19, 20, 21, 30, 31 and 32 lying within the natural drainage basin of Coyote Spring Valley.

T.14S., R.62E., M.D.B.&M.

All Sections.

T.14S., R.63E., M.D.B.&M.

All of Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33 and 34 and that portion of Sections 1, 12, 13, 24, 25, 35 and 36 lying within the natural drainage basin of Coyote Spring Valley.

T.15S., R.61E., M.D.B.&M.

All of Sections 1, 2, 3, 10, 11, 12 and 13 and that portion of Sections 4, 5, 9, 14, 15, 16, 22, 23 and 24 lying within the natural drainage basin of Coyote Spring Valley.

T.15S., R.62E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24 and 28 and that portion of Sections 19, 25, 26, 27, 29, 30, 31, 32, 33 and 34 lying within the natural drainage basin of Coyote Spring Valley.

T.15S., R.63E., M.D.B.&M.

All of Sections 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20 and 21 and that portion of Sections 1, 2, 12, 13, 22, 23, 24, 27, 28, 29 and 30 lying within the natural drainage basin of Coyote Spring Valley.

T.16S., R.62E., M.D.B.&M.

That portion of Sections 3 and 5 lying within the natural drainage basin of Coyote Spring Valley.

A public hearing, as required under NRS 534.030, in the matter of the designation of Coyote Spring Valley Ground Water Basin was held in Las Vegas, Nevada, on August 13, 1985.

The designated Coyote Spring Valley Basin is depicted and defined on Nevada Division of Water Resources, State Engineer's office maps.

Most of the available ground water for Municipal, Power, Industrial and Domestic purposes occurs in the above described area. The safeguarding of the aforementioned limited water supply necessitates and demands that Municipal, Power, Industrial and Domestic use be declared a preferred use of the ground water resource pursuant to NRS 534.120.

Peter G. Morros
Peter G. Morros
State Engineer

Dated at Carson City, Nevada,
this 21st day of AUGUST 1985.

IN THE OFFICE OF THE STATE ENGINEER

OF THE STATE OF NEVADA

O R D E R

DESIGNATING AND DESCRIBING THE
LOWER MEADOW VALLEY WASH (205)
GROUND WATER BASIN, CLARK AND
LINCOLN COUNTIES, NEVADA

The State Engineer finds that conditions warrant the designation of Lower Meadow Valley Wash Ground Water Basin, Clark and Lincoln Counties, Nevada, and by this Order designates the following described area of land as a ground water basin coming under the provisions of Chapter 534 NRS (Conservation and Distribution of Underground Waters).

T.3S., R.66E., M.D.B.&M.

Those portions of Sections 33, 34, 35 and 36 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.4S., R.65E., M.D.B.&M.

All of Sections 13, 23, 24, 25, 26, 27, 34, 35 and 36, and that portion of Sections 11, 12, 14, 15, 20, 21, 22, 28, 29, 32 and 33 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.4S., R.66E., M.D.B.&M.

All of Sections 2, 3, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36, and that portion of Sections 1, 4, 5, 6 and 7 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.4S., R.67E., M.D.B.&M.

All of Sections 17, 18, 19, 20, 30 and 31, and that portion of Sections 6, 7, 8, 9, 16, 21, 28, 29 and 32 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.5S., R.65E., M.D.B.&M.

All of Sections 1, 2, 3, 9, 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 35 and 36, and that portion of Sections 4, 5, 8, 16, 17, 21, 28, 33 and 34 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.5S., R.66E., M.D.B.&M.

All Sections.

T.5S., R.67E., M.D.B.&M.

All of Sections 6, 7, 18, 19, 20, 29, 30, 31 and 32, and that portion of Sections 5, 8, 15, 16, 17, 21, 22, 28, 33, 34, 35 and 36 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.6S., R.65E., M.D.B.&M.

All of Sections 1, 2, 11, 12, and that portion of Sections 3, 10, 13, 14, 15, 24 and 25 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.6S., R.66E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35 and 36, and that portion of Sections 30 and 31 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.6S., R.67E., M.D.B.&M.

All of Sections 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36, and that portion of Sections 1, 2 and 3 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.6S., R.68E., M.D.B.&M.

All of Sections 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36, and that portion of Sections 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 24 and 25 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.6S., R.69E., M.D.B.&M.

Those portions of Sections 19, 30, 31, 32 and 33 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.7S., R.66E., M.D.B.&M.

All of Sections 1, 2, 3, 11, 12, 13 and 24, and that portion of Sections 4, 5, 6, 9, 10, 14, 15, 23, 25, 26, 35 and 36 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.7S., R.67E., M.D.B.&M.

All Sections.

T.7S., R.68E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34 and 35, and that portion of Sections 25 and 36 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.7S., R.69E., M.D.B.&M.

All of Sections 5, 6, 7 and 8, and that portion of Sections 4, 9, 10, 16, 17, 18, 19, 30 and 31 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.8S., R.66E., M.D.B.&M.

All of Sections 12, 13, 22, 23, 24, 25, 26, 27, 28, 33, 34, 35 and 36, and that portion of Sections 1, 2, 11, 14, 15, 16, 20, 21, 29, 31 and 32 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.8S., R.67E., M.D.B.&M.

All Sections.

T.8S., R.68E., M.D.B.&M.

All of Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, 30, 31 and 32, and that portion of Sections 1, 11, 12, 13, 24, 25, 26, 33, 34 and 35 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.8S., R.69E., M.D.B.&M.

That portion of Section 18 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.8½S., R.68E., M.D.B.&M.

All of Sections 31 and 32 and that portion of Section 33 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.9S., R.65E., M.D.B.&M.

All of Sections 25, 35 and 36, and that portion of Sections 13, 23, 24, 26, 27 and 34 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.9S., R.66E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36, and that portion of Sections 5, 7, 8 and 18 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.9S., R.67E., M.D.B.&M.

All Sections.

T.9S., R.68E., M.D.B.&M.

All of Sections 5, 6, 7, 8, 17, 18, 19, 20, 29, 30, 31 and 32, and that portion of Sections 4, 9, 16, 21, 28 and 33 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.10S., R.64E., M.D.B.&M.

All of Section 36, and that portion of Sections 24, 25, 26 and 35 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.10S., R.65E., M.D.B.&M.

All of Sections 1, 2, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36, and that portion of Sections 3, 4, 8, 9, 17, 19 and 20 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.10S., R.66E., M.D.B.&M.

All Sections

T.10S., R.67E., M.D.B.&M.

All Sections.

T.10S., R.68E., M.D.B.&M.

All of Sections 5, 6, 7, 18, 19 and 30, and that portion of Sections 4, 8, 9, 17, 20, 28, 29, 31 and 32 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.11S., R.64E., M.D.B.&M.

All of Sections 1, 11, 12, 13, 14, 23, 24, 25, 26, 35 and 36, and that portion of Sections 2, 3, 10, 15, 22, 27 and 34 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.11S., R.65E., M.D.B.&M.

All Sections.

T.10½S., R.66E., M.D.B.&M.

All of Sections 31, 32, 33, 34, 35 and 36.

T.10½S., R.67E., M.D.B.&M.

All of Sections 31, 32, 33, 34, 35 and 36.

T.11S., R.66E., M.D.B.&M.

All Sections.

T.11S., R.67E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 28, 29, 30, 31, 32, 33 and 34, and that portion of Sections 12, 13, 22, 23, 24, 26, 27, 35 and 36 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.11S., R.68E., M.D.B.&M.

That portion of Sections 6 and 7 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.12S., R.64E., M.D.B.&M.

All of Sections 1, 11, 12, 13, 14, 23, 24, 25 and 36, and that portion of Sections 2, 3, 10, 15, 22, 26, 27 and 35 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.11½S., R.65E., M.D.B.&M.

All of Sections 31, 32, 33, 34, 35 and 36.

T.12S., R.65E., M.D.B.&M.

All Sections.

T.12S., R.66E., M.D.B.&M.

All Sections.

T.12S., R.67E., M.D.B.&M.

All of Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 29, 30 and 31, and that portion of Sections 1, 12, 13, 22, 23, 24, 25, 26, 27, 28, 32 and 33 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.12S., R.68E., M.D.B.&M.

That portion of Sections 7 and 18 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.13S., R.64E., M.D.B.&M.

That portion of Sections 1, 2 and 12 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.13S., R.65E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 24 and 25, and that portion of Sections 6, 7, 8, 9, 15, 16, 22, 23, 26, 35 and 36 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.13S., R.66E., M.D.B.&M.

All of Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 20, 21, 28, 29, 30, 31, 32 and 33, and that portion of Sections 12, 13, 14, 22, 23, 27, 34 and 35 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.13S., R.67E., M.D.B.&M.

That portion of Sections 5, 6 and 7 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.14S., R.65E., M.D.B.&M.

That portion of Sections 1, 2, 12, 13 and 24 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.14S., R.66E., M.D.B.&M.

All of Sections 3, 4, 5, 6, 7, 8, 9, 10, 14, 15, 16, 17, 18, 21, 22, 23, 26, 27 and 35, and that portion of Sections 2, 11, 12, 13, 19, 20, 24, 25, 28, 29, 33, 34 and 36 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.14S., R.67E., M.D.B.&M.

That portion of Sections 18, 19 and 30 lying within the natural drainage basin of Lower Meadow Valley Wash.

T.15S., R.66E., M.D.B.&M.

That portion of Sections 1, 2 and 3 lying within the natural drainage basin of Lower Meadow Valley Wash.

The Lower Meadow Valley Wash is also delineated as Hydrographic Area No. 205 on a map titled "State of Nevada Water Resources and Inter-Basin Flows" prepared cooperatively by the Nevada Division of Water Resources and the Geological Survey, United States Department of the Interior and published in September, 1971.

That area of the Lower Meadow Valley Wash lying south of T.12S., within Clark County has a concentration of wells and numerous water rights. In accordance with NRS 534.120, subsection 2, the irrigation of land using underground water is not considered to be a preferred use of the limited underground water resource and applications to appropriate water for irrigation will be denied in those areas lying within T.13S., T.14S., T.15S., in the Lower Meadow Valley Wash drainage basin in Clark County.

Peter G. Morros
Peter G. Morros
State Engineer

Dated at Carson City, Nevada, this

23rd day of NOVEMBER, 1982.

IN THE OFFICE OF THE STATE ENGINEER

OF THE STATE OF NEVADA

ORDER

DESIGNATING AND DESCRIBING

THE MUDDY RIVER SPRINGS AREA GROUND

WATER BASIN, CLARK COUNTY, NEVADA

The State Engineer finds that conditions warrant the designation of the Muddy River Springs Area Ground Water Basin, Clark County, Nevada and by this Order designates the following described area of land as a ground water basin coming under the provisions of Chapter 534 NRS (Conservation and Distribution of Under Ground Waters).

Sections 4, 5, 8, 9, 10, 11, 13, 14, 15, 16, 17, 21, 22, 23 and 24 and those portions of Sections 25 and 26 lying outside of the Moapa River Indian Reservation boundaries, all in T. 14 S., R. 65 E., M.D.B.&M.

Roland D. Westergard
Roland D. Westergard
State Engineer

Dated at Carson City, Nevada,

this 14th day of July, 1971

IN THE OFFICE OF THE STATE ENGINEER
OF THE STATE OF NEVADA

IN THE MATTER OF APPLICATIONS 72218, 72219, 72220 AND 72221 FILED TO APPROPRIATE THE UNDERGROUND WATERS OF THE KANE SPRINGS VALLEY HYDROGRAPHIC BASIN (206) LINCOLN COUNTY, NEVADA.	)	**RULING** #5712

GENERAL

I.

Application 72218 was filed on February 14, 2005, by Lincoln County Water District and Vidler Water Company, Inc., to appropriate 6.0 cubic feet per second (cfs) of the underground water of the Kane Springs Valley Hydrographic Basin for municipal purposes within Coyote Spring Valley Hydrographic Basin more specifically described as portions of T.8S., R.62E., T.8S., R.63E., T.8S., R.64E., T.9S., R.61E., T.9S., R.62E., T.9S., R.63E., T.9S., R.64E., T.10S., R.61E., all of T.10S., R.62E., portions of T.10S., R.63E., T.10S., R.64E., T.11S., R.61E., all of T.11S., R.62E., portions of T.11S., R.63E., T.11S., R.64E., T.12S., R.61E., all of T.12S., R.62E., all of T.12S., R.63E., portions of T.12S., R.64E., T.12.5S., R.61E., T.12.5S., R.62E., T.13S., R.61E., all of T.13S., R.62E., portions of T.13S., R.63E., T.13S., R.64E., T.13.5S., R.63E., T.14S., R.61E., all of T.14S., R.62E., portions of T.14S., R.63E., T.15S., R.61E., T.15S., R.62E., T.15S., R.63E., T.16S., R.62E., M.D.B.& M. The proposed point of diversion is described as being located within the SW¼ SE¼ of Section 25, T.8S., R.65E., M.D.B.&M.[1]

II.

Application 72219 was filed on February 14, 2005, by Lincoln County Water District and Vidler Water Company, Inc., to appropriate 6.0 cfs of the underground water of the Kane Springs Valley Hydrographic Basin for municipal purposes within Coyote Spring Valley Hydrographic Basin more specifically as described above. The proposed point of diversion is described as being located within the SE¼ SW¼ of Section 31, T.9S., R.65E., M.D.B.&M.[2]

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[1] File No. 72218, official records of the Office of the State Engineer. Exhibit No. 2, public administrative hearing before the State Engineer, April 4-6, 2006. Hereinafter the exhibits and transcript will be referred to solely by exhibit number or transcript page.
[2] Exhibit No. 3.

III.

Application 72220 was filed on February 14, 2005, by Lincoln County Water District and Vidler Water Company, Inc., to appropriate 6.0 cfs of the underground water of the Kane Springs Valley Hydrographic Basin for municipal purposes within Coyote Spring Valley Hydrographic Basin more specifically as described above. The proposed point of diversion is described as being located within the SE¼ SW¼ of Section 6, T.11S., R.64E., M.D.B.&M.[3]

IV.

Application 72221 was filed on February 14, 2005, by Lincoln County Water District and Vidler Water Company, Inc., to appropriate 6.0 cfs of the underground water of the Kane Springs Valley Hydrographic Basin for municipal purposes within Coyote Spring Valley Hydrographic Basin more specifically as described above. The proposed point of diversion is described as being located in the SE¼ SW¼ of Section 11, T.9S., R.65E., M.D.B.&M.[4]

V.

Applications 72218 and 72219 were timely protested by White Pine County; however, said protests were withdrawn prior to the administrative hearing.[5]

VI.

Applications 72218 and 72219 were timely protested by Wayne Lister, Ruby Lister and Bevan Lister on the grounds that:

> 1. Lincoln County Water District has no written adopted plan for the use of the water applied for under this permit. There is no city or town within the area of this permit.
> 2. We have long argued that moving water from one basin to another is detrimental to the originating basin.
> 3. Lincoln County Water District is supposed to be a local government entity protecting and planning for the benefit of the citizens of Lincoln County but in teaming up with Vidler they become merely speculative with the sole objective to make a profit.[6]

VII.

Applications 72218, 72219, 72220 and 72221 were timely protested by the United States Department of Interior, National Park Service ("NPS") on the grounds that:

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[3] Exhibit No. 4.
[4] Exhibit No. 5.
[5] Exhibit No. 6.
[6] Exhibit No. 7.

1. There is no water available for appropriation because committed water resources exceed ground-water recharge.
2. The approval and development of the appropriation proposed by this application will impair the water rights of the United States, because:
   A. The appropriation, in combination with other appropriations and withdrawals in Coyote Spring Valley will further reduce the discharge of the Muddy River. The United States' senior water right and other existing rights to the Muddy River would be impaired, if the appropriation is approved and developed.
   B. The proposed appropriation, in combination with existing appropriations and pending applications in the White River ground-water flow system, if approved and developed, would reduce the discharge of Lake Mead NRA [National Recreation Area] springs, because of the large potential withdrawal rate. The drawdown caused by such large withdrawals would extend to capture ground water that naturally discharges through the springs.
   C. The effects of the appropriation proposed by this application, when combined with other existing and proposed appropriations, could impair the senior water rights of the Lake Mead NRA more quickly and/or to a degree greater than the withdrawal proposed under this application alone.
3. The public interest would not be served, by granting a permit to this application, because:
   A. The public interest would not be served by granting this application, because the water and water-related resources in the nationally important Lake Mead NRA would be diminished or impaired, as a result of the appropriation proposed by this application.
   B. The land which the applicant proposes to withdraw the water is not owned by the applicant. [This protest claim only goes to Applications 72218 and 72219.][7]

VIII.

Applications 72220 and 72221 were protested by the United States Department of Interior, Fish and Wildlife Service ("FWS") on the grounds that:

> The proposed groundwater development threatens the biological and water resources under the jurisdiction of the US Fish and Wildlife Service in the White River Groundwater Flow System. Kane Springs Valley is located upgradient of Coyote Spring Valley and the Muddy River Area. Pumping of groundwater from the basin could reduce the groundwater influx to springs at Moapa Valley National Wildlife Refuge in the Muddy River Area. The combined perennial yield for Coyote Spring valley [sic] and Kane Springs Valley may be on the order of 2,600 acre-feet/yr as estimated in ground-water Resources Reconnaissance Series Report 25. Although there are no permits in Kane Springs Valley, there are at least 200,000

[7] Exhibit No. 8.

> acre-feet/yr of permitted and pending applications in Coyote Spring Valley, directly downgradient. An additional withdrawal would only add to the current exceedance of the perennial yield for the combined basins. Such a withdrawal of groundwater in excess of the perennial yield could result in reduced groundwater flow from Coyote Spring Valley to the Muddy River Area, or result in a reversed gradient causing groundwater outflow from Coyote Spring Valley to Kane Springs Valley. Senior water rights held by the Fish and Wildlife Service in the Moapa Valley National Wildlife refuge [sic] could be adversely impacted. Such an impact to the water rights and resources of the Moapa Valley National Wildlife refuge [sic] and environs could adversely impact threatened and endangered species including Moapa dace and Southwestern Willow Flycatcher; which depend on these water resources for survival. Water-dependent resources in Lower Meadow Valley Wash may be threatened by the proposed development too. The combined volume from all of these pending applications and permitted water rights exceeds all current estimates of the available water for appropriation in the White River Groundwater Flow System. Lacking more information to demonstrate that water is available for appropriation without adversely impacting existing water rights and water-related resources, these applications should be denied.[8]

IX.

By letter dated February 6, 2006, the NPS and FWS requested the State Engineer amend State Engineer's Order No. 1169 to include the Kane Springs Valley Hydrographic Basin within the provisions of the Order and included a request to hold these applications in abeyance until the pumping ordered in Coyote Spring Valley was completed and analyzed.[9] The reasoning behind the request is that these agencies believe Kane Springs Valley and Coyote Spring Valley, while administratively classified as separate hydrographic basins, are actually a single distinct hydrologic drainage basin and should be managed as such. At the public administrative hearing on these applications, the Applicant and Protestant FWS presented a stipulation to resolve the FWS's protests.[10] The resolution was also in lieu of statements made on behalf of the FWS in the February 6, 2006, letter that requested Kane Springs Valley be included in State Engineer's Order No. 1169.[11] Pursuant to the Stipulation, the FWS withdrew its protests and the parties requested that Exhibit A to the Stipulation be included as part of the terms and conditions of any applications that are granted. However, the NPS's request to include Kane Springs Valley Hydrographic Basin within the provisions of Order No. 1169 remains to be resolved.

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[8] Exhibit No. 9.
[9] Exhibit No. 10.
[10] Exhibit No. 116.
[11] Transcript, p. 12.

X.

After all parties of interest were duly noticed by certified mail, an administrative hearing was held with regard to the protested applications on April 4-6, 2006, at Carson City, Nevada, before representatives of the Office of the State Engineer.[12]

FINDINGS OF FACT

I.

The Listers protested the applications on the grounds that Lincoln County Water District has no written plan for the use of the water applied for and there is no city or town within the area of the applications. The State Engineer finds there is no requirement in Nevada water law for a written plan to be provided in furtherance of a water right application. The State Engineer finds water right applications are almost always filed for proposed projects that are planned, but not in existence, and the water cannot be used until the State Engineer grants a permit that authorizes the use of the water. As discussed in Section III below, the Nevada Legislature has provided the Lincoln County Water District with the authority to serve water to all real property located within the boundaries of Lincoln County. Nevada water law requires that an applicant provide evidence of an actual beneficial use for the water applied for[13] and proof satisfactory to the State Engineer of his intention in good faith to construct any work necessary to apply the water to the intended beneficial use with reasonable diligence and his financial ability and reasonable expectation to actually construct the work and apply the water to the intended beneficial use with reasonable diligence.[14] The State Engineer finds, as discussed below, that the Applicant provided substantial evidence of a project where the water applied for would be used and proof satisfactory of construction of the work to apply the water to the intended beneficial use with reasonable diligence and the financial ability and reasonable expectation to actually construct the work and apply the water to the intended beneficial use with reasonable diligence.

II.

The Listers' protests allege that they have long argued that moving water from one basin to another is detrimental to the originating basin. The State Engineer finds that Nevada water law specifically provides for the interbasin transfer of water provided the applicant meets all of the

[12] Exhibit No. 1.
[13] NRS § 533.035.
[14] NRS § 533.370.

necessary criteria found in the Nevada Revised Statutes, including but not limited to NRS §§ 533.370(5) and (6). Nevada Revised Statute § 533.370(6)(c) and (d) require the State Engineer to take into consideration whether the proposed action is environmentally sound as it relates to the basin from which the water is exported and whether the proposed action is an appropriate long-term use which will not unduly limit the future growth and development in the basin from which the water is exported. The State Engineer finds Nevada water law requires the State Engineer to consider factors relevant to the originating basin, but specifically provides for the interbasin transfer of water.

III.

The Listers' protests allege that the Lincoln County Water District is supposed to be a local government entity protecting and planning for the benefit of the citizens of Lincoln County but, that in teaming up with Vidler Water Company, the Lincoln County Water District has become merely speculative with the sole objective to make a profit. In 2003, the Nevada Legislature enacted legislation that provided for the creation of the Lincoln County Water District.[15] The special legislative act that created the Lincoln County Water District provided that its jurisdiction and service area are all the real property located within the boundaries of Lincoln County and authorized the Lincoln County Water District to sell water and water rights and to enter into agreements with a private entity or corporation for the transfer or delivery of any water right or water appropriated.[16]

The State Engineer finds the Nevada Legislature gave the Lincoln County Water District its authority. The State Engineer finds the Lincoln County Water District like any other applicant has to demonstrate a beneficial use for the water applied for under these applications and has to satisfy the other statutory requirements. The State Engineer finds if the Protestant Listers have an issue with the operation of the Lincoln County Water District that is a matter outside of the State Engineer's jurisdiction.

IV.

Through testimony and evidence, the Applicants' expert witnesses presented their interpretation of the geology and hydrogeology of the Kane Springs Valley and vicinity. They conclude that the northern portion of the valley is underlain by a volcanic caldera complex and,

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[15] Chapter 474, Statutes of Nevada 2003.
[16] *Id.* at Sections 11(7), 11(11), and 11(12).

therefore, has low potential for regional ground-water flow. However, they interpreted the evidence as indicating that the southwestern portion of the basin is underlain by a significant thickness of carbonate rocks.[17] The Applicants conducted a pumping test at their well KPW-1 and, based on the results of the test and their interpretation of the geology, concluded that there is the potential for considerable ground-water movement through the Paleozoic carbonate rocks in Kane Springs Valley.[18] The Kane Springs Wash fault zone is oriented in a northeasterly direction, and is thought to both channel ground-water flow along its length from northeast to southwest, and to act as a barrier to ground-water flow across it from north to south. The witnesses also presented testimony supporting ground-water inflow into the Kane Springs Valley from the north.[19]

The State Engineer finds that the Applicants' interpretation of ground-water movement in the Kane Springs Valley from northeast to southwest and into Coyote Spring Valley, preferentially along the Kane Springs Wash fault zone, is generally consistent with the available data. The State Engineer further finds that the Applicants' pumping test supports the conclusion that there is considerable potential for ground-water flow in the carbonate rocks in the vicinity of well KPW-1. The State Engineer also finds that there was not sufficient evidence presented to support a determination of the potential for ground-water inflow into the Kane Springs Valley.

V.

The Applicants presented evidence to quantify subsurface inflow and outflow across the Kane Springs Valley Hydrographic Basin boundaries. The Applicants propose that ground water enters Kane Springs Valley from northern Coyote Spring Valley, passing through its western tip, and exits southwesterly back into Coyote Spring Valley. Local recharge is thought to combine with the inflow and exit the basin to the southwest. Since the water table is relatively deep in Kane Springs Valley and ET of ground water is negligible, virtually all ground-water discharge from the basin must occur via subsurface outflow.

Mr. Lewis applied Darcy's law to estimate the magnitude of the ground-water inflow into Kane Springs Valley Hydrographic Basin via a three-mile corridor on the western edge of Kane Springs Valley.[20] Darcy's law states the volume of flow is equal to aquifer transmissivity multiplied by aquifer width multiplied by the hydraulic gradient. He estimated transmissivity for

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[17] Transcript, pp. 43-47, 57; Exhibit No. 15, pp. 13-14; Exhibit No. 20, pp. 3-4.
[18] Transcript, pp. 58-59, 62-63.
[19] Exhibit No. 20, pp. 6-13.
[20] Exhibit No. 20, pp. 6-13.

the "bulk aquifer" from the pumping test performed at the well identified as KPW-1. He then multiplied that value by three on the assumption that the aquifer is three times thicker than penetrated by the test well. For a value of hydraulic gradient, Mr. Lewis used water levels in wells CSVM-3 and CE-VF-2, which are located near the center of Coyote Spring Valley.

The State Engineer finds the Applicants' inflow analysis is overly interpretive and without sufficient supporting evidence. Inflow into the basin is proposed to occur through a three-mile wide zone on the western basin boundary. Flow direction is assumed to be from the north to south even though there are no local hydraulic head data to support the hypothesis of hydraulic gradient or flow direction. The Applicants' witness used hydraulic data from the KPW-1 pumping test, which is located approximately six miles from the proposed inflow area. The hydraulic gradient is assumed to be equal to that between wells CSVM-3 and CE-VF-2 even though these wells are located six and 15 miles away, respectively, from the proposed inflow zone. Inflow through the three-mile wide corridor is proposed by the Applicants to be 13,000 acre-feet per year. This amount is approximately one-third of the total amount of regional flow from Pahranagat and Delamar Valleys to Coyote Spring Valley of approximately 37,000 acre-feet per year.[21] However, the proposed flow corridor into Kane Springs Valley is a relatively narrow zone at the corner of the basin. Geologic structures in the area of the proposed inflow corridor strike north northeasterly, and may have the effect of channeling flow along them parallel to the basin boundary, similar to the conceptual model of the Applicants along the Kane Spring and Willow Spring fault zones. Geologic cross-section B-B' shows a thrusted block of low-permeability basement rocks that would act to block potential inflow.[22] The State Engineer finds that sufficient data does not exist to substantiate or reliably estimate subsurface flows into the Kane Springs Valley Hydrographic Basin and the Applicants' inflow estimates are hereby discounted and not accepted.

The Applicants' outflow analysis utilized two estimates of transmissivity from the KPW-1 pumping test. This analysis used a measured transmissivity of 50,000 gallons per day/foot (gpd/ft), which is thought to be representative of the regional carbonate aquifer and a transmissivity of 300,000 gpd/ft, which is thought to be representative of the local Willow Spring fault zone. The Applicants "scaled-up" the pumping test transmissivities to a basin scale by

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[21] State Engineer's Office, *Water for Nevada, State of Nevada Water Planning Report No. 3*, Oct. 1971.
[22] Exhibit No. 15.

multiplying the values by three. Outflow is thought to occur in a southwesterly direction parallel to the axis of the Kane Springs Valley. The outflow corridor is estimated to be four-miles wide by 3,000 feet thick. They attribute one-half mile of the four-mile width to the fault zone and the remaining three and one-half miles to regional conditions, each having separate hydraulic gradients for their flow calculations. For the regional flow they used a gradient of 0.005, and for the structural zone they used a gradient of 0.0005. Total basin outflow was calculated to be 16,000 acre-feet per year.[23]

The State Engineer finds several irregularities and inconsistencies with the Applicants' analysis. The Applicants' hydrologist used a hydraulic gradient of 0.005 for the regional component of flow based on the water levels in wells CSVM-3 and CE-VF-2, which are located near the center of Coyote Spring Valley, rather than using a hydraulic gradient of 0.0004 for the regional component of flow based on water levels in wells KPW-1 and CSVM-4, which are located at the outflow of Kane Springs Valley Hydrographic Basin and better situated to measure the applicable gradient.[24] The Applicant calculated the regional component of outflow to be 15,000 acre-feet per year using the hydraulic gradient of 0.005 as opposed to an outflow calculation of 1,250 acre-feet per year using the lower hydraulic gradient of 0.0004. The State Engineer finds that using the higher hydraulic gradient of 0.005 to compute outflow from Kane Springs Valley Hydrographic Basin rather than using the lower gradient of 0.0004 between KPW-1 and CSVM-4 is in error and inconsistent with the Applicants' documented conceptual view of the flow system.[25]

The Applicants' estimate of outflow along the structural zone was computed separately using a transmissivity of 900,000 gpd/ft and a hydraulic gradient of 0.0005. The State Engineer finds the Applicant incorrectly approximated the hydraulic gradient to be 0.0005, and should have used a hydraulic gradient of 0.0004.[26] Based on the actual hydraulic gradient of 0.0004 the resulting basin outflow along the structural zone would then be 1,000 acre-feet per year. Adding the estimated outflow along the structural zone of 1,000 acre-feet per year to the regional flow of 1,250 acre-feet per year results in an estimated basin outflow of 2,250 acre-feet annually rather than the Applicants' calculation of 16,000 acre-feet annually.

[23] Exhibit No. 16.
[24] *Ibid.*, pp. 20 and 31.
[25] Exhibit No. 17, p 21.
[26] Exhibit No. 20, p. 11.

The State Engineer finds the Applicants' inflow and outflow analyses lack sufficient data to provide a reliable estimate of basin boundary flows. Furthermore, he finds the Applicants' conceptual analyses were overly interpretive and, in part, were inconsistent with their conceptual model of regional flow. The State Engineer finds that sufficient data were not collected or presented to substantiate the Applicants' estimate of subsurface flow into or out of the Kane Springs Valley Hydrographic Basin.

VI.

The Applicant presented a witness to address the geochemical framework of the Kane Springs Valley Hydrographic Basin and the White River flow system south of the Pahranagat shear zone. The witness presented evidence on stable isotopes, major ion chemistry, and carbon-14 analyses.[27] In summary, the geochemical evidence supports the ground-water gradient data that indicates Kane Springs Valley ground water flows into Coyote Spring Valley and that, in general, water in the White River flow system flows from north to south and mixes with local recharge en route to discharge areas. The witness presented deuterium data collected from springs in Kane Springs Valley believed to represent local recharge water, springs in Pahranagat Valley believed to represent regional carbonate water, and ground water from KPW-1 believed to represent a mix of local recharge water and regional carbonate water. Using a mixing equation the witness computed the percent of regional carbonate ground water from the KPW-1 deuterium sample to equal 77 percent.[28] If the same analysis is repeated using oxygen-18 instead of deuterium, the percent of regional carbonate ground water from the KPW-1 oxygen-18 sample equals 87 percent.[29] As previously discussed, the reinterpretation of the Applicants' subsurface outflow analysis resulted in approximately 2,250 acre-feet per year of basin outflow from the Kane Springs Valley Hydrographic Basin. The State Engineer finds applying the percentages of regional carbonate ground water from KPW-1 for both the deuterium and oxygen-18 samples, the local ground-water recharge component of the outflow would therefore be approximately 518 acre-feet per year and 293 acre-feet per year, respectively. These values appear to support the reconnaissance estimate of 500 acre-feet per year of recharge, however, it is recognized that the re-interpreted outflow is only an estimate, and its value is limited due to uncertain hydraulic parameters.[30]

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[27] Testimony of R. Glanzman; Exhibit No. 32.
[28] Exhibit No. 117, p. 10.
[29] Exhibit No. 34, Table 1, p. 2.
[30] State Engineer's Office, *Water for Nevada, State of Nevada Water Planning Report No. 3*, Oct. 1971.

VII.

Testimony and evidence was presented in an attempt to support a determination that significantly more water is locally recharged in the Kane Springs Valley Hydrographic Basin than previously reported. The Applicants presented Mr. Walker, who possesses a background in range management, as a witness who used plant communities as a method to estimate precipitation. However, Mr. Walker also testified that the use of plant communities as a method to calculate recharge does not exist, and his methodology for calculating recharge is not used anywhere else in the United States.[31] The Applicants then presented Mr. Lewis for the purpose of using Mr. Walker's estimation of precipitation for the establishment of new recharge estimates in the Kane Springs Valley Hydrographic Basin.[32]

Reconnaissance investigations by the U.S.G.S. estimate the combined recharge for Kane Springs Valley, Coyote Spring Valley and the Muddy River Springs Area to be 2,600 acre-feet annually.[33] Recharge for Kane Springs Valley was further delineated in 1971 and was estimated to be 500 acre-feet per year.[34] The methods and estimates presented by the Applicants in Exhibit Nos. 29 and 30 used four estimates of precipitation. With each of the four estimates of precipitation, ground-water recharge was then estimated using two methods: a version of the well-known Maxey-Eakin technique and a water budget method. In total, the Applicants computed eight recharge estimates ranging from 5,300 to 14,155 acre-feet per year[35]

One method for estimating precipitation tied plant communities to precipitation and elevation, and then used elevation zones to distribute precipitation throughout the basin. The second method used a spatial distribution of vegetative zones and their respective precipitation based on a United States Department of Agriculture, Natural Resource Conservation Service technical guide for ecological site descriptions.[36] A third precipitation method used PRISM[37]

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[31] Transcript, pp. 244, 264.
[32] Transcript, pp. 245-246.
[33] T.E. Eakin, *Ground- water Resources – Reconnaissance Series Report 25, Ground-water Appraisal of Coyote Spring and Kane Spring Valleys and Muddy River Springs Area, Lincoln and Clark Counties, Nevada*, State of Nevada, Department of Conservation and Natural Resources, United States Department of Interior, Geologic Survey, February 1964.
[34] Transcript, p. 253.
[35] Exhibit No. 16, p. 5.
[36] Exhibit No. 29, pp. 6, 15-17.
[37] PRISM – Parameter-elevation Regressions on Independent Slopes Model and is a method of spatially distributing precipitation.

modeled precipitation.[38] The last precipitation estimate was based on a local altitude-precipitation method developed by the Las Vegas Valley Water District.[39] For each of these precipitation estimates, Mr. Lewis applied both a numerical form of the Maxey-Eakin technique and water budget approach for estimating recharge.

However, Mr. Halford, as expert witness for the Protestant National Park Service, testified that the use of the Maxey-Eakin technique in each of these cases was in error,[40] because using the Maxey-Eakin recharge coefficients with any precipitation estimates other than the Hardman precipitation map is inappropriate. The Maxey-Eakin recharge coefficients are married to the Hardman map and cannot be used otherwise.[41] Mr. Halford testified that if one is going to develop a new method of estimating recharge they must have the precipitation maps for the area of interest and controls on ground-water discharge, and then they can develop new recharge coefficients based on that information.[42]

The Applicants also used a water-budget approach with each of the precipitation estimates to arrive at an estimate of recharge. In the approach for Kane Springs Valley Hydrographic Basin, it was estimated that recharge is equal to precipitation less the sum of evapotranspiration (ET), surface runoff and spring discharge. Surface runoff and spring discharge were each estimated to average a few hundred acre-feet annually; therefore, recharge was estimated to be approximately equal to precipitation minus ET. Due to the lack of ET measurements or estimates of ET in Kane Springs Valley, the Applicants used data from a United States Geologic Survey report on evapotranspiration in Ruby Valley, over 200 miles to the north.[43] Their evidence provides that a report prepared by Berger in 2001 reports an estimate of ET using the Bowen-ratio method for an upland-shrub non-phreatophytic plant community of 12 inches per year where annual precipitation was estimated to be 13 to 15 inches.[44] On that basis, the Applicants assume 12 inches per year of ET for areas receiving 13 to 15 inches of precipitation in Kane Springs Valley and 13 inches per year of ET for areas receiving greater than 15 inches per year of precipitation.

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[38] Exhibit No. 29, p. 9.
[39] Exhibit No. 54, public administrative hearing before the State Engineer, July 16-20, 23-27, 2001, official records in the Office of the State Engineer.
[40] Transcript, pp. 489-520.
[41] Transcript, p. 493.
[42] Transcript, p. 495.
[43] Exhibit No. 29, p. 13.
[44] *Ibid.*

However, the State Engineer believes the Applicants misinterpreted and/or misapplied the data from the Berger 2001 report, which states that precipitation at the Ruby Lake National Wildlife Refuge site for the 2000 water year was only 7.74 inches, or 58 percent of the 1961 to 1990 30-year average of 13.3 inches.[45] During this same time period, ET at the upland-shrub site was 11.96 inches.[46] The report does not indicate what ET rates might be in the upland-shrub community during average precipitation years, although the data does support higher daily ET rates in the summer months when there was an increase in available soil moisture from precipitation.[47] In addition, the Applicants did not provide evidence suggesting that the ET rates in areas that receive greater than 15 inches per year would remain constant at 13 inches. The Applicants also did not address other factors that differ between Kane Springs Valley and Ruby Valley that could have an effect on ET rates such as differences in temperature, solar radiation, time and type of precipitation, and variable plant species distinct from those in Kane Springs Valley.

The State Engineer recognizes the difficulty in accurately estimating recharge and even the Applicants admit that estimates of recharge are extremely problematic as it is a parameter that cannot be measured directly.[48] The State Engineer agrees that recharge is a very difficult parameter to measure, and if it is used to determine perennial yield, the uncertainty in the estimates must be recognized and a conservative approach taken. Given the uncertainties inherent in estimating recharge and the validity in the testimony of the Protestant's expert stating that the recharge technique applied was in error and inappropriate, the State Engineer finds that the Applicants' evidence and testimony lack the scientific and practical basis to substantiate the proffered recharge of 5,000 to 14,000 acre-feet annually and are hereby discounted and not accepted. However, the State Engineer also recognizes that the current reconnaissance estimate of average annual recharge is probably low.

The Death Valley flow system area lies west and southwest of Kane Springs Valley. Because the Kane Springs Valley climate, latitude, geology and soil types are similar to the Death Valley flow system basins, it is reasonable to expect that similar precipitation amounts will result in

[45] D.L. Berger, M.J. Johnson, M.L. Tumbusch, *Estimates of Evapotranspiration from the Ruby Lake National Wildlife Refuge Area, Ruby Valley, Northeastern Nevada, May 1999-October 2000*, Water-Resources Investigations Report 01-4234, United States Department of Interior, Geological Survey, Nevada Division of Water Resources and the United States Department of Interior, Fish and Wildlife Service, 2001.
[46] *Id.* at 25.
[47] *Id.* at 20.
[48] Transcript, p. 267.

similar amounts of ground-water recharge. Recharge within the Death Valley regional flow system has been calibrated to measured discharge, and therefore provides a greater level of certainty than recharge estimates made without a comparative discharge.[49] Several basins within the Death Valley regional flow system have similar amounts of precipitation as Kane Springs Valley with the ground-water recharge in those basins ranging from 1% to 2% of total precipitation.[50] Recent estimates of precipitation in the Kane Springs Valley range from 120,000 to 140,000 acre-feet per year as opposed to the Hardman estimate of 80,000 acre-feet per year.[51] Using a recharge to precipitation ratio of 1% to 2% as found in the Death Valley regional flow model for basins with similar amounts of precipitation, the recharge in Kane Springs Valley would be 1,200 to 2,800 acre-feet per year, which is substantially less than the Applicants' estimate of recharge of 5,000 to 14,000 acre-feet annually. This is a qualitative comparison, and is not proposed by the State Engineer to definitively estimate recharge in Kane Springs Valley, but serves as a barometer, for comparative purposes only, of recharge estimates in this area. The State Engineer finds recharge in Kane Springs Valley is uncertain, but is likely greater than the reconnaissance estimate of 500 acre-feet per year and less than the Applicant's estimates of 5,000 to 14,000 acre-feet per year.

VIII.

The perennial yield of a ground-water reservoir may be defined as the maximum amount of ground water that can be salvaged each year over the long term without depleting the ground-water reservoir. The perennial yield cannot be more than the natural recharge to a ground water basin and in some cases is less. In determining the amount of water available for appropriation in basins where outflow from one basin is part of the inflow to another basin, the State Engineer must take into consideration the amount of water appropriated in the upgradient basin and discount the amount from inflow into the downgradient basin. If the water appropriated in an upgradient basin is not deducted from the amount which discharges to the downgradient basin, it creates the potential for double accounting and regional over appropriation. Thus, the State Engineer is still able to manage the ground-water basins as they have been historically managed administratively, but also take into consideration the concerns that arise for ground-water basins that are hydrologically connected.

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[49] Belcher, W., ed., 2004 Death Valley Regional Ground-Water Flow System, Nevada and California – Hydrogeologic Framework and Transient Ground-Water Flow Model, USGS SIR 2004-4205.
[50] Belcher, W., ed., 2004, Death Valley Regional Flow Model, USGS SIR 2004-4205.
[51] Exhibit 16, p. 5.

The Applicants propose that ground water flows from upgradient basins through Kane Springs Valley into downgradient basins. In the case of the Kane Springs Valley Hydrographic Basin, the upgradient basin and the downgradient basin is the Coyote Spring Valley Hydrographic Basin. That is, ground water is proposed to flow from northern Coyote Spring Valley into Kane Springs Valley then back into Coyote Spring Valley. The Protestant NPS argues that the State Engineer should consider any inflow into Kane Springs Valley from the Coyote Spring Valley as previously allocated in Coyote Spring Valley and the subsequent outflow from Kane Springs Valley should be permitted to flow into Coyote Spring Valley in its entirety to meet the approximate 16,000 acre-feet per year of senior appropriated rights there. The majority of those senior water rights were issued with the intent to develop ground water from the White River regional carbonate-rock aquifer system. Given the unique hydrologic connection between the Kane Springs Valley Hydrographic Basin and the Coyote Spring Valley Hydrographic Basin, the development of ground water within Kane Springs Valley will ultimately affect water levels and flows in the White River regional carbonate-rock aquifer system. However, the State Engineer believes a small amount of water can be developed in the Kane Springs Valley and not unreasonably impact existing rights in the discharge areas of the White River carbonate-rock aquifer system, which are already fully appropriated. Well KPW-1 lies within 1,000 feet of Coyote Spring Valley and pumping simulations by the Applicant show a cone of depression extending well into Coyote Spring Valley. To further minimize potential effects on existing rights in the discharge areas of the White River carbonate-rock aquifer system, the State Engineer will limit the amount of ground water that can be pumped from wells in Kane springs Valley near the boundary with Coyote Spring Valley. After careful consideration of the uncertainties regarding the ranges of ground-water recharge, quantification of subsurface inflows and outflows, the demonstrated connection of Kane Springs Valley with the White River Regional flow system, and senior appropriated rights in the down-gradient basins, the State Engineer finds that 1,000 acre-feet is a reasonable amount to allow for appropriation from Kane Springs Valley.

IX.

Nevada Revised Statute § 533.370(5) provides that an applicant provide proof satisfactory to the State Engineer of his intention in good faith to construct any work necessary to apply the water to the intended beneficial use with reasonable diligence and his financial ability and reasonable expectation to actually construct the work and apply the water to the intended beneficial use with reasonable diligence. Nevada Revised Statute § 533.375 provides that in the case of an application or multiple applications proposing to divert more than 10 cubic feet per second (such as the applications under consideration here) the State Engineer may require in the case of an incorporated company the submission of articles of incorporation, the names and places of residence of directors and officers and the amount of its authorized and paid-up capital. If the applicant is not an incorporated company, he may require a statement as to the name of the person proposing to construct the work, and a showing of facts necessary to enable him to determine whether the applicant has the financial ability to carry out the proposed work and whether the application has been made in good faith.

The Applicants presented the Chairwoman for the Lincoln County Water District, Rhonda Hornbeck, as a witness who testified that the Lincoln County Water District through its partner Vidler Water Company has an agreement with Coyote Springs Investment (CSI) to provide wholesale water to CSI's development. Additionally, the witness indicated they are working with the United States Department of Interior, Bureau of Land Management to gain a right of way to bring water from the wellhead down to the CSI property. The testimony indicated that a general improvement district is in place, as is a planned unit development.[52] The Applicants provided evidence on the plan of development, which is a report that was submitted to the United States Department of Interior, Bureau of Land Management, that identifies how the ground water will be withdrawn, how the pipes will be installed, what equipment is needed to complete the well and addresses the pipeline project to deliver the water to the place where it will be used, and pipeline permitting is underway.[53]

When questioned whether the Lincoln County Water District had the financial resources to place the water to beneficial use, the witness for the Lincoln County Water District provided several scenarios as to how those financial resources might be obtained, but did not provide any specific evidence of having the financial resources in place. The testimony indicated that the possibilities include: (1) floating a bond with its partner Vidler Water Company; (2) asking the State of Nevada

[52] Transcript, pp. 388-389; Exhibit No. 41; Exhibit No. 122 (Agreement dated Oct. 17, 2005, between Coyote Springs Investment, LLC and Lincoln County Water District and Vidler Water Company - marked as an exhibit after the hearing when document was filed upon request of the State Engineer.)
[53] Transcript, p. 95; Exhibit No. 26.

for a low-interest loan; or (3) a development agreement with CSI, where CSI would pay for the infrastructure to place the water to beneficial use; however the witness then testified there is already an agreement in place with CSI paying the cost of infrastructure.[54]

Dorothy-Timian Palmer, as a witness for the Applicants, testified that Vidler Water Company has already drilled a production well and a monitoring well and has spent a considerable amount of money on field work and analyses of that field work and has the financial ability to construct the work necessary to put the water to beneficial use.[55] The Agreement between CSI, the Lincoln County Water District and Vidler Water Company provides that CSI will purchase "all water available within the Kane Springs Basin." "Upon payment in full of the purchase price of Kane Water, the DISTRICT and VIDLER will convey the Kane Water by Water Rights Deed to CSI and will partially assign to CSI certain rights and delegate to CSI certain obligations related to the underlying water rights permit(s)."[56] The Applicants only intend to develop the water to the wellhead and CSI will develop the infrastructure to deliver the water from the wellhead to the development.[57]

Harvey Whittemore, as a witness for the Applicants, testified that within the CSI project there would be two separate general improvement districts. The one in Lincoln County has already been formed; however, the one in Clark County was to be formed in June 2006. The testimony indicated that the water rights already held by CSI will be assigned for the benefit of the general improvement districts and the Clark and Lincoln County Commissions will act as trustees for the general improvement districts. Mr. Whittemore indicated that the development is at a stage where all of the approvals necessary for the first phase of construction have been acquired with respect to Clark County. As to the Lincoln County portion of the project, it is still subject to the completion of a multi-species habitat conservation plan, as well as a number of additional approvals from federal agencies. The water rights at issue here would ultimately be owned by the developer CSI and then transferred to the Lincoln County General Improvement District.[58] CSI has already received approval in the form of parcel maps, zoning entitlement and development agreements for 49,000 units in Clark County and 110,000 units in Lincoln County.[59]

[54] Transcript, pp. 392-393.
[55] Transcript, pp. 458-461.
[56] Exhibit No. 122.
[57] Transcript, pp. 412-415.
[58] Transcript, pp. 419-420.
[59] Transcript, pp. 427, 439; Exhibit Nos. 43, 44, 45.

The State Engineer finds the Applicants provided proof satisfactory to the State Engineer of an intention in good faith to construct any work necessary to apply the water to the intended beneficial use with reasonable diligence and a reasonable expectation to actually construct the work and apply the water to the intended beneficial use with reasonable diligence.

X.

Testimony and evidence indicate there are no permitted or certificated groundwater rights in Kane Springs Valley Hydrographic Basin.[60] However, the witness for the NPS testified that Kane Springs Valley Hydrographic Basin and Coyote Spring Valley are hydrographically and hydrologically one and the same basin. Approximately 16,100 acre-feet have been appropriated in Coyote Spring Valley and applications are pending for another 200,000 acre-feet annually. Therefore, there is no water available for appropriation.[61] The State Engineer finds no water has been appropriated in Kane Springs Valley Hydrographic Basin and by limiting the quantity of water authorized for appropriation, the potential impacts to existing rights in down-gradient hydrographic basins will be minimized.

XI.

Nevada Revised Statute § 533.370(6) provides that in determining whether an application for an interbasin transfer of ground water must be rejected the State Engineer shall consider: (a) whether the applicant has justified the need to import water from another basin; (b) if the State Engineer determines that a plan for conservation of water is advisable for the basin into which the water is to be imported, whether the applicant has demonstrated that such a plan has been adopted and is effectively being carried out; (c) whether the proposed action is environmentally sound as it relates to the basin from which the water is exported; (d) whether the proposed action is an appropriate long-term use which will not unduly limit the future growth and development in the basin from which the water is exported; and (e) any other factor the State Engineer determines is relevant.

Testimony was provided as to the extent of the project proposed in Coyote Spring Valley and estimates of the quantity of water necessary to carry out the project. That testimony satisfactorily addresses the provision of whether the applicant has justified the need to import water

[60] Transcript, pp. 208-209.
[61] Transcript, pp. 589-594.

from another basin.[62] Testimony was provided that indicated conservation measures are in place for the planned development similar to traditional development measures associated with development in southern Nevada that have been adopted and imposed,[63] and there is no evidence that the appropriation of water from Kane Springs Valley Hydrographic Basin will damage the environment of the valley.

Testimony was provided that indicated there is no private land within Kane Springs Valley Hydrographic Basin, rather all land within the valley is owned by the federal government; therefore, the use of the water will not unduly limit future growth and development in Kane Springs Valley Hydrographic Basin.[64]

The State Engineer finds the evidence does not support rejection of the application for an interbasin transfer of water.

XII.

Witnesses for both the Applicants (Glanzman)[65] and the Protestant NPS (Van Liew)[66] agree that the discharge at Rogers and Blue Point Springs in the Lake Mead National Recreation Area is not entirely carbonate-rock aquifer discharge, but is composed of some local precipitation that infiltrates and mixes with the carbonate-rock aquifer water that is flowing toward land surface along fault structures. Mr. Glanzman testified that in general when water in the White River flow system flows from north to south it mixes with local recharge en route to discharge areas at the Muddy River Springs Area and Rogers Springs and Blue Point Springs.[67] Using isotopic data, Mr. Glanzman estimated that approximately 25% of the discharge at Rogers Springs and Blue Point Springs could be characterized as regional carbonate water. For purposes of his analysis, Mr. Glanzman considered water in the carbonate aquifer of Pahranagat Valley to be 100% carbonate water.[68,69] Mr. Van Liew testified that discharge from the White River flow system appears to be predominantly at the Muddy River Springs, Rogers Springs and Blue Point Springs and raised the

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[62] Transcript, pp. 427-445.
[63] Transcript, pp. 428-429.
[64] Transcript, pp. 207-208.
[65] Transcript, pp. 115-203, 221-236.
[66] Transcript, pp. 523-621.
[67] Exhibit No. 34; Transcript, pp. 115 –203, 221-236.
[68] Transcript, pp. 137-138.
[69] Exhibit No. 117.

argument that there does not seem to be anywhere else for the ground water to flow. In addition, he doubted much water moved out to the Lake Mead area and testified that the ground-water gradient supports that conclusion.

The State Engineer finds there is not substantial evidence that the appropriation of the limited quantity being granted under this ruling will likely impair the flow at Muddy River Springs, Rogers Springs or Blue Point Springs.

XIII.

By letter dated February 6, 2006, the NPS and FWS requested the State Engineer amend State Engineer's Order No. 1169 to include the Kane Springs Valley Hydrographic Area.[70] The reasoning behind the request is that these agencies believe Kane Springs Valley and Coyote Spring Valley, while administratively classified as separate hydrographic basins, are actually a single distinct hydrologic drainage basin and should be managed as such. However, during the public administrative hearing, the FWS indicated that the resolution of its protests pursuant to the Stipulation also goes to its statements in the February 6, 2006, letter. Thus, the Stipulation was presented in place of the FWS request to include Kane Springs Valley within the provisions of Order No. 1169.[71] However, the request by the NPS to include the Kane Springs Valley Hydrographic Basin within the provisions of Order No. 1169 still remains. Thus, two separate agencies within the United States Department of Interior take different positions with regard to the request to include Kane Springs within the provisions of Order No. 1169.

The witness for the Protestant NPS testified as to various reports and information that all conclude that the discharge from the Muddy River Springs is regional in nature, that a sufficient quantity does not come from local recharge to support the discharge and that a substantial portion of the discharge of the region is concentrated in the Muddy River Springs Area.[72] Citing to Exhibit No. 91, the witness noted that the writer of that report found that the "Coyote Springs Valley, Kane Springs Valley and the Muddy River Springs hydrographic areas (1,025 square miles) in southern Lincoln and Clark Counties have been combined for this report because the areas are hydrologically and topographically connected."[73] The faults in the area are believed to control the majority of

[70] Exhibit No. 10.
[71] Transcript, pp. 12-13.
[72] Transcript, pp. 530-581; *See*, Exhibit Nos. 87, 88, 91.
[73] Transcript, p. 533.

ground-water movement through the carbonate aquifer, including Kane Springs Wash fault zone, which the witness believes to be a conduit for flow to Coyote Spring Valley.[74] Additionally, the NPS witness believes that the Kane Springs Valley Hydrographic Basin and the Coyote Spring Valley are one hydrographic area.[75]

A witness for the Applicants indicated that there is a presumption that the Kane Springs Wash fault zone is effectively a no-flow boundary such that water flowing into Kane Springs Valley Hydrographic Basin flows out of Kane Springs Wash into Coyote Spring Valley, and that the water that is recharged in Kane Springs Valley Hydrographic Basin flows into Coyote Spring Valley.[76] Additionally, evidence developed from the well pump test and analyzed in conjunction with other evidence, such as the implication of a flat gradient, indicates a relatively high transmissivity across the southern half of the study area, indicating a high potential for regional ground-water flow.[77]

The State Engineer finds the evidence indicates a strong hydrologic connection between Kane Springs Valley and Coyote Spring Valley, specifically, that ground water flows from Kane Springs Valley into Coyote Spring Valley. However, carbonate water levels near the boundary between Kane Springs Valley and Coyote Spring Valley are approximately 1,875 feet in elevation, and in southern Coyote Spring Valley and throughout most of the other basins covered under Order No. 1169, carbonate-rock aquifer water levels are mostly between 1,800 feet and 1,825 feet. This marked difference in head supports the probability of a low-permeability structure or change in lithology between Kane Springs Valley and the southern part of Coyote Spring Valley. The State Engineer finds Order No. 1169 was issued to address the requests for the additional appropriation of water filed in Coyote Spring Valley, but the focus of the additional study ordered is the Muddy River Springs Area. The State Engineer finds there is not substantial evidence that the appropriation of a limited quantity of water in Kane Springs Valley Hydrographic Basin will have any measurable impact on the Muddy River Springs that warrants the inclusion of Kane Springs Valley in Order No. 1169. Therefore, the State Engineer denies the request to hold these applications in abeyance and include Kane Spring Valley within the provisions of Order No. 1169.

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[74] Transcript, pp. 545-550.
[75] Transcript, pp. 589-591.
[76] Transcript, pp. 291, 303.
[77] Transcript, pp. 329-330.

XIV.

The Applicants requested that the State Engineer act on Applications 72220 and 72221 and grant them for a total combined duty of 5,000 acre-feet annually and hold Applications 72218 and 72219 in abeyance. The State Engineer finds that the total amount of 1,000 acre-feet annually of groundwater available to be appropriated in Kane Springs Valley Hydrographic Basin is less than the requested 5,000 acre-feet annually; therefore the State Engineer finds he will not hold any of the applications in abeyance.

CONCLUSIONS

I.

The State Engineer has jurisdiction over the parties and the subject matter of this action and determination.[78]

II.

The State Engineer is prohibited by law from granting a permit to appropriate the public waters where:[79]

A. there is no unappropriated water at the proposed source;
B. the proposed use or change conflicts with existing rights;
C. the proposed use or change conflicts with protectible interests in existing domestic wells as set forth in NRS § 533.024; or
D. the proposed use or change threatens to prove detrimental to the public interest.

III.

The State Engineer concludes that to permit the appropriation of water in an amount greater than permitted under this ruling will conflict with existing rights and threaten to prove detrimental to the public interest.

RULING

The protests to the applications are hereby upheld in part and overruled in part. Application 72220 is hereby granted for a duty of 500 acre-feet annually. Applications 72218, 72219, and 72221 are hereby granted for a total combined duty of 500 acre-feet annually.

[78] NRS chapters 533 and 534.
[79] NRS 533.370(5).

Applications 72218, 72219, 72220, and 72221 are granted subject to:

1. The payment of statutory permit fees;
2. A monitoring plan to be approved by this office.

Respectfully submitted,

Tracy Taylor, P.E.

TRACY TAYLOR, P.E.
State Engineer

TT /jm

Dated this 2nd day of
February, 2007.

IN THE OFFICE OF THE STATE ENGINEER
OF THE STATE OF NEVADA

IN THE MATTER OF APPLICATIONS 74147,)
74148, 74149, AND 74150 FILED TO)
APPROPRIATE THE UNDERGROUND)
WATERS OF THE KANE SPRINGS VALLEY)
HYDROGRAPHIC BASIN (206), LINCOLN)
COUNTY, NEVADA.)

RULING
#5987

GENERAL

I.

Application 74147 was filed on April 10, 2006, by the Lincoln County Water District and Vidler Water Company, Inc., to appropriate 6.0 cubic feet per second (cfs) of water from an underground source within the Kane Springs Valley Hydrographic Basin for municipal purposes within the Coyote Spring Valley Hydrographic Basin more specifically described as portions of T.8S., R.62E., T.8S., R.63E., T.8S., R.64E., T.9S., R.61E., T.9S., R.62E., T.9S., T.63E., T.9S., R.64E., T.10S., R.61E., all of T.10S., R.62E., portions of T.10S., R.63E., T.10S., R.64E., T.11S., R.61E., all of T.11S., R.62E., portions of T.11S., R.63E., T.11S., R.64E., T.12S., R.61E., all of T.12S., R.62E., all of T.12S., R.63E., portions of T.12S., R.64E., T.12.5S., R.61E., T.12.5S., R.62E., T.13S., R.61E., all of T.13S., R.62E., portions of T.13S., R.63E., T.13S., R.64E., T.13.5S., R.63E., T.14S. R.61E., all of T.14S., R.62E., portions of T.14S., R.63E., T.15S., R.61E., T.15S., R.62E., T.15S., R.63E., T.16S., R.62E., M.D.B.&M. The proposed point of diversion is described as being located in the SW¼ SE¼ of Section 25, T.8S., R.65E., M.D.B.&M.[1]

II.

Application 74148 was filed on April 10, 2006, by the Lincoln County Water District and Vidler Water Company, Inc., to appropriate 6.0 cfs of water from an underground source within the Kane Springs Valley Hydrographic Basin for municipal purposes within Coyote Spring Valley Hydrographic Basin as more specifically described above. The proposed point of diversion is described as being located in the SE¼ SW¼ of Section 31, T.9S., R.65E., M.D.B.&M.[2]

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[1] File No. 74147, official records in the Office of the State Engineer.
[2] File No. 74148, official records in the Office of the State Engineer.

III.

Application 74149 was filed on April 10, 2006, by the Lincoln County Water District and Vidler Water Company, Inc., to appropriate 6.0 cfs of water from an underground source within the Kane Springs Valley Hydrographic Basin for municipal purposes within Coyote Spring Valley Hydrographic Basin as more specifically described in Section I of this ruling. The proposed point of diversion is described as being located in the SE¼ SW¼ of Section 6, T.11S., R.64E., M.D.B.&M.[3]

IV.

Application 74150 was filed on April 10, 2006, by Lincoln County Water District and Vidler Water Company, Inc., to appropriate 6.0 cfs of water from an underground source within the Kane Springs Valley Hydrographic Basin for municipal purposes within Coyote Spring Valley Hydrographic Basin more specifically as described in Section I of this ruling. The proposed point of diversion is described as being located in the SE¼ SW¼ of Section 11, T.9S., R.65E., M.D.B.&M.[4]

V.

Applications 74147, 74148, 74149 and 74150 were timely protested by the United States Department of Interior, Bureau of Indian Affairs, the Moapa Band of Paiute Indians and the United States Department of Interior, National Park Service on various grounds as summarized below.[1,2,3,4]

The Bureau of Indians Affairs alleges that the proposed diversions will impact the water rights of the Moapa Band of Paiute Indians and other state-based water rights, there is no unappropriated water in the Kane Springs Valley Hydrographic Basin and the proposed applications could adversely affect the implementation and success of a Memorandum of Agreement with the United States Fish and Wildlife Service, Coyote Springs Investment, LLC, the Moapa Valley Water District and the Southern Nevada Water Authority designed to protect the Muddy River Springs environment and other regional water resources.

The Moapa Band of Paiute Indians protested the applications on the grounds that there is no unappropriated water in the source of supply, the proposed withdrawals would conflict with

[3] File No. 74149, official records in the Office of the State Engineer.
[4] File No. 74150, official records in the Office of the State Engineer.

existing rights, especially those of the Tribe, the proposed withdrawals would threaten to prove detrimental to the public interest, the proposed withdrawals would be inconsistent and subvert the Applicants' Stipulation to limit ground-water withdrawals under Permits 72218 through 72221, the proposed withdrawals would undermine the efficacy of the critically important Memorandum of Understanding recently entered into by the United States Fish and Wildlife Service, the Southern Nevada Water Authority, Coyote Springs Investment, LLC, the Moapa Valley Water District and the Tribe to maintain Muddy Springs flows to protect the endangered Moapa Dace.

The National Park Service protested the applications on the grounds that there is no water available for appropriation because the committed water resources exceed the ground-water recharge, the approval and development of the proposed appropriations will impair the water rights of the United States and the public interest would not be served by diminishing or impairing the water-related resources in the Lake Mead National Recreation Area.

FINDINGS OF FACT

I.

In State Engineer's Ruling No. 5712, dated February 2, 2007, the State Engineer addressed applications filed by these same Applicants to appropriate ground water from the Kane Springs Valley Hydrographic Basin.[5] In that ruling, the State Engineer addressed the Applicants' argument regarding ground water availability in the Kane Springs Valley Hydrographic Basin and rejected the Applicants' argument and evidence for the appropriation of ground water above the quantity granted in that ruling. The State Engineer finds that with the issuance of State Engineer's Ruling No. 5712, there is no additional water available for appropriation in the Kane Springs Valley Hydrographic Basin.

CONCLUSIONS

I.

The State Engineer has jurisdiction over the parties and the subject matter of this action and determination.[6]

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[5] State Engineer's Ruling No. 5712, dated February 2, 2007, official records in the Office of the State Engineer.
[6] NRS chapters 533 and 534.

II.

The State Engineer is prohibited by law from granting a permit to appropriate the public waters where:[7]

A. there is no unappropriated water at the proposed source;
B. the proposed use or change conflicts with existing rights;
C. the proposed use or change conflicts with protectible interests in existing domestic wells as set forth in NRS § 533.024; or
D. the proposed use or change threatens to prove detrimental to the public interest.

III.

The State Engineer concludes that there is no additional ground water available for appropriation in the Kane Springs Valley Hydrographic Basin; therefore, the granting of any appropriation under Applications 74147, 74148, 74149 or 74150 would conflict with existing rights and thus threaten to prove detrimental to the public interest.

RULING

Applications 74147, 74148, 74149 and 74150 are hereby denied on the grounds there is no unappropriated water in the source and to grant additional water rights would conflict with existing rights and threaten to prove detrimental to the public interest. No ruling is made on the merits of the protests.

Respectfully submitted,

P.E.

TRACY TAYLOR, P.E.
State Engineer

TT/jm

Dated this 29th day of

April, 2009.

[7] NRS 533.370(5).

Water Planning Report No. 3 lists the perennial yield of Coyote Spring Valley as 18,000 acre-feet, approximately one-half of the basin subsurface discharge.[40] One of the goals of the Order 1169 test was to determine the perennial yield of Coyote Spring Valley.

The vast majority of the scientific literature supports the premise that, unlike other separate and distinct basins in Nevada that do not feature carbonate-rock aquifers, all of the Order 1169 basins share virtually all of the same supply of water. The Order 1169 pumping test further supports the conclusion that pumping from any of the five basins with a close hydrologic connection (Coyote Spring Valley, Muddy River Springs Area, Hidden Valley, Garnet Valley and California Wash) will have a similar impact on water levels in the five-basin area and on the Muddy River spring flows. Therefore, because these basins share a unique and close hydrological connection and share virtually all of the same source and supply of water, unlike other basins in Nevada, these five basins will be jointly managed. The perennial yield of these basins cannot be more than the total annual supply of 50,000 acre-feet. Because the Muddy River and Muddy River springs also utilize this supply, and are the most senior water rights in the region, the perennial yield is further reduced to an amount less than 50,000 acre-feet. The State Engineer finds that the amount and location of groundwater that can be developed without capture of and conflict with senior water rights on the Muddy River and springs remains unclear, but the evidence is overwhelming that unappropriated water does not exist.

V.

Recent rulings by the State Engineer for groundwater applications in other basins within the White River Flow System allowed for the appropriation of additional water.[41] These basins, Cave Valley, Dry Lake Valley, and Delamar Valley Hydrographic Basins, lie 40 to 100 miles north of the Muddy River Springs. Groundwater from both Dry Lake Valley and Delamar Valley is believed to contribute to discharge from the springs. Water rights were granted in the Cave Valley, Dry Lake Valley and Delamar Valley basins based on two critical points that do not exist in the basins in Order 1169. First, the groundwater appropriated in the Cave Valley, Dry Lake Valley and Delamar Valley basins is recharged within the basins. Water is available at the source and can be developed without depleting the supply. Second, the water can be developed without conflicting with any existing rights for hundreds of years. In contrast, neither of these conditions is met in the Order 1169 basins. Recharge in each of the Order 1169 basins is

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[40] Office of the State Engineer, *Water for Nevada, State of Nevada Water Planning Report No. 3*, Oct. 1971.
[41] State Engineer's Ruling Nos. 6165, 6166 and 6167, dated March 22, 2012, official records in the Office of the State Engineer.

Nevada Division of Water Resources

Hydrographic Abstracts

Hydrographic Abstract Report

Selection Criteria: WHERE owner_type IN ('C','B') AND ms Basin IN ('205') Run Date: 8/22/2019 9:20:21 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
205	10062		3404	12/9/1938	CER	SPR	SW	NW	33	06S	67E	0.003	STK		12/9/1930	2.178919	LI	RANKIN, RICHARD AND MEREDITH 50%
205	10102		2383	12/14/1937	CER	STR	SW	NE	27	09S	67E	0.461	IRR		11/11/1927	333	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	10416			8/28/1939	CAN	OSW	E2	SW	36	12S	65E	0.1	MM		8/28/1939	0	LI	QUIST, EARNEST L.
205	10613			1/27/1941	WDR	UG	NE	NE	35	04S	66E	1	IRR		1/27/1941	0	LI	CONAWAY, JOHN H.
205	10614		3211	1/27/1941	CER	UG	SE	NW	25	04S	66E	0.408	IRR		1/27/1941	147.83	LI	RAINBOW LAND & CATTLE COMPANY, LLC
205	10620			2/14/1941	CAN	UG	NW	SE	07	04S	67E	1.5	IRR		2/14/1941	0	LI	DUFFIN, PRESS JR.
205	10645		2641	4/10/1941	CER	UG	SE	SE	15	09S	67E	0.00899999	STK		4/10/1941	6.44489	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	10652		2642	4/24/1941	CER	SPR	NW	NW	34	08S	66E	0.008	STK		4/24/1941	6.383312	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	10653		2643	4/24/1941	CER	SPR	SW	SE	34	08S	66E	0.008	STK		4/24/1941	6.383312	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	10655		2611	4/30/1941	CER	SPR	NW	NE	19	04S	66E	0.007	STK		4/30/1941	5.003685	LI	CORP PRESIDING BISHOP CHURCH JC LDS
205	10658		2612	4/30/1941	CER	SPR	SE	NW	34	04S	65E	0.008	STK		4/30/1941	5.800221	LI	CORP PRESIDING BISHOP CHURCH JC LDS
205	10662		3052	5/14/1941	CER	UG	NW	SW	08	04S	67E	1	MUN		5/14/1941	10	LI	CALIENTE-CITY
		CHANGED BY: 35309			CAN	UG												
		CHANGED BY: 83307			PER	UG												
205	10663			5/14/1941	WDR	UG	SW	NE	08	04S	67E	1	MUN		5/14/1941	0	LI	CALIENTE PUBLIC UTILITIES
205	10862		2680	9/14/1942	CER	SPR	NE	NW	11	05S	65E	0.003	STK		9/14/1942	2.240297	LI	JERRY JOHNSTON OR JANET LIND
205	10886			10/21/1942	CAN	SPR	NE	SW	30	12S	65E	3	MM		10/21/1942	0	LI	SMITH, BENJ. H.
205	10897		2770	12/3/1942	CER	SPR	NE	SW	18	06S	66E	0.016	STK		12/3/1942	11.20148 5	LI	CORP PRESIDING BISHOP CHURCH JC LDS
205	10899		2689	12/15/1942	CER	OSW	NE	NW	14	05S	65E	0.00899999	STK		12/15/1942	6.506068	LI	JERRY JOHNSTON OR JANET LIND

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205	10922		2712	2/15/1943	CER	SPR	NE	SW	21	05S	66E	0.006	STK		2/15/1943	4.480594	LI	JERRY JOHNSTON OR JANET LIND
205	10923		2713	2/15/1943	CER	SPR	SE	SE	07	05S	66E	0.001	STK		2/15/1943	1.135493	LI	JERRY JOHNSTON OR JANET LIND
205	10924		2714	2/15/1943	CER	SPR	SE	SE	17	05S	66E	0.002	STK		2/15/1943	1.770962	LI	JERRY JOHNSTON OR JANET LIND
205	10929			2/24/1943	CAN	STR						0	STK		2/24/1943		LI	FLESHER, WILLIAM H.
205	11040		3020	12/20/1943	CER	SPR	SE	SE	16	06S	66E	0.003	STK		12/20/1943	2.547187	LI	BRADSHAW, R.J.
205	11044			1/5/1944	WDR	STR	SE	SE	23	06S	67E	0.125	STK		1/5/1944	0	LI	FLESHER, W.H.
205	11546			4/9/1946	DEN	UG	NW	SW	35	14S	66E	1.5	IRR		4/9/1946	0	CL	GUBLER, HELEN
205	11581		3720	5/24/1946	ABR	UG	SW	NW	08	04S	67E	0.8	DOM		5/24/1946	0	LI	CALIENTE-CITY
		CHANGED BY: 83308			PER	UG												
205	1208			12/11/1908	CAN	SPR				08S	67E	4	IRR	Y	12/11/1908	0	LI	BRANEN, W.F.
205	12282		3839	2/26/1948	CER	UG	SE	SE	35	14S	66E	2.69	IRR		2/26/1948	570	CL	WTC WATER HOLDINGS L.L.C.
205	12310			3/3/1948	DEN	STR	NW	SW	35	14S	66E	1.5	IRR		3/3/1948	0	CL	GUBLER, HELEN
205	13030			8/24/1949	CAN	OSW	SW	SW	11	08S	67E	1	IRR		8/24/1949	0	LI	HENRIE, PAUL STEWART
205	14630		4518	11/24/1952	ABR	STR	SW	SE	36	12S	65E	2	IRR		11/24/1952	0	LI	STUART, ROBERT B.
		CHANGED BY: 61289T			EXP	STR												
		CHANGED BY: 62397			ABR	STR												
205	15294			9/8/1953	WDR	UG	NW	NE	35	14S	66E	8	IRD		9/8/1953	0	CL	HAIL, J.A.
205	15513		4830	2/23/1954	CER	SPR	SW	NW	25	12S	65E	0.6	IRR		2/23/1954	148.65	LI	LEWIS, RICHARD C. FAMILY REV TRUST I
		CHANGED BY: 72919			WDR	SPR												
205	1655			12/14/1909	CAN	STR	NW	NE	12	10S	67E	0	PWR	Y	12/14/1909	0	LI	OVERTON MILLING AND POWER CO
205	16121			2/18/1955	CAN	UG	NW	SW	12	12S	65E	5	IRR		2/18/1955	0	LI	GRAHAM, BEN
205	17135			12/28/1956	CAN	UG	NE	SW	12	12S	65E	2	IRR		12/28/1956	0	LI	FERREE, KENNETH BERNARD
205	17240			4/15/1957	CAN	UG	52	NW	01	12S	65E	2	IRR		4/15/1957	0	LI	O'BRIEN, JACK J. JR

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205	17550			4/28/1958	CAN	UG	NE	NE	07	04S	67E	2	MUN		4/28/1958	0	LI	CALIENTE-CITY
205	17597			7/7/1958	CAN	STR	SW	NW	24	12S	65E	3	IRD		7/7/1958	0	LI	BUNKER, LORIN F.
205	17600			7/14/1958	CAN	UG	NW	SE	07	04S	67E	0.45	IRR		7/14/1958	0	NY	YOUNG, RONAL T.
205	17679			10/2/1958	WDR	STR	NW	NE	19	13S	66E	6	IRR		10/2/1958	0	CL	WERTZ, JESSE L.
205	17680			10/2/1958	ABR	UG	NE	NW	19	13S	66E	3.5	IRD		10/2/1958	0	CL	COLE, NELDA
		CHANGED BY: 22358			CAN	UG												
		CHANGED BY: 23092			ABR	UG												
205	17722			11/19/1958	WDR	STR	SW	NW	24	12S	65E	1.7	IRR		11/19/1958	0	LI	BUNKER, F. LORIN
205	17749		6390	12/15/1958	CER	UG	NE	NW	13	12S	65E	2	IRR		12/15/1958	30	LI	ROBERT C. LEWIS & VIVIAN C. LEWIS, CO-TRUSTEES OF THE ROBERT C. & VIVIAN C. LEWIS 1990 TRUST DATED JUNE 20, 1990
		CHANGED BY: 60334			ABR	UG												
205	17871			3/4/1959	CAN	SPR	SW	NW	13	12S	65E	1	IRR		3/4/1959	800	LI	BREEDLOVE, MILDRED M.
205	17905			3/25/1959	CAN	UG	SW	SE	09	14S	65E	1	IRR		3/25/1959		CL	TAYLOR, M.W.
205	17907			3/26/1959	CAN	SPR	SE	NW	13	12S	65E	1	IRR		3/26/1959	0	LI	BREEDLOVE, MILDRED M.
205	17921		5201	3/31/1959	CER	UG	NW	SE	07	04S	67E	0.45	IRR		3/31/1959	80.95	LI	AVERY, NOLAN AND TEVA
		CHANGED BY: 60488			CAN	UG												
		CHANGED BY: 88981			RFA	UG												
205	18175			7/31/1959	CAN	UG	SE	SW	12	12S	65E	2	IRR		7/31/1959	800	LI	CHAMBERS, WILLIAM HENRY
205	18311			9/3/1959	CAN	UG	NE	NW	08	04S	67E	1	OM		9/3/1959		LI	ALLEC, JOE
205	18419			11/9/1959	ABR	STR	SW	NW	14	08S	67E	5.5	IRD		11/9/1959	0	LI	BRADSHAW, DONALD LEE
		CHANGED BY: 23817			ABR	STR												
205	1853			10/24/1910	CAN	SPR	SE	SE	36	12S	65E	60	IRR	Y	10/24/1910	0	LI	SPRUNT, JAMES P.
205	18910		7014	6/8/1960	CER	UG	NE	NW	18	04S	67E	2.225	IRR	Y	6/8/1960	551.22	LI	H H. LAND AND CATTLE COMPANY

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205	19153		6391	8/26/1960	CER	UG	NE	NW	12	12S	65E	2	IRD		8/26/1960	30	LI	ROBERT C. LEWIS & VIVIAN C. LEWIS, CO-TRUSTEES OF THE ROBERT C. & VIVIAN C. LEWIS 1990 TRUST DATED JUNE 20, 1990
		CHANGED BY: 66335			ABR	UG												
205	19154			8/26/1960	DEN	UG	NW	NW	01	12S	65E	2	IRD		8/26/1960	0	LI	TUSSING, WILLIAM
205	19201			9/15/1960	DEN	UG	SE	SW	20	13S	66E	6	IRD		9/15/1960	0	CL	THOMPSON, OMER
205	19317			11/3/1960	CAN	UG	SW	SW	38	14S	66E	2	IRD		11/3/1960		CL	BULLARD, MRS.R. L.
205	19377			12/8/1960	PER	UG	NE	SE	07	04S	67E	2	MUN	Y	12/8/1960	1448	LI	CALIENTE PUBLIC UTILITIES
		CHANGED BY: 83309			WDR	UG												
205	20212		6030	12/28/1961	CER	UG	SW	NW	11	09S	67E	4.22	IRR	Y	12/26/1961	807.85	LI	LEWIS, ROBERT C. & VIVIAN
		CHANGED BY: 66336			DEN	UG												
205	20260			2/6/1962	CAN	UG	NW	NE	20	07S	67E	4	IRR		2/6/1962	0	LI	SCHLARMAN, OLIVER
205	20298			2/16/1962	CAN	SPR	NE	NW	13	12S	67E	0.003	STK		2/16/1962	1.779962	LI	BREEDLOVE, MILDRED
205	20299			2/16/1962	CAN	SPR	SW	SE	03	12S	67E	0.004	STK		2/16/1962	0	LI	BREEDLOVE, MILDRED
205	20744			9/24/1962	WDR	UG	NE	SW	35	14S	66E	3.5	PWR		9/24/1962	0	CL	NEVADA POWER COMPANY
205	20782			10/16/1962	WDR	UG	NE	SW	35	14S	66E	3.5	PWR		10/16/1962	0	CL	NEVADA POWER COMPANY
205	20783			10/16/1962	WDR	UG	NE	SW	35	14S	66E	3.5	PWR		10/16/1962	0	CL	NEVADA POWER COMPANY
205	20784			10/16/1962	WDR	UG	NE	SW	35	14S	66E	3.5	PWR		10/16/1962	0	CL	NEVADA POWER COMPANY
205	20881			12/7/1962	CAN	UG	NE	SW	17	07S	67E	0.002	STK		12/7/1962	0	LI	RACHAEL SCHLARMAN ESTATE
205	20882			12/7/1962	CAN	UG	NW	NE	20	07S	67E	1.7	IRR		12/7/1962	0	LI	DIELMAN, ROGER H.
205	21443		7304	8/6/1963	CER	UG	NE	SE	22	09S	67E	2.5	IRR		8/6/1963	153.2	LI	LEWIS, ROBERT C. & VIVIAN
		CHANGED BY: 66337			ABR	UG												
205	2152			7/24/1911	CAN	STR		LT06	08	13S	66E	250	IRR	Y	7/24/1911		CL	FERRY, WILLIAM MONTAGUE
205	21580		6988	10/17/1963	CER	UG	NW	SW	21	07S	67E	1.5	IRR		10/17/1963	157.2	LI	RAINBOW RANCH, INC.
205	21926			4/6/1964	ABR	UG	SW	NE	19	13S	66E	3.4	IRR		4/6/1964	0	CL	COLE, NELDA

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		CHANGED BY: 23091			WDR	UG												
205	22046			8/15/1964	CAN	UG	SE	SW	21	07S	67E	1	IRR		6/15/1964	0	LI	BRADSHAW, JAMES W.
205	22047		6969	6/15/1964	CER	STR	NW	NE	20	07S	67E	1.5	IRR		6/15/1964	157.2	LI	RAINBOW RANCH, INC.
205	22149		6827	7/29/1964	CER	STR	SW	NW	25	12S	65E	1.35	IRD		7/29/1964	100	LI	RICHARD C. LEWIS FAMILY REVOCABLE TR
		CHANGED BY: 72920			WDR	STR												
205	22163			8/5/1964	WDR	UG	SE	SW	26	14S	66E	3.5	PWR		8/5/1964	0	CL	NEVADA POWER CO.
205	22164			8/5/1964	WDR	UG	SW	SE	22	14S	66E	3.5	PWR		8/5/1964	0	CL	NEVADA POWER CO.
205	22358			12/14/1964	CAN	UG	NE	NW	19	13S	66E	3.5	IRD		10/2/1958	0	CL	COLE, NELDA
205	22585			5/14/1965	ABR	UG	SW	SE	22	14S	66E	3.5	IND		5/14/1965	0	CL	NEVADA POWER COMPANY
		CHANGED BY: 44318			CER	UG												
		CHANGED BY: 45218			CER	UG												
205	22586			5/14/1965	ABR	UG	SE	SW	26	14S	66E	3.5	IND		5/14/1965	0	CL	NEVADA POWER CO.
		CHANGED BY: 44314			CAN	UG												
		CHANGED BY: 44317			CER	UG												
		CHANGED BY: 45219			CER	UG												
205	22587			5/14/1965	ABR	UG	NE	SW	35	14S	66E	3.5	IND		5/14/1965	0	CL	NEVADA POWER CO.
		CHANGED BY: 44313			CER	UG												
		CHANGED BY: 45220			CER	UG												
205	22588			5/14/1965	CAN	UG	NE	SW	35	14S	66E	3.5	IND		5/14/1965	0	CL	NEVADA POWER COMPANY
205	22589			5/14/1965	ABR	UG	NE	SW	35	14S	66E	3.5	IND		5/14/1965	0	CL	NEVADA POWER COMPANY
		CHANGED BY: 44315			CER	UG												
		CHANGED BY: 44316			CER	UG												
205	2281			12/18/1911	DEN	OSW			11	06S	66E	250	IRR	Y	12/18/1911	0	LI	BRADSHAW, JAMES W.

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205	22919		7582	1/13/1966	ABR	UG	NE	NE	19	13S	66E	1	IRR		1/13/1966	0	CL	INFINITON LLC
		CHANGED BY: 70315T			WDR	UG												
		CHANGED BY: 50855			CAN	UG												
		CHANGED BY: 69259			ABR	UG												
205	2306			1/8/1912	ABR	STR	SE	NE	22	08S	67E	1.6	IRR	Y	1/8/1912		LI	HENRIE, ETHEL S.
		CHANGED BY: 6506			CAN	STR												
205	2307			1/8/1912	CAN	STR	NW	SW	23	09S	67E	10	IRR	Y	1/8/1912	0	LI	MABEY, CLARENCE
205	23091			4/7/1966	WDR	UG	NE	NW	19	13S	66E	3.4	IRR		4/8/1964	0	CL	COLE, NELDA
205	23092		7655	4/7/1966	ABR	UG	NE	NW	19	13S	66E	0.9	IRR		10/2/1958	0	CL	COLE, CHARLES WAYNE
		CHANGED BY: 63410			ABR	UG												
		CHANGED BY: 63411T			EXP	UG												
205	23477			11/4/1966	CAN	UG	NW	NW	25	12S	65E	2	IRR		11/4/1966	0	LI	LEAVITT, ART
205	23817		6657	4/17/1967	ABR	STR	SE	NW	23	08S	67E	5.5	IRR		11/9/1959	0	LI	JENSEN'S PALISADE INC.
		CHANGED BY: 39805			CAN	STR												
		CHANGED BY: 48491			CER	STR												
205	23933			6/12/1967	PER	UG	SW	NW	08	04S	67E	6	MUN	Y	6/12/1967	325	LI	CALIENTE-CITY
		CHANGED BY: 80043T			EXP	UG												
		CHANGED BY: 81130T			EXP	UG												
		CHANGED BY: 83310			WDR	UG												
		CHANGED BY: 78984			WDR	UG												
205	24481		7822	5/3/1968	CER	UG	NE	NW	08	04S	67E	0.35	IRR		5/3/1968	26.35	LI	DUESCO
205	2499			9/4/1912	DEN	STR	SE	SE	25	12S	66E	2	IRR		9/4/1912	0	LI	NEFF RANCHING COMPANY
205	25471		8472	2/20/1970	CER	UG	NE	SW	22	14S	66E	0.5	IRR		2/20/1970	90	CL	DANIEL BRYCE OMER AND B L & J INC

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205	25748			8/7/1970	CAN	UG	SW	NW	08	04S	67E	6	MUN		8/7/1970		LI	CALIENTE, CITY OF
205	25775			8/24/1970	CAN	UG	SW	NW	22	14S	66E	2.7	IRR		8/24/1970	0	CL	HENRIE, PAUL S.
205	25776			8/24/1970	CAN	UG	NW	NW	22	14S	66E	2.7	IRR		8/24/1970	0	CL	HENRIE, PAUL S.
205	25777			8/24/1970	CAN	UG	SW	NW	22	14S	66E	2.7	IRR		8/24/1970	0	CL	HENRIE, PAUL S.
205	25918			1/25/1971	CAN	STR	NE	SW	18	13S	66E	5.4	IRR		1/25/1971	0	CL	COLE, NELDA
205	25919			1/25/1971	CAN	UG	NW	NW	22	14S	66E	2.7	IRR		1/25/1971	800	CL	HENRIE, PAUL S.
205	25920			1/25/1971	CAN	UG	SW	NW	22	14S	66E	2.7	IRR		1/25/1971	800	CL	HENRIE, PAUL S.
205	25921			1/25/1971	CAN	UG	SW	NW	22	14S	66E	2.7	IRR		1/25/1971	800	CL	HENRIE, SUZY
205	25922			1/25/1971	ABR	UG	NE	NW	27	14S	66E	0.5	IRR		1/25/1971	0	CL	CUTLER, HUBERT K.
		CHANGED BY: 33056			CER	UG												
205	25970			2/18/1971	PER	UG	SW	NW	08	04S	67E	8	MUN	Y	2/18/1971	0	LI	CALIENTE-CITY
		CHANGED BY: 83311			WDR	UG												
205	26382		8486	10/26/1971	CER	UG	NE	SW	22	14S	66E	0.5	IRR		10/26/1971	90	CL	WRIGHT, LEONARD E.
205	26689			4/26/1972	CAN	UG	NE	NW	19	13S	66E	5.4	IRR		4/26/1972	0	CL	COLE, MRS. NELDA
205	2670			3/29/1913	CAN	STR	SW	NW	24	12S	65E	1.5	IRR		3/29/1913	0	LI	MERCER, IDA BELL
205	26770		8216	8/14/1972	CER	UG	NW	NE	27	14S	66E	0.5	IRR		8/14/1972	94	CL	DEY, WAYNE K. AND LINDA
		CHANGED BY: 82662			CER	UG												
205	2681			4/10/1913	CAN	STR	NW	NE	34	05S	66E	0.4	IRR	Y	4/10/1913		LI	REED, CLARK D.
205	26990			9/18/1972	ABR	UG	SW	NE	27	14S	66E	0.07	IRR		9/18/1972	0	CL	EMBRY, VELDA
		CHANGED BY: 45540			CER	UG												
205	26991			9/18/1972	CAN	UG	SW	NE	27	14S	66E	0.07	IRR		9/18/1972	0	CL	PAYTAS, DENNIS ROBERT
205	26992			9/18/1972	CAN	UG	NE	NE	27	14S	66E	0.12	IRR		9/18/1972	0	CL	SCHLARMAN, HENRY J.
205	26993			9/18/1972	ABR	UG	NE	NE	27	14S	66E	0.13	IRR		9/18/1972	0	CL	SCHLARMAN, HENRY J.

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		CHANGED BY: 35757			CER	UG												
205	27264			2/5/1973	CAN	UG	NW	NW	27	14S	66E	0.375	IRR		2/5/1973	0	CL	COLE, JOE
205	27276		8889	2/8/1973	CER	UG	SE	NE	27	14S	66E	1	IRR		2/8/1973	45	CL	BENNINGHOFF 1990 TRUST
		CHANGED BY: 45010			ABR	UG												
		CHANGED BY: 50604			CAN	UG												
		CHANGED BY: 50972			ABR	UG												
		CHANGED BY: 85293			PER	UG												
		CHANGED BY: 85294			PER	UG												
		CHANGED BY: 82894			PER	UG												
205	2752			7/7/1913	DEN	STR			20	05S	66E	1	IRR	Y	7/7/1913	0	LI	BLACK, PARLEY
205	27644			7/20/1973	CAN	UG	NE	NW	19	13S	66E	5.4	IRR		7/20/1973	0	CL	COLE, MRS. NELDA
205	27645			7/20/1973	CAN	UG	NW	NW	27	14S	66E	0.1	IRR		7/20/1973	0	CL	BALLOW, JOE C.
205	27903		8497	11/15/1973	ABR	UG	NE	SE	27	14S	66E	0.4	IRR		11/15/1973	0	CL	LEWIS, ROBERT C.
		CHANGED BY: 50605			CAN	UG												
		CHANGED BY: 50973			WDR	UG												
		CHANGED BY: 57584			ABR	UG												
205	27904		9027	11/15/1973	ABR	UG	SW	SW	35	14S	66E	0.4	IRR	Y	11/15/1973	0	CL	MOAPA MISSION
		CHANGED BY: 66976			PER	UG												
205	27905			11/15/1973	CAN	UG	NW	SW	35	14S	66E	0.8	IRR		11/15/1973	0	CL	LEWIS, PAUL
205	27970			12/24/1973	CAN	UG	NW	NE	27	14S	66E	0.25	IRR		12/24/1973	0	CL	PERKINS, ROBERT
205	28185			3/13/1974	CAN	SPR	NW	SW	12	07S	66E	0.016	STK		3/13/1974	0	LI	BRADSHAW INC.
205	28285		8790	4/24/1974	CER	UG	NE	NE	27	14S	66E	0.03	IRR		4/24/1974	8.75	CL	FOLEY, ROBERT R.
205	28321			5/13/1974	CAN	STR	NE	SW	18	13S	66E	5.4	IRR		5/13/1974	0	CL	COLE, NELDA

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205	28327			5/15/1974	CAN	UG	NE	SW	09	10S	67E	1.5	IRR		5/15/1974	400	LI	GUINN, ROBERT
205	28557			8/1/1974	CAN	UG	SW	NW	18	04S	67E	0.002	DOM		8/1/1974	1.994785	LI	SUMMA CORPORATION
205	28558		9055	8/1/1974	CER	UG	SE	SE	13	04S	66E	2	IRR	Y	8/1/1974	439.73	LI	H.H. LAND AND CATTLE COMPANY
205	28559		9056	8/1/1974	CER	UG	SE	NW	18	04S	67E	2.5	IRR		8/1/1974	245.03	LI	H.H. LAND AND CATTLE COMPANY
205	28560		9057	8/1/1974	CER	UG	SW	SW	18	04S	67E	2.4	IRR		8/1/1974	114.14	LI	H.H. LAND AND CATTLE COMPANY
205	2873		237	1/10/1914	CER	STR	NE	NW	08	04S	67E	0.14	IRR	Y	1/10/1914	42.49	LI	H.H. LAND AND CATTLE COMPANY
205	2921			3/23/1914	WDR	STR	SE	SE	01	13S	65E	100	IRR	Y	3/23/1914	0	CL	DOUGLAS, W.B.
205	2922			3/24/1914	DEN	STR	NW	SE	11	06S	67E	0	IRR	Y	3/24/1914	100000	LI	GREAT WESTERN LAND, WATER & POWER CO
205	29338		9059	4/8/1975	CER	UG	SE	NE	24	04S	66E	1.34	IRR		4/8/1975	353.62	LI	H.H. LAND AND CATTLE COMPANY
205	29606		10964	8/27/1975	CER	UG	SW	NW	28	14S	66E	1	IRR		8/27/1975	197	CL	ROBERT C. LEWIS AND VIVIAN C. LEWIS CO-TRUSTEES OF THE ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST DATED JUNE 20, 1990
		CHANGED BY: 66338			RFA	UG												
205	29607		9303	8/27/1975	ABR	UG	NE	SE	27	14S	66E	0.83	IRR		8/27/1975	0	CL	LEWIS, ROBERT C.
		CHANGED BY: 50974			ABR	UG												
		CHANGED BY: 50606			CAN	UG												
205	29618		9304	8/28/1975	ABR	UG	NE	SE	27	14S	66E	0.36	IRR		8/28/1975	0	CL	LEWIS, ROBERT C. AND VIVIAN
		CHANGED BY: 50607			CAN	UG												
		CHANGED BY: 50975			ABR	UG												
205	29619		9698	9/2/1975	CER	UG	NW	SW	35	14S	66E	0.074	IRR		9/2/1975	26.85	CL	LEAVITT, DIANNE
205	29632		9382	9/8/1975	CER	UG	NW	SW	35	14S	66E	0.37	IRR		9/8/1975	48	CL	PULSIPHER, BILLY H.
205	29834		10491	12/4/1975	CER	UG	SE	SW	07	04S	67E	0.111	IRR		12/4/1975	5.34	LI	JORDAN VALLEY, LLC
		CHANGED BY: 72708			CER	UG												
205	30295			6/1/1976	CAN	UG	NE	NW	19	13S	66E	4.7	IRR		6/1/1976	0	CL	COLE, CHARLES WAYNE
205	30296			6/1/1976	ABR	UG	NE	NW	19	13S	66E	2.68	IRR		6/1/1976	0	CL	COLE, CHARLES WAYNE

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		CHANGED BY: 56551			ABR	UG												
205	30725			10/8/1976	ABR	UG	NW	NW	04	14S	66E	2	IRD		10/8/1976	0	CL	LEWIS, VIVIAN
		CHANGED BY: 46168			ABR	UG												
205	30726			10/8/1976	DEN	UG	SE	SE	04	14S	66E	5	IRD		10/8/1976	0	CL	MEADOW VLY. FARM LANDS IRR. CO.
205	30727			10/8/1976	DEN	UG	NW	NW	09	14S	66E	5	IRC		10/8/1976	0	CL	MEADOW VALLEY FARM LANDS IRR. CO.
205	30728			10/8/1976	DEN	UG	SW	SW	10	14S	66E	5	IRD		10/8/1976	0	CL	COMPANY
205	30729			10/8/1976	ABR	UG	SW	SE	15	14S	66E	5	IRD		10/8/1976	0	CL	MEADOW VALLEY FARM LAND IRRIGATION
		CHANGED BY: 50976			ABR	UG												
		CHANGED BY: 50608			CAN	UG												
205	30730			10/8/1976	ABR	UG	NW	SW	15	14S	66E	0	IRD		10/8/1976	0	CL	MEADOW VALLEY FARM LANDS IRRIGATION
		CHANGED BY: 50609			CAN	UG												
		CHANGED BY: 50977			ABR	UG												
205	30731			10/8/1976	DEN	UG						5	IRD		10/8/1976	0	CL	MEADOW VLY FARM LANDS IRRIGATION CO.
205	30732			10/8/1976	ABR	UG	NE	SE	22	14S	66E	5	IRD		10/8/1976	0	CL	MEADOW VALLEY FARM LAND IRRIGATION
		CHANGED BY: 50610			CAN	UG												
		CHANGED BY: 50978			ABR	UG												
205	30733			10/8/1976	DEN	UG	NW	NW	26	14S	66E	5	IRD		10/8/1976	0	CL	MEADOW VALLEY FARM LANDS IRR. CO.
205	30734			10/8/1976	ABR	UG	SW	SW	26	14S	66E	5	IRD		10/8/1976	0	CL	MEADOW VALLEY FARM LANDS IRR. CO.
		CHANGED BY: 50611			CAN	UG												
		CHANGED BY: 50979			ABR	UG												
205	30735			10/8/1976	DEN	UG	SE	SW	26	14S	66E	5	IRD		10/8/1976	0	CL	MEADOW VALLEY FARM LANDS IRR. CO.
205	30738			10/8/1976	DEN	UG	SE	NE	35	14S	66E	5	IRD		10/8/1976	0	CL	MEADOW VALLEY FARM LANDS IRR. CO.
205	31044		10371	1/31/1977	CER	UG	SE	SE	24	04S	66E	0.15	IRR		1/31/1977	29.55	LI	H.H. LAND AND CATTLE COMPANY

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							POINT OF DIVERSION											
205	31045		10372	1/31/1977	CER	UG	SE	SE	13	04S	66E	0.34	IRR	Y	1/31/1977	72.91	LI	H.H. LAND AND CATTLE COMPANY
205	31098		9840	2/14/1977	CER	UG	NE	NW	14	09S	67E	3.75	IRR	Y	2/14/1977	290.52	LI	GLENDALE OC IRREVOCABLE BUSINESS TRUST
		CHANGED BY: 68339			ABR	UG												
205	31118			2/17/1977	ABR	UG	SW	NW	02	05S	66E	3.34	IRR		2/17/1977	0	LI	TENNILLE, JAMES B. JR.
		CHANGED BY: 45945			CER	UG												
205	31315			4/11/1977	ABR	UG	NW	NW	02	15S	68E	0.25	IRR		4/11/1977	0	CL	EWING, JAMES L.
		CHANGED BY: 49298			CER	UG												
205	31620			5/11/1977	DEN	UG	NW	NW	29	13S	66E	4	IRR		5/11/1977	0	CL	HAWORTH, JERRY L.
205	31621			5/11/1977	DEN	UG	SE	NW	29	13S	66E	4	IRR		5/11/1977	0	CL	STROUD, A. ALLEN
205	31622			5/11/1977	DEN	UG	SW	SW	20	13S	66E	4	IRR		5/11/1977	0	CL	STROUD, A. ALLEN
205	31623			5/11/1977	DEN	UG	NE	NW	32	13S	66E	4	IRR		5/11/1977	0	CL	STROUD, A. ALLEN
205	31624			5/11/1977	DEN	UG	NW	SW	33	13S	66E	4	IRR		5/11/1977	0	CL	HAWORTH, JAMES S.
205	31625			5/11/1977	DEN	UG	NW	SE	32	13S	66E	4	IRR		5/11/1977	0	CL	HAWORTH, JAMES S.
205	31626			5/11/1977	DEN	UG	SW	NW	33	13S	66E	4	IRR		5/11/1977	800	CL	HAWORTH, JERRY L.
205	31627			5/11/1977	DEN	UG	NE	SW	29	13S	66E	4	IRR		5/11/1977	800	CL	HAWORTH, JERRY L.
205	31628			5/11/1977	DEN	UG	NW	NE	32	13S	66E	0	IRR		5/11/1977	0	CL	HAWORTH, JAMES S.
205	31629			5/11/1977	DEN	UG	SW	NE	32	13S	66E	2	IRR		5/11/1977	400	CL	STROUD, A. ALLEN
205	3169			11/12/1914	CAN	STR	SE	SW	15	14S	66E	1.6	IRR	Y	11/12/1914		CL	POWERS, W.J.
205	31954			6/6/1977	CAN	UG		SW	33	13S	66E	3	IRR		6/6/1977	0	CL	PERKINS, KATHY
205	31955			6/6/1977	CAN	UG		NW	33	13S	66E	3	IRR		6/6/1977	0	CL	PERKINS, TIM
205	31982			6/9/1977	CAN	UG	NW	SE	15	13S	66E	3	IRR		6/9/1977	0	CL	SCHOLL, BEVERLY J.
205	32059			6/13/1977	CAN	UG	SW	NW	22	14S	66E	3	IRR		6/13/1977	77.5	CL	HUGHES, LARRY ROGER
		CHANGED BY: 47637			CAN	UG												

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205	32060			6/13/1977	ABR	UG	SW	NW	22	14S	66E	3	IRR		6/13/1977	0	CL	LEWIS, RICHARD CLARENCE
		CHANGED BY: 50980			ABR	UG												
		CHANGED BY: 50612			CAN	UG												
205	32061			6/13/1977	ABR	UG	SW	NW	22	14S	66E	3	IRR		6/13/1977	0	CL	LEWIS, ROBERT C. AND VIVIAN C.
		CHANGED BY: 50581			WDR	UG												
		CHANGED BY: 50613			CAN	UG												
		CHANGED BY: 51283			ABR	UG												
205	32450			6/29/1977	WDR	UG				08S	67E	6	IRC		6/29/1977	0	LI	GRAY'S MEADOW VALLEY FARMS
205	32752			7/8/1977	CAN	UG	SW	NW	07	13S	66E	3	IRR		7/8/1977	0	CL	KEBLINGER, ROBERT
205	32763			7/11/1977	CAN	UG	SE	NW	18	13S	66E	0	IRR		7/11/1977	0	CL	SCHOLL, JAMES L JR.
205	32764			7/11/1977	CAN	UG	NE	NE	30	13S	66E	0	IRR		7/11/1977	0	CL	KEBLINGER, PATRICIA
205	32809			7/14/1977	DEN	UG	NW	SW	29	13S	66E	2.8	IRR		7/14/1977	0	CL	MUNOZ, ALFRED V.
205	32911			7/25/1977	DEN	UG	NW	NW	04	14S	66E	2.8	IRR		7/25/1977	0	CL	STOKKE, EARTHA A.
205	32912			7/25/1977	DEN	UG	NE	NE	05	14S	66E	2.8	IRR		7/25/1977	0	CL	KJERSTEN, MARLENE E.
205	32915			7/26/1977	CAN	UG	NW	NE	18	13S	66E	2	IRR		7/26/1977	0	CL	WALKER, JAY DEE
205	32948			7/28/1977	DEN	UG	NW	NW	30	11S	66E	2.7	IRR		7/28/1977	0	LI	GRAY, MARGARET V.
205	32949			7/28/1977	DEN	UG	SE	SW	19	11S	66E	2.7	IRR		7/28/1977	0	LI	SCHOBER, MARJORIE L.
205	3295		1392	3/6/1915	CER	SPR	NE	SW	26	10S	65E	0.012	STK	Y	1/1/1913	8.89981	LI	HIKO LAND AND CATTLE CO.
205	33055		13469	8/5/1977	CER	UG	NE	NW	27	14S	66E	0.267	IRR		8/5/1977	9.999999 9046325 7	CL	BRINKERHOFF, REE & KATRINA
		CHANGED BY: 68621			CAN	UG												
		CHANGED BY: 62874			CER	UG												
		CHANGED BY: 71023			CER	UG												
		CHANGED BY: 71024			ABR	UG												

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		CHANGED BY: 65761			CER	UG												
205	33050		9307	8/5/1977	CER	UG	NE	NW	27	14S	66E	0.5	IRR		1/25/1971	60	CL	CUTLER, HAROLD K.
		CHANGED BY: 43743			CAN	UG												
		CHANGED BY: 44240			CAN	UG												
		CHANGED BY: 67339			DEN	UG												
205	33182			8/15/1977	CAN	UG	NW	NW	36	12S	65E	2.5	IRR		8/15/1977	0	LI	LESTER, MURL STUART
205	33166			8/15/1977	WDR	UG	NE	SW	32	13S	66E	3	IRR		8/15/1977	0	CL	JOHNSON, CHARLEY R.
205	33195			8/18/1977	CAN	UG	NE	NE	12	13S	65E	2.5	IRR		8/18/1977	0	CL	GLASS, DARRELL LEE
205	33248			8/22/1977	CAN	UG	SE	NW	07	13S	66E	4	IRR		8/22/1977	0	CL	DEWITT, RANDALL
205	33249			8/22/1977	DEN	UG	NW	NW	14	08S	67E	2.7	IRR		8/22/1977	0	LI	GRAY, JOHN F.
205	33250			8/22/1977	DEN	UG	NW	NW	23	08S	67E	2.7	IRR		8/22/1977	0	LI	GRAY, FLORENE
205	33251			8/22/1977	DEN	UG	NW	NE	36	11S	65E	2.7	IRC		8/22/1977	0	LI	GRAY, ROSS A.
205	33252			8/22/1977	DEN	UG	NE	SE	25	11S	65E	2.7	IRC		8/22/1977		LI	GRAY, JEAN M.
205	33253			8/22/1977	DEN	UG	NW	SW	14	09S	67E	2.7	IRC		8/22/1977		LI	KOONTZ, ROSS
205	33254			8/22/1977	CAN	UG	NW	SE	36	11S	65E	2.7	IRC		8/22/1977	0	LI	GRAY, T.P
205	33255			8/22/1977	CAN	UG	NE	NW	01	12S	65E	2.7	IRC		8/22/1977	0	LI	GRAY, GEORGIA O.
205	33269			8/22/1977	CAN	UG	NW	NW	05	14S	66E	5	IRR		8/22/1977	0	CL	MEADOW VALLEY ASSOCIATION
205	33270			8/22/1977	CAN	UG	NW	NW	24	12S	66E	5	IRR		8/22/1977	0	LI	MEADOW VALLEY ASSOCIATION
205	33271			8/22/1977	CAN	UG	NE	NE	30	13S	68E	0	IRR		8/22/1977	0	CL	MEADOW VALLEY ASSOCIATION
205	33308			8/23/1977	CAN	UG	NW	SW	20	13S	66E	3	IRR		8/23/1977	0	CL	KIMBALL, DEBORAH
205	33314			8/23/1977	CAN	UG	NW	NW	29	13S	66E	2.8	IRR		8/23/1977	0	CL	TOLLESTRUP, MARY
205	33354			8/26/1977	CAN	UG			32	14S	66E	3	IRR		8/26/1977	800	CL	BAKER, ANTHONY P
205	33388			8/29/1977	DEN	UG	NW	SE	29	13S	66E	3	IRR		8/29/1977	0	CL	GREENE, O. BARRY

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205	33700			9/22/1977	CAN	UG	NE	SW	07	14S	66E	2.7	IRC		9/22/1977		CL	UNGARO, JAMES C.
205	33701			9/22/1977	CAN	UG	NW	SE	18	14S	66E	2.7	IRC		9/22/1977		CL	UNGARO, LAURA
205	33702			9/22/1977	CAN	UG	SE	NW	07	14S	66E	2.7	IRC		9/22/1977		CL	UNGARO, ROCK C.
205	33703			9/22/1977	CAN	UG	SW	NE	07	14S	66E	2.7	IRC		9/22/1977		CL	UNGARO, MARY
205	33704			9/22/1977	CAN	UG	NW	SE	13	14S	65E	2.7	IRC		9/22/1977	100	CL	KOSTAL, HARRIET GRACE
205	33705			9/22/1977	CAN	UG	NW	NW	13	14S	65E	2.7	IRC		9/22/1977	100	CL	KOSTAL, KATHY ANNE
205	33706			9/22/1977	CAN	UG	NW	NE	13	14S	65E	2.7	IRR		9/22/1977	100	CL	KOSTAL, ARTHUR H.
205	33707			9/22/1977	CAN	UG	NW	SW	18	14S	66E	2.7	IRC		9/22/1977		CL	UNGARO, ELIZABETH J.
205	33708			9/22/1977	CAN	UG	NW	SE	07	14S	66E	2.7	IRC		9/22/1977		CL	UNGARO, JAMES P.
205	33709			9/22/1977	CAN	UG	NW	NW	18	14S	66E	2.7	IRC		9/22/1977		CL	UNGARO, MARCELLINA CELLINI
205	33710			9/22/1977	CAN	UG	NW	NE	18	14S	66E	2.7	IRC		9/22/1977		CL	UNGARO, MARK CURRAN
205	33711			9/22/1977	CAN	UG	NW	NW	19	14S	66E	2.7	IRC		9/22/1977		CL	KONYS, MARK
205	33712			9/22/1977	CAN	UG		NE	19	14S	66E	2.7	IRC		9/22/1977		CL	KONYS, JAMES J.
205	33713			9/22/1977	CAN	UG	NW	SE	19	14S	66E	2.7	IRC		9/22/1977		CL	KONYS, ROBERT E.
205	33714			9/22/1977	CAN	UG		SW	19	14S	66E	2.7	IRC		9/22/1977		CL	KONYS, SUE
205	33715			9/22/1977	CAN	UG	NW	SE	28	14S	66E	2.7	IRC		9/22/1977		CL	ROSZYK, ALAN
205	33716			9/22/1977	CAN	UG	SW	NE	28	14S	66E	2.7	IRC		9/22/1977		CL	GOMAN, NICK C.
205	33717			9/22/1977	CAN	UG		SW	13	14S	65E	2.7	IRR		9/22/1977	100	CL	KOSTAL, CANDICE LYNN
205	33857			9/28/1977	CAN	UG		NE	12	14S	65E	2.7	IRR		9/28/1977	0	CL	ZAPPULLA, JOSEPH G.
205	33858			9/28/1977	CAN	UG		SE	01	14S	65E	2.7	IRR		9/28/1977	0	CL	ALLEN, HANNA JO
205	33861			9/28/1977	CAN	UG		SE	12	14S	65E	2.7	IRR		9/28/1977	100	CL	KELLEY, RICHARD D.
205	33889			9/30/1977	DEN	UG	SE	NW	01	14S	65E	2.7	IRR		9/30/1977	0	CL	GRANTHAM, MEL M.
205	3396			5/17/1915	CAN	UG	NW	NW	27	14S	66E	3.2	IRR	Y	5/17/1915		CL	THRESHER, JOSEPH E.

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205	34171			11/14/1977	CAN	UG		NW	34	14S	66E	2.7	IRR		11/14/1977	0	CL	BARRETT, HERBERT L.
205	34172			10/14/1977	CAN	UG		NE	33	14S	66E	2.7	IRR		10/14/1977		CL	GOODIELL, ALFRED E.
205	34811		19742	11/14/1977	CER	UG	SW	SW	14	09S	67E	1.7	IRR	Y	10/11/2012	161.45	LI	SCOTT, CATHERINE S.
		CHANGED BY: 66285			WDR	UG												
		CHANGED BY: 75443			CAN	UG												
		CHANGED BY: 75826			ABR	UG												
205	34817			1/3/1978	ABR	UG	NE	SE	27	14S	66E	1	IRR		1/3/1978	0	CL	LEWIS, ROBERT C. AND VIVIAN
		CHANGED BY: 50982			ABR	UG												
		CHANGED BY: 50014			CAN	UG												
205	35309			4/18/1978	CAN	UG	NW	SW	08	04S	67E	1	MUN		5/14/1941	0	LI	CALIENTE PUBLIC UTILITIES
205	35434			5/15/1978	DEN	UG	NW	NW	25	12S	65E	2.67	IRR		5/15/1978	0	LI	MOSS, JAMES W.
205	35526			6/12/1978	CAN	UG	SW	SE	35	14S	66E	0.16	IRR		6/12/1978	125	CL	HESTER, VERA A.
205	35588			7/3/1978	ABR	UG	NW	SW	08	04S	67E	3	MUN		7/3/1978	0	LI	CALIENTE PUBLIC UTILITIES
		CHANGED BY: 49892			ABR	UG												
		CHANGED BY: 49893			CER	UG												
205	35589			7/3/1978	CAN	UG	SW	SW	22	14S	66E	0.67	IRR		7/3/1978	100	CL	WHIPPLE, J. LYNN
205	35655			7/24/1978	DEN	UG	NW	NE	18	13S	66E	2.7	IRC		7/24/1978		CL	WALKER, JAY DEE
205	35758			8/17/1978	ABR	UG	NE	NE	27	14S	66E	0.13	IRR		8/17/1978	0	CL	SCHLARMAN, HENRY J. AND SOPHIA
		CHANGED BY: 50615			CAN	UG												
		CHANGED BY: 50983			ABR	UG												
205	35757		10753	8/17/1978	CER	UG	NE	NE	27	14S	66E	0.13	IRR		9/18/1972	73.59999 99	CL	WRIGHT, J. & R. & LYMAN, SHARI
205	3590			9/27/1915	CAN	SPR	NE	SE	34	09S	67E	0	STK	Y	9/27/1915	0	LI	HENRIE, R.P.
205	35904			9/21/1978	CAN	UG	NW	NW	27	14S	66E	0.375	IRR		9/21/1978	75	CL	COLE, JOE

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205	36093			10/24/1978	DEN	UG	SW	NE	18	14S	66E	2.7	IRC		10/24/1978	100	CL	UNGARO, MARK CURRAN
205	36094			10/24/1978	DEN	UG	SE	NW	18	14S	66E	2.7	IRC		10/24/1978	100	CL	UNGARO, MARCELLINA CELLINI
205	36095			10/24/1978	DEN	UG	NW	SE	18	14S	66E	2.7	IRC		10/24/1978	100	CL	UNGARO, LAURA E.
205	36096			10/24/1978	DEN	UG	NW	SE	07	14S	66E	2.7	IRC		10/24/1978	100	CL	UNGARO, JAMES
205	36097			10/24/1978	DEN	UG	NE	SW	18	14S	66E	2.7	IRC		10/24/1978	100	CL	UNGARO, ELIZABETH J.
205	36098			10/24/1978	DEN	UG	SW	NE	07	14S	66E	2.7	IRC		10/24/1978	100	CL	UNGARO, MARY
205	36099			10/24/1978	DEN	UG	NE	SW	07	14S	66E	2.7	IRC		10/24/1978	100	CL	UNGARO, JAMES C.
205	36100			10/24/1978	DEN	UG	SE	NW	07	14S	66E	2.7	IRC		10/24/1978	100	CL	UNGARO, ROCK C.
205	36285			12/13/1978	ABR	STR	NE	SW	18	13S	66E	5.4	IRR		7/7/2000	0	CL	INFINITON LLC
		CHANGED BY: 69337			ABR	STR												
205	36895			3/6/1979	CAN	UG	NW	SW	12	12S	65E	3	IRD		3/6/1979	0	LI	DUNN, LYNN P.
205	37171			3/26/1979	CAN	UG						7	IRC		3/26/1979		LI	DOBSON, RONALD W.
205	37172			3/26/1979	CAN	UG						7	IRC		3/26/1979		LI	DOBSON, LOIS L.
205	37173			3/26/1979	CAN	UG						7	IRC		3/26/1979		LI	DOBSON, HARLON S.
205	37174			3/26/1979	CAN	UG						7	IRC		3/26/1979		LI	JONES, CLARENCE H.
205	37175			3/26/1979	CAN	UG						7	IRC		3/26/1979		LI	JONES, JUDY L.
205	37198			3/26/1979	DEN	UG	SW	NW	28	14S	66E	5.4	IRD		3/26/1979	0	CL	GORMAN, NICK C.
205	37203			3/26/1979	DEN	UG	NE	SW	23	14S	66E	5.4	IRD		3/26/1979	0	CL	EARL, DORIS
205	37204			3/26/1979	DEN	UG	NE	NW	26	14S	66E	5.4	IRD		3/26/1979	0	CL	EARL, LEE M.
205	37205			3/26/1979	DEN	UG	NE	NE	04	14S	66E	5.4	IRD		3/26/1979	1600	CL	LEAVITT, MICHAEL E.
205	37210			3/26/1979	DEN	UG	NE	NE	35	14S	66E	5.4	IRD		3/26/1979	1600	CL	LEAVITT, GERALD N.
205	37212			3/26/1979	DEN	UG	SW	SE	27	14S	66E	5.4	IRD		3/26/1979	1600	CL	LEAVITT, ELEANORA E.
205	37213			3/26/1979	DEN	UG	NW	NW	23	14S	66E	5.4	IRD		3/26/1979	1600	CL	WITTWER, NELLIE

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205	37214			3/26/1979	DEN	UG	NW	NW	04	14S	66E	5.4	IRD		3/26/1979	1600	CL	JOSEPH, BERNARD
205	37254			3/27/1979	DEN	UG	NE	NE	09	14S	66E	5.4	IRD		3/27/1979		CL	LEAVITT, J. ROBERT CARLETON
205	37250			3/27/1979	DEN	UG	NE	NW	09	14S	66E	5.4	IRD		3/27/1979		CL	LEAVITT, VAUGHN K.
205	37310			3/29/1979	CAN	UG	NE	NW	13	12S	65E	9	IRD		3/29/1979		LI	BREEDLOVE, C.P.
205	37326			3/29/1979	CAN	UG	SW	SW	36	11S	65E	7	IRD		3/29/1979	0	LI	BULGER, CAROLYN
205	37329			3/29/1979	CAN	UG			12	12S	65E	7	IRR		3/29/1979		LI	THOMPSON, PAUL R.
205	37330			3/29/1979	CAN	UG			12	12S	65E	7	IRR		3/29/1979		LI	SCARPATI, RALPH L.
205	37331			3/29/1979	CAN	UG	NW	NW	01	12S	65E	7	IRR		3/29/1979		LI	THOMPSON, MARY V.
205	37332			3/29/1979	CAN	UG	NW	NW	01	12S	65E	7	IRR		3/29/1979		LI	SCARPATI, JOHN W.
205	37333			3/29/1979	CAN	UG	SE	SE	11	12S	65E	7	IRR		3/29/1979		LI	THOMPSON, WM. T.
205	37334			3/29/1979	CAN	UG	NW	NW	36	11S	65E	7	IRD		3/29/1979	0	LI	THOMPSON, KAY F.
205	37399			3/30/1979	CAN	UG	NW	NW	10	14S	66E	8	IRD		3/30/1979		CL	STROUD, A. ALLEN
205	3747			12/20/1915	CAN	SPR	NE	NE	18	05S	66E	1	MM		12/20/1915		LI	TAYLOR, JOSEPH W.
205	37565			4/2/1979	DEN	UG	NE	SW	12	12S	65E	5	IRD		4/2/1979	0	LI	JENSEN, RAYMOND
205	37566			4/2/1979	DEN	UG	SE	NW	01	12S	65E	5	IRD		4/2/1979	0	LI	JENSEN, JACK D.
205	3761			12/30/1915	DEN	STR	SW	NE	05	14S	66E	3.2	IRR		12/30/1915	0	CL	VAN HORN, WILLIAM H.
205	3762			1/3/1916	CAN	SPR	NE	SE	34	09S	67E	0.05	STK		1/3/1916		LI	HENRIE, R.P.
205	37652			4/3/1979	DEN	UG	NW	NW	10	14S	66E	5.4	IRD		4/3/1979		CL	ROSENHAN, KATHLEEN
205	3776			1/13/1916	DEN	STR	SW	NE	05	14S	66E	3.2	IRR		1/13/1916	0	CL	POWERS, WILLIAM J.
205	37868			4/10/1979	CAN	UG	NE	SE	12	12S	65E	5.7	IRD		4/10/1979	0	LI	MOYLES, JAMES R.
205	37871			4/10/1979	CAN	UG	NW	SW	13	12S	65E	5.7	IRD		4/10/1979	0	LI	PLEYTE, JACK C.
205	37929			4/16/1979	DEN	UG	NE	NW	15	14S	66E	5.4	IRD		4/16/1979		CL	ROSENHAN, MAX
205	3797			2/15/1916	DEN	STR	SW	SW	14	09S	67E	3	IRR		2/15/1916	0	LI	RAPPLEYE, EZRA T. JR

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205	38060			4/30/1979	CAN	UG	SW	NW	10	14S	66E	5	IRD		4/30/1979	700	CL	STEWART, THERON D.
205	38061			4/30/1979	CAN	UG	SE	SW	10	14S	66E	5	IRD		4/30/1979	800	CL	STEWART, THERON D.
205	38062			4/30/1979	CAN	UG	SW	SE	22	14S	66E	2	IRD		4/30/1979	400	CL	STEWART, MARK A.
205	38063			4/30/1979	CAN	UG	SW	SW	23	14S	66E	2	IRD		4/30/1979	400	CL	STEWART, MARK A.
205	38064			4/30/1979	CAN	UG	SW	NW	26	14S	66E	2	IRD		4/30/1979	400	CL	STEWART, MARK A.
205	38065			4/30/1979	DEN	UG	NE	NE	09	14S	66E	5	IRD		4/30/1979	1600	CL	DRISCOLL DAVID E.
205	38066			4/30/1979	DEN	UG	NW	NW	09	14S	66E	5	IRD		4/30/1979	1600	CL	DRISCOLL DAVID E.
205	38067			4/30/1979	DEN	UG	NW	NE	09	14S	66E	5	IRD		4/30/1979		CL	DRISCOLL, DAVID E.
205	38068			4/30/1979	DEN	UG	NE	SE	22	14S	66E	5	IRD		4/30/1979		CL	STEWART,DANA H.
205	38069			4/30/1979	DEN	UG	NE	NE	22	14S	66E	5	IRD		4/30/1979		CL	STEWART, DANA H.
205	38070			4/30/1979	DEN	UG	SE	NE	22	14S	66E	5	IRD		4/30/1979		CL	STEWART, DANA H.
205	38071			4/30/1979	DEN	UG	SE	SW	09	14S	66E	5	IRD		4/30/1979	0	CL	STEWART, BRENT D.
205	38072			4/30/1979	DEN	UG	SE	SE	09	14S	66E	5	IRD		4/30/1979	0	CL	STEWART, BRENT W.
205	38073			4/30/1979	DEN	UG	NW	SW	09	14S	66E	5	IRD		4/30/1979		CL	STEWART, BRENT D.
205	38091			5/3/1979	ABR	UG	SE	NE	27	14S	66E	0.2	IRR		5/3/1979	0	CL	LEWIS, MRS. VIVIAN
		CHANGED BY: 50984			ABR	UG												
		CHANGED BY: 50618			CAN	UG												
205	38333			6/15/1979	DEN	UG	NE	NE	29	14S	66E	5.4	IRD		6/15/1979		CL	GESSLER, EARL N.
205	38589			7/18/1979	CAN	UG	NE	SW	09	14S	66E	0	IRD		7/18/1979		CL	KNEPPER, TOM R. JR.
205	38604			7/20/1979	DEN	UG	SE	NE	17	14S	66E	6	IRD		7/20/1979		CL	BOATMAN, MARILYN
205	38605			7/20/1979	CAN	UG	NW	NE	08	14S	66E	6	IRD		7/20/1979		CL	SUMPTER, HELEN F.
205	38606			7/20/1979	CAN	UG	NW	NE	09	14S	66E	6	IRD		7/20/1979		CL	SUMPTER, CHARLES G.
205	38607			7/20/1979	DEN	UG	NW	NW	09	14S	66E	6	IRD		7/20/1979		CL	SUMPTER, JEFFERY LYNN

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205	38608			7/20/1979	DEN	UG	SE	SW	16	14S	66E	6	IRD		7/20/1979	0	CL	BATDORF, JOHN W.
205	38609			7/20/1979	DEN	UG	NE	NW	21	14S	66E	6	IRD		7/20/1979		CL	DUGGAN, DAVID
205	38610			7/20/1979	DEN	UG	NW	NE	04	14S	66E	6	IRD		7/20/1979	0	CL	HUGHES, LISA
205	38611			7/20/1979	DEN	UG	SW	NW	10	14S	66E	6	IRD		7/20/1979		CL	DUGGAN, ANN C.
205	38612			7/20/1979	DEN	UG	SW	NW	04	14S	66E	6	IRD		7/20/1979		CL	DUGGAN, JONATHAN
205	38613			7/20/1979	DEN	UG	SW	SW	15	14S	66E	6	IRD		7/20/1979	0	CL	DUGGAN, MATTHEW
205	38614			7/20/1979	CAN	UG		SE	21	14S	66E	6	IRD		7/20/1979	0	CL	SUHRING, LUCILE C.
205	38615			7/20/1979	CAN	UG	SW	SW	33	13S	66E	2.7	IRC		7/20/1979		CL	TORKELSON, INEZ
205	38616			7/20/1979	DEN	UG	SE	SW	32	13S	66E	6	IRC		7/20/1979		CL	DUGGAN, ERIC
205	38617			7/20/1979	DEN	UG	NE	NE	22	14S	66E	6	IRD		7/20/1979	0	CL	ESPINOZA, JORI
205	38618			7/20/1979	CAN	UG	NW	NE	05	14S	66E	6	IRD		7/20/1979	0	CL	AMBROSE, TRACY
205	38648			7/23/1979	CAN	UG	NW		04	14S	66E	0	IRD		7/23/1979	0	CL	KNEPPER, THOMAS R. SR.
205	38664			7/25/1979	DEN	UG	NE	SE	16	14S	66E	6	IRD		7/25/1979	0	CL	MORRISON, CALVIN O.
205	38671			7/25/1979	DEN	UG	NW	NE	26	14S	66E	6	IRD		7/25/1979	0	CL	KOFOED, EARL B.
205	38672			7/25/1979	DEN	UG	SE	SE	22	14S	66E	6	IRD		7/25/1979	0	CL	DOBBS, ALENE K.
205	38673			7/25/1979	CAN	UG	NE	NW	35	14S	66E	6	IRD		7/25/1979	0	CL	DIBELLA, JANIE L.
205	39387		10738	10/24/1979	CER	UG	SW	SW	07	13S	66E	0.09	OM		10/24/1979	4.460594	CL	LOS ANGELES & SALT LAKE RAILROAD CO.
205	39605			11/21/1979	CAN	STR	NW	SW	11	08S	67E	5.5	IRR		11/9/1959	0	LI	JENSEN'S PALISADE INC.
205	40262			1/8/1980	DEN	UG	NW	NE	18	07S	67E	4	IRD		1/8/1980	0	LI	BRADSHAW, BARBARA
205	40394			1/23/1980	CAN	UG	NE	W2	29	13S	66E	5.4	IRC		1/23/1980		CL	BROWN, MARVIN E.
205	40395			1/23/1980	DEN	UG	NE	NE	04	14S	66E	5.4	IRD		1/23/1980	0	CL	WARD, STEVE E.
205	40396			1/23/1980	CAN	UG	NE	SW	32	13S	66E	5.4	IRC		1/23/1980		CL	WARD, ELAINE A.
205	40397			1/23/1980	DEN	UG	SE	NE	21	14S	66E	5.4	IRD		1/23/1980	0	CL	GUIN, JAMES W.

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205	40398			1/23/1980	DEN	UG	NE	SE	21	14S	66E	5.4	IRD		1/23/1980	0	CL	GUIN, BARBARA J.
205	40399			1/23/1980	DEN	UG	SW	NW	22	14S	66E	5.4	IRD		1/23/1980	0	CL	GUIN, ARCHIE D.
205	40553			2/19/1980	DEN	UG	NW	SE	09	14S	66E	6.2	IRD		2/19/1980	0	CL	SUMPTER, CHARLES G.
205	40554			2/19/1980	DEN	UG	NW	SE	08	14S	66E	6	IRD		2/19/1980	0	CL	SUMPTER, HELEN F.
205	40555			2/19/1980	DEN	UG	NW	SE	05	14S	66E	6	IRD		2/19/1980	0	CL	AMBROSE, TRACY L.
205	40772			2/28/1980	CAN	UG	SE	SE	17	14S	66E	6	IRD		2/28/1980	0	CL	BOATMAN, MARILYN
205	40773			2/28/1980	CAN	UG	SE	NW	16	14S	66E	6	IRD		2/28/1980	0	CL	BATDORF, JOHN W.
205	40791			3/3/1980	DEN	UG	NE	NE	18	14S	66E	6	IRD		3/3/1980	0	CL	MORRISON, CALVIN O.
205	40792			3/3/1980	DEN	UG	NW	SW	09	14S	66E	6	IRD		3/3/1980	0	CL	SUMPTER, JEFFREY LYNN
205	40796			3/3/1980	DEN	UG	NE	NW	35	14S	66E	6	IRD		3/3/1980	0	CL	DI BELLA, JANIE L.
205	40798			3/3/1980	DEN	UG	SE	SW	28	14S	66E	6	IRD		3/3/1980	0	CL	KOFOED, EARL B.
205	40799			3/3/1980	DEN	UG	SW	SW	23	14S	66E	6	IRD		3/3/1980		CL	DOBBS, ALENE K.
205	40834			3/5/1980	DEN	UG	SW	SE	32	13S	66E	6	IRC		3/5/1980		CL	DUGGAN, ERIC
205	40835			3/5/1980	DEN	UG	SW	SW	10	14S	66E	6	IRD		3/5/1980	0	CL	DUGGAN, ANN C.
205	40836			3/5/1980	DEN	UG	NW	SW	04	14S	66E	6	IRD		3/5/1980	0	CL	DUGGAN, JONATHAN
205	40837			3/5/1980	DEN	UG	SW	SW	15	14S	66E	6	IRD		3/5/1980	0	CL	DUGGAN, MATTHEW
205	40838			3/5/1980	DEN	UG	NE	SE	15	14S	66E	6	IRD		3/5/1980	0	CL	ESPINOZA, JORI
205	40839			3/5/1980	DEN	UG	SW	SE	33	13S	66E	6	IRC		3/5/1980		CL	TORKELSON, INEZ
205	40840			3/5/1980	DEN	UG	NW	SE	04	14S	66E	6	IRD		3/5/1980	0	CL	HUGHES, LISA
205	40841			3/5/1980	DEN	UG	NE	NE	21	14S	66E	6	IRD		3/5/1980	0	CL	DUGGAN, DAVID
205	40903			3/17/1980	ABR	UG	SE	NE	01	13S	65E	1	IRR		3/17/1980	0	CL	STUART, ROBERT B.
		CHANGED BY: 61408T			EXP	UG												
		CHANGED BY: 62398			WDR	UG												

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205	40909			3/18/1980	CAN	UG	NW	SW	13	14S	65E	5.4	IRD		3/18/1980		CL	LOISELLE, ROGER
205	40996			4/1/1980	CAN	UG	SE	SE	15	09S	67E	4.8	IRR		4/1/1980		LI	WOOD, MICHAEL LESLIE
205	40998		14226	4/1/1980	CER	SPR	NE	NE	19	04S	67E	0.003	REC		7/18/1994	2.424431	LI	NEVADA-PARKS DIVISION
205	40999		14903	4/1/1980	CER	SPR	NE	NE	19	04S	67E	0.011	REC		4/1/1980	8.040518	LI	NEVADA-PARKS DIVISION
205	41000		14904	4/1/1980	CER	SPR	NE	NE	19	04S	67E	0.007	REC		4/1/1980	4.848862	LI	NEVADA-PARKS DIVISION
205	42380			9/4/1980	DEN	UG	SE	SE	15	09S	67E	12	IRD		9/4/1980		LI	WOOD, MICHAEL LESLIE
205	42381			9/4/1980	DEN	UG	SE	SE	15	09S	67E	12	IRD		9/4/1980		LI	WOOD, MICHAEL LESLIE
205	42382			9/4/1980	DEN	UG	SE	SE	15	09S	67E	12	IRD		9/4/1980		LI	WOOD, MICHAEL LESLIE
205	42682			10/17/1980	CAN	STR	SW	SE	30	06S	66E	0	IRR		10/17/1980	0	LI	BRADSHAW INC.
205	42751			10/30/1980	CAN	UG	NW	NW	17	14S	66E	5	IRD		10/30/1980		CL	WITTWER, NETTIE E.
205	42762			11/3/1980	DEN	UG	SE	SE	15	09S	67E	12	IRD		11/3/1980		LI	WOOD, MICHAEL LESLIE
205	4338		1569	3/2/1917	CER	RES	SW	SW	17	07S	68E	0.015	STK		3/2/1917	4.695417	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	4339		1570	3/2/1917	CER	RES	SE	SW	05	07S	68E	0.015	STK	Y	3/2/1917	4.695417	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	4340		426	3/2/1917	CER	STR	SE	SE	23	06S	67E	0.025	STK	Y	3/2/1917	8.782269	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	4341		1571	2/2/1917	CER	SPR	NW	NW	18	06S	68E	0.017	STK	Y	2/2/1917	6.321934	LI	BARNES, DAVE L.
205	43530			4/14/1981	CAN	UG	SE	NW	17	14S	66E	6	IRD		4/14/1981	0	CL	MORRISON, CHARLES ALAN
205	43531			4/14/1981	CAN	UG	NE	SW	17	14S	66E	6	IRD		4/14/1981		CL	MORRISON, CHARLES ALAN
205	43532			4/14/1981	CAN	UG	SE	NE	18	14S	66E	6	IRD		4/14/1981		CL	MORRISON, CHARLES ALAN
205	43545			4/15/1981	CAN	UG	SE	NE	18	14S	66E	6	IRD		4/15/1981		CL	MORRISON, KRISTI
205	43546			4/15/1981	CAN	UG	SE	SE	18	14S	66E	6	IRD		4/15/1981		CL	MORRISON, KRISTI
205	43547			4/15/1981	CAN	UG	NW	NE	29	14S	66E	6	IRD		4/15/1981		CL	MORRISON, CHARLES ALAN
205	43548			4/15/1981	CAN	UG	SE	SW	20	14S	66E	6	IRD		4/15/1981		CL	MORRISON, CHARLES ALAN
205	43743			5/15/1981	CAN	UG	NW	NW	27	14S	66E	0.003	IRR		8/5/1977	2.5	CL	LEARNED, BENJAMIN

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('205') Run Date: 8/22/2019 9:20:21 AM

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205	43822			6/2/1981	DEN	UG	NE	NW	19	13S	66E	5.4	IRR		6/2/1981	0	CL	COLE, NELDA (MRS.)
205	43850			6/8/1981	CAN	UG	SE	SE	32	13S	66E	0.02	MM		6/8/1981	11.50837 5	CL	TEMPLE & BRECHAN
205	44159			7/15/1981	DEN	UG	SE	NE	27	05S	66E	0.33	IRD		7/15/1981	0	LI	BALLOW, JOE C.
205	44160			7/15/1981	DEN	STR	SE	SE	29	05S	66E	0.25	IRD		7/15/1981	0	LI	BALLOW, JOE C.
205	44161			7/15/1981	DEN	STR	NW	NE	32	05S	66E	0.25	IRD		7/15/1981	0	LI	BALLOW, JOE C.
205	44212			7/30/1981	CAN	UG	NW	NE	20	07S	67E	0.305	IRR		7/30/1981	0	LI	HARVEY, CAROLINE
		CHANGED BY: 58003			CER	UG												
205	44240			8/6/1981	CAN	UG	NW	SE	27	14S	66E	0.028	IRR		1/25/1971	20	CL	LEWIS, ROBERT C.
205	44313		12946	8/19/1981	CER	UG	SE	NW	35	14S	66E	0.83	IND	Y	5/14/1965	458.0947 03	CL	NEVADA POWER CO.
205	44314			8/19/1981	CAN	UG	NE	SW	35	14S	66E	2.87	IND		5/14/1965	1933.038 732	CL	NEVADA POWER CO.
205	44315		12947	8/19/1981	CER	UG	SW	SW	26	14S	66E	1.1	IND	Y	5/14/1965	648.1516 8	CL	NEVADA POWER COMPANY
205	44316		12949	8/19/1981	CER	UG	NW	SE	35	14S	66E	1.92	IND	Y	5/14/1965	942.9809 03	CL	NEVADA POWER COMPANY
205	44317		12950	8/19/1981	CER	UG	SE	NW	35	14S	66E	0.16	IND	Y	5/14/1965	88.29225 3	CL	NEVADA POWER CO.
205	44318		12951	8/19/1981	CER	UG	SE	NW	35	14S	66E	0.79	IND	Y	5/14/1965	571.9508 93	CL	NEVADA POWER COMPANY
205	44719			10/29/1981	CAN	UG		SW	17	05S	66E	0.005	STK		10/29/1981	0	LI	BLM
205	45010			11/2/1981	ABR	UG	NE	SE	27	14S	66E	0.305	IRR		2/8/1973	0	CL	LEWIS, ROBERT C.
		CHANGED BY: 56489			ABR	UG												
205	45077			11/23/1981	CAN	UG	NE	SW	26	14S	66E	0	IRD		11/23/1981	0	CL	BINGHAM, JACOB DAVID
205	45078			11/23/1981	CAN	UG	NE	SW	27	14S	66E	0	IRD		11/23/1981	0	CL	AHLSTROM, FRED
205	45218		12955	1/14/1982	CER	UG	SW	SE	22	14S	66E	1.27	IND	Y	5/14/1965	715.9743 7	CL	NEVADA POWER COMPANY
205	45219		11186	1/14/1982	CER	UG	SE	SW	26	14S	66E	0.67	IND	Y	5/14/1965	485.08	CL	NEVADA POWER CO.
205	45220		11187	1/14/1982	CER	UG	NE	SW	35	14S	66E	2.67	IND	Y	5/14/1965	1933.08	CL	NEVADA POWER CO.
205	45540		10555	4/15/1982	CER	UG	SW	NE	27	14S	66E	0.07	IRR		9/18/1972	15.1	CL	EMBRY, MILTON

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205	45861			6/18/1982	WDR	UG	NW	NE	08	14S	66E	5.4	IRR		6/18/1982	0	CL	EARL, HAROLD
205	45945		10739	7/16/1982	CER	UG	SW	NW	02	05S	65E	2.37	IRR		2/17/1977	334.5	LI	325 EAST FOURTH ST
205	46080			8/23/1982	DEN	UG	SW	NE	33	13S	66E	1.8	MM		8/23/1982	0	CL	BLUE CACTUS MINING CO, INC.
205	46166			9/23/1982	ABR	UG	NE	SE	27	14S	66E	2	IRD		10/8/1978	0	CL	LEWIS, ROBERT C.
		CHANGED BY: 50985			ABR	UG												
		CHANGED BY: 50617			CAN	UG												
205	46512			1/10/1983	CAN	UG	SW	SW	25	12S	65E	2.228	MM		1/10/1983	20.070606	LI	GREAT BASIN MINES, INC.
205	4698			11/12/1917	CAN	SPR				04S	65E	0.025	STK	Y	11/12/1917	0	LI	GARDNER RANCH CO.
205	47085			7/19/1983	DEN	UG	SW	SW	30	12S	66E	5	MM		7/19/1983		LI	LABYRINTH CORPORATION
205	47109			7/27/1983	ABR	UG	SW	SW	31	12S	66E	3	MM		2/28/1986	0	LI	BLUE STAR MINING INC.
		CHANGED BY: 49785			CAN	UG												
205	4711			11/19/1917	DEN	SPR				05S	64E	0.1	STK		11/19/1917	0	LI	JONES, JOS.
205	47305			10/5/1983	DEN	STR	NW	SW	26	14S	66E	10	IRD		10/5/1983	1600	CL	LEWIS, ROBERT C.
205	47637			2/1/1984	CAN	UG	NW	SW	22	14S	66E	1	IRR		6/13/1977	137.5	CL	HUGHES, LARRY ROGER
205	47798		13579	3/14/1984	CER	SPR	NE	NW	22	06S	67E	0.01	OM		3/14/1984	2.209608	LI	JOHNSTON, THOMAS C.
205	47799		13580	3/14/1984	CER	UG	NW	NE	22	06S	67E	0.2	MM		3/14/1984	6.4047943	LI	JOHNSTON, THOMAS C.
205	48074			6/1/1984	DEN	UG	SE	SW	09	14S	66E	0.3	MM		6/1/1984		CL	COOK INTERNATIONAL INVESTMENTS, INC.
205	48075			6/1/1984	DEN	UG	SE	NE	08	14S	66E	0.3	MM		6/1/1984		CL	NEVADA NATIONAL MINING CORPORATION
205	48491		13250	10/16/1984	CER	STR	NW	NW	11	08S	67E	5.5	IRR		11/8/1959	862.09	LI	LEWIS, ROBERT C. & VIVIAN
205	48493			10/16/1984	CAN	UG	NE	NW	08	04S	67E	0.21	IRR		10/16/1984	58.65	LI	BARNETT, RONALD
205	49062			5/20/1985	CAN	UG			19	13S	66E	0	MM		5/20/1985	0	CL	HI-TECH CORPORATION
205	49079		13354	5/23/1985	CER	UG	NE	SW	09	10S	67E	0.87	IRR		5/23/1985	140	LI	BRUNDY, SALLY M.
205	49131			6/12/1985	CAN	UG	SE	SE	26	14S	66E	0	IND		6/12/1985	0	CL	NEVADA POWER COMPANY

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205	49132			6/12/1985	CAN	UG	SW	NW	24	12S	65E	0	IND		6/12/1985	0	LI	NEVADA POWER COMPANY
205	49133			6/12/1985	CAN	UG	SW	SW	13	12S	65E	0	IND		6/12/1985	0	LI	NEVADA POWER COMPANY
205	49298		12602	8/22/1985	CER	UG	NW	NW	02	15S	66E	0.25	IRR		4/11/1977	56	CL	EWING INVESTMENTS
		CHANGED BY: 70518			WDR	UG												
		CHANGED BY: 70500			CER	UG												
		CHANGED BY: 73735			CER	UG												
205	49333			9/4/1985	DEN	UG	NE	SW	18	13S	66E	1	MM		9/4/1985		CL	DEREFIELD ASSOCIATES
205	49334			9/4/1985	DEN	UG	NE	SW	18	13S	66E	1	MM		9/4/1985	0	CL	DEREFIELD ASSOCIATES
205	49429			10/3/1985	CAN	UG	SE	SE	18	13S	66E	3	MM		10/3/1985	1630.445 192	CL	SIERRA MINERALS, INC.
205	49430			10/3/1985	CAN	UG	NW	SE	18	13S	66E	3	MM		10/3/1985	1630.445 192	CL	SIERRA MINERALS, INC.
205	49431			10/3/1985	CAN	UG	SE	SE	18	13S	66E	3	MM		10/3/1985	1630.445 192	CL	SIERRA MINERALS, INC.
205	4974		631	3/23/1918	CER	STR	SE	SW	17	07S	67E	0.083	IRR	Y	3/23/1918	30.1	LI	DIELEMAN, ROGER J.
205	49784			3/25/1986	CAN	UG	SE	SW	06	13S	66E	1	MM		3/25/1986	676.1400 48	CL	ROARING SPRINGS RANCH CO
205	49785			3/25/1986	CAN	UG	NW	SE	07	13S	66E	3	MM		2/28/1986	279.2899	CL	BLUE STAR MINING INC
205	4983			3/29/1918	DEN	STR	SW	SW	14	09S	67E	2.5	IRR	Y	3/29/1918		LI	WILLIAMS, EMMERSON F.
205	49850			4/29/1986	CAN	STR	NW	SW	07	13S	66E	1	MM		4/29/1986	676.1400 48	CL	ROARING SPRINGS RANCH
205	49892			5/23/1986	ABR	UG	SW	NE	08	04S	67E	1.5	MUN		7/18/1991	0	LI	CALIENTE-CITY
		CHANGED BY: 83312			PER	UG												
205	49893		14323	5/23/1986	CER	UG	SW	NE	08	04S	67E	1.45	MUN		7/18/1991	661	LI	CALIENTE PUBLIC UTILITIES
		CHANGED BY: 59395T			EXP	UG												
205	49894			5/27/1986	WDR	SPR	SW	SW	22	06S	67E	0.3	MM		5/27/1986	0	LI	FISCHER-WATT MINING
205	49895			5/27/1986	WDR	UG	NE	SW	22	06S	67E	0.3	MM		5/27/1986		LI	FISCHER-WATT MINING
205	49906			6/6/1986	CAN	UG	SW	NE	08	14S	66E	0.3	MM		6/6/1986	109.9893 76	CL	NEVTEX

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205	50604			2/17/1987	CAN	UG	SE	NE	27	14S	66E	1	IRR		2/8/1973		CL	LEWIS, ROBERT C.
205	50605			2/17/1987	CAN	UG	NE	SE	27	14S	66E	0.4	IRR		11/15/1973	125	CL	LEWIS, PAUL
205	50606			2/17/1987	CAN	UG	NE	SE	27	14S	66E	1	IRR		8/27/1975		CL	LEWIS, ROBERT C.
205	50607			2/17/1987	CAN	UG	NE	SE	27	14S	66E	0.4	IRR		10/28/1975		CL	LEWIS, ROBERT C.
205	50608			2/17/1987	CAN	UG	SW	SE	15	14S	66E	5	IRR		10/8/1976		CL	MEADOW VALLEY FARM LANDS IRR. CO.
205	50609			2/17/1987	CAN	UG	NW	SW	15	14S	66E	5	IRR		10/8/1976		CL	MEADOW VALLEY FARM LANDS IRR. CO.
205	50610			2/17/1987	CAN	UG	NE	SE	22	14S	66E	5	IRR		10/8/1976		CL	MEADOW VALLEY FARM LANDS IRR. CO
205	50611			2/17/1987	CAN	UG	SW	SW	26	14S	66E	5	IRR		10/8/1976		CL	MEADOW VALLEY FARM LANDS IRR. CO.
205	50612			2/17/1987	CAN	UG	SW	NW	22	14S	66E	3	IRR		6/13/1977		CL	RICHARD, PAUL C.
205	50613			2/17/1987	CAN	UG	NW	NW	22	14S	66E	3	IRR		6/13/1977		CL	LEWIS, ROBERT C.
205	50614			2/17/1987	CAN	UG	NE	SE	27	14S	66E	1	IRR		1/3/1978		CL	LEWIS, ROBERT C.
205	50615			2/17/1987	CAN	UG	NE	NE	27	14S	66E	0.13	IRR		8/17/1978		CL	LEWIS, ROBERT C.
205	50616			2/17/1987	CAN	UG	SE	NE	27	14S	66E	0.2	IRR		5/3/1979		CL	LEWIS, ROBERT C.
205	50617			2/17/1987	CAN	UG	NE	SE	27	14S	66E	5	IRR		10/8/1976		CL	LEWIS, ROBERT C.
205	50850			4/23/1987	CAN	UG	SE	SW	12	13S	65E	0.5	MM		4/23/1987	381.9767 56	CL	BLACK CANYON MINING CO.
205	50855			4/27/1987	CAN	UG	NE	NE	18	13S	66E	1	MM		1/13/1966	0	CL	COLE, CHARLES W.
205	50972			5/29/1987	ABR	UG	SE	NE	27	14S	66E	0.195	IRR		2/8/1973	0	CL	LEWIS, ROBERT C.
		CHANGED BY: 56488			ABR	UG												
205	50973			5/29/1987	WDR	UG	NE	SE	27	14S	66E	0.4	IRR		11/15/1973	289.52	CL	LEWIS, PAUL
205	50974			5/29/1987	ABR	UG	NE	SE	27	14S	66E	0.83	IRR		8/27/1975	0	CL	LEWIS, VIVIAN
		CHANGED BY: 56487			WDR	UG												
205	50975			5/29/1987	ABR	UG	NE	SE	27	14S	66E	0.38	IRR		10/28/1975	0	CL	LEWIS, ROBERT C.
		CHANGED BY: 56486			ABR	UG												

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205	50970			5/29/1987	ABR	UG	SW	SE	15	14S	66E	5	IRR		10/8/1976	0	CL	MEADOW VALLEY FARM LANDS IRRIG. CO.
		CHANGED BY: 56481			ABR	UG												
205	50977			5/29/1987	ABR	UG	NW	SW	15	14S	66E	5	IRR		10/8/1976	0	CL	MEADOW VALLEY FARM LANDS IRRIG. CO.
		CHANGED BY: 56480			ABR	UG												
205	50978			5/29/1987	ABR	UG	NW	SE	22	14S	66E	5	IRR		10/8/1976	0	CL	MEADOW VALLEY FARM LANDS IRRIG. CO.
		CHANGED BY: 52574			ABR	UG												
205	50979			5/29/1987	ABR	UG	SW	SW	26	14S	66E	5	IRR		10/8/1976	0	CL	WHITNEY, MARY
		CHANGED BY: 60338			CER	UG												
		CHANGED BY: 56479			ABR	UG												
205	50980			5/29/1987	ABR	UG	SW	NW	22	14S	66E	3	IRR		6/13/1977	0	CL	LEWIS, KIM E.
		CHANGED BY: 56477			ABR	UG												
205	50981			5/29/1987	WDR	UG	NW	NW	22	14S	66E	3	IRR		6/13/1977	2171.39	CL	LEWIS, ROBERT C.
205	50982			5/29/1987	ABR	UG	NE	SE	27	14S	66E	1	IRR		1/3/1978	0	CL	LEWIS, ROBERT C.
		CHANGED BY: 56485			ABR	UG												
205	50983			5/29/1987	ABR	UG	NE	NE	27	14S	66E	0.13	IRR		6/17/1978	0	CL	WILLIAMS, LARRY & SUSAN
		CHANGED BY: 56484			ABR	UG												
		CHANGED BY: 63830			CER	UG												
205	50984			5/29/1987	ABR	UG	SE	NE	27	14S	66E	0.2	IRR		5/3/1979	0	CL	LEWIS, ROBERT C.
		CHANGED BY: 56483			ABR	UG												
205	50985			5/29/1987	ABR	UG	NE	SE	27	14S	66E	2	IRR		10/8/1976	0	CL	LEWIS, VIVIAN
		CHANGED BY: 56482			ABR	UG												
205	51283			9/8/1987	ABR	UG	NW	NW	22	14S	66E	3	IRR		6/13/1977	0	CL	LEWIS, KIM E.
		CHANGED BY: 56677			ABR	UG												

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205	5224			8/22/1918	CAN	SPR	SW	NE	22	09S	67E	4.8	IRR	Y	8/22/1918	0	LI	MABEY, CLARENCE
205	52414		12838	8/12/1988	CER	SPR	NE	SW	03	05S	66E	0.003	STK		8/12/1988	2.363053	LI	TENNILLE, JAMES B. JR.
205	52415		12839	8/12/1988	CER	SPR	NE	SW	09	05S	66E	0.001	STK		8/12/1988	0.787225	LI	JERRY JOHNSTON OR JANET LIND
205	52416		12840	8/12/1988	CER	SPR	SW	NE	18	05S	66E	0.002	STK		8/12/1988	1.565139	LI	JERRY JOHNSTON OR JANET LIND
205	52417		12841	8/12/1988	CER	SPR	SW	SE	23	05S	65E	0.001	STK		8/12/1988	0.787814	LI	JERRY JOHNSTON OR JANET LIND
205	52574			9/29/1988	ABR	UG	SW	NE	22	14S	66E	5	IRR		10/8/1976	0	CL	MEADOW VALLEY FARM LANDS IRRIGATION
		CHANGED BY: 56478			ABR	UG												
205	5401			2/26/1919	CAN	SPR				11S	65E	0.1	STK	Y	2/26/1919	0	LI	C.I. WADSWORTH & BROS.
205	54035			10/17/1989	WDR	UG	SE	NE	08	14S	66E	6	MUN		10/17/1989	0	CL	LAS VEGAS VALLEY WATER DISTRICT
205	54105			10/23/1989	WDR	UG	NE	SE	09	08S	68E	10	MUN		10/23/1989	0	LI	LAS VEGAS VALLEY WATER DISTRICT
205	5428			3/17/1919	CAN	OSW	SE	NW	09	14S	66E	3.2	IRR	Y	3/17/1919	0	CL	DROGE, JOHN C.
205	5481		2017	4/25/1919	CER	OSW	NE	NE	03	09S	67E	0.386	IRR	Y	4/25/1919	280	LI	LEWIS, ROBERT C. & VIVIAN
205	55876			2/25/1991	CAN	SPR	NE	NE	12	04S	66E	0.004	OM		2/25/1991	3.19	LI	ROWE, DOROTHEA M.
205	55877		17710	2/25/1991	CER	SPR	NE	NE	12	04S	66E	0.006	OM		2/25/1991	0.94	LI	ROWE, GEORGE T.
205	55878			2/25/1991	WDR	SPR	NE	NE	12	04S	66E	0.001	OM		2/25/1991	0.8	LI	ROWE, DOROTHEA M.
205	55879		17711	2/25/1991	CER	SPR	SE	SE	01	04S	66E	0.002	OM		2/25/1991	1.59	LI	LEE, CHARLIE & LAVETTE
205	56477			6/24/1991	ABR	UG	SW	NW	22	14S	66E	3	IRR	Y	6/13/1977	0	CL	GLENDALE OC IRREVOCABLE BUSINESS TRUST
		CHANGED BY: 79946			CER	UG												
		CHANGED BY: 66977			PER	UG												
205	56478		15552	6/24/1991	ABR	UG	SW	NE	22	14S	66E	1.025	IRR	Y	10/8/1976	0	CL	DAY MARITAL AND FAMILY TRUST
		CHANGED BY: 66978			PER	UG												
205	56479		15553	6/24/1991	ABR	UG	SW	SW	26	14S	66E	1.17	IRR	Y	10/8/1976	0	CL	MEADOW VALLEY FARM LANDS IRRIGATION COMPANY
		CHANGED BY: 66980			PER	UG												

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		CHANGED BY: 85482			PER	UG												
205	56480		15848	6/24/1991	ABR	UG	NW	SW	15	14S	66E	5	IRR	Y	10/8/1976	0	CL	GLENDALE OC IRREVOCABLE BUSINESS TRUST
		CHANGED BY: 66981			PER	UG												
205	56481		15554	6/24/1991	ABR	UG	SW	SE	15	14S	66E	0.613	IRR	Y	10/8/1976	0	CL	GLENDALE OC IRREVOCABLE BUSINESS TRUST
		CHANGED BY: 66982			PER	UG												
205	56482			6/24/1991	ABR	UG	NE	SE	27	14S	66E	2	IRR	Y	10/8/1976	0	CL	MOAPA ALLIANCE BUSINESS TRUST
		CHANGED BY: 66993			PER	UG												
205	56483			6/24/1991	ABR	UG	SE	NE	27	14S	66E	0.2	IRR		5/3/1979	0	CL	LEWIS, VIVIAN
		CHANGED BY: 65138			ABR	UG												
205	56484			6/24/1991	ABR	UG	NE	NE	27	14S	66E	0.13	IRR		8/17/1978	0	CL	LEWIS, ROBERT C.
		CHANGED BY: 65137			ABR	UG												
205	56485			6/24/1991	ABR	UG	NE	SE	27	14S	66E	1	IRR	Y	1/3/1978	0	CL	MOAPA PIONEERS 1919 TRUST
		CHANGED BY: 66987			PER	UG												
205	56486			6/24/1991	ABR	UG	NE	NE	27	14S	66E	0.36	IRR	Y	10/28/1975	0	CL	LEWIS, ROBERT C. & VIVIAN
		CHANGED BY: 72922			WDR	UG												
		CHANGED BY: 77119			WDR	UG												
		CHANGED BY: 66983			PER	UG												
		CHANGED BY: 85620			PER	UG												
205	56487			6/24/1991	WDR	UG	NE	NE	27	14S	66E	0.83	IRR	Y	8/27/1975	135	CL	LEWIS, ROBERT C.
		CHANGED BY: 72923			WDR	UG												
		CHANGED BY: 77120			WDR	UG												
		CHANGED BY: 66989			WDR	UG												
		CHANGED BY: 85640			WDR	UG												

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('205')

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Basin	App	Prev App / Change of App	Cert	Filing Date	Status	Source	Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
205	56488			6/24/1991	ABR	UG	SE	NE	27	14S	66E	0.195	IRR		2/8/1973	0	CL	LEWIS, VIVIAN
		CHANGED BY: 63481			CER	UG												
		CHANGED BY: 65138			ABR	UG												
205	56489		15555	6/24/1991	ABR	UG	NE	SE	27	14S	66E	0.305	IRR	Y	2/8/1973	21.337	CL	LEWIS, ROBERT AND VIVIAN
		CHANGED BY: 66984			PER	UG												
		CHANGED BY: 85427			PER	UG												
205	56551		13798	7/19/1991	ABR	UG	NW	NE	19	13S	66E	2.68	IRR		6/1/1976	0	CL	BARR L.L.C., A NV LIM. LIABILITY CO.
		CHANGED BY: 69260			ABR	UG												
		CHANGED BY: 69201T			EXP	UG												
205	56677		15556	8/16/1991	ABR	UG	NW	NW	22	14S	66E	1.97	IRR	Y	6/13/1977	0	CL	GLENDALE OC IRREVOCABLE BUSINESS TRUST
		CHANGED BY: 66950			PER	UG												
205	56689			8/20/1991	PER	EFF	SW	SE	07	04S	67E	0.62	STO		8/20/1991	221	LI	CALIENTE-CITY
205	56689S01		17794	8/8/1994	CER	EFF	SE	SE	13	04S	66E	0.62	IRR		8/8/1994	221	LI	CALIENTE-CITY
205	5684			8/21/1919	DEN	SPR	NE	SE	34	09S	67E	0.4	IRR	Y	8/21/1919	125	LI	HENRIE, ETHEL S.
205	5702			9/2/1919	CAN	STR	SW	SE	04	10S	67E	1.6	IRR		9/2/1919		LI	REES, MATHEW D.
205	57564			5/4/1992	ABR	UG	NE	SE	27	14S	66E	0.4	IRR		11/15/1973	0	LI	LEWIS, VIVIAN C.
		CHANGED BY: 65139			ABR	UG												
205	5792			10/6/1919	DEN	STR	NW	NW	14	08S	67E	0.3	IRR	Y	10/6/1919	0	LI	HUSTON, A.W.
205	58003		14121	8/25/1992	CER	UG	NW	NE	20	07S	67E	1.67	IRR		7/30/1981	271.55	LI	DIELEMAN, ROGER J.
205	58026		14244	8/31/1992	CER	UG	NW	NE	20	07S	67E	0.006	STK		8/31/1992	4.480594	LI	DIELEMAN, ROGER J.
205	58780			4/23/1993	WDR	UG	SE	SE	13	04S	66E	0.022	MUN		4/23/1993		LI	CALIENTE-CITY
205	58908E			8/7/1993	PER	UG	NW	SW	08	04S	67E	0.058	ENV		8/7/1993	40.32534 8	LI	EIZMAN'S SERVICES
205	5912			12/19/1919	CAN	OSW	NE	NE	03	09S	67E	2	IRR	Y	12/19/1919	800	LI	BUNKER, ROBERT E.

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('205') Run Date: 8/22/2019 9:20:21 AM

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205	5913			12/19/1919	CAN	OSW	NE	NE	03	09S	67E	2	IRR	Y	12/19/1919	600	LI	BUNKER, MARTIN A.
205	5914		1155	12/19/1919	CER	SPR	SW	SE	03	12S	67E	0.004	STK	Y	12/19/1919	1.503761	LI	MONFORT, ROY D
205	5916		2043	12/19/1919	CER	SPR	NE	SW	11	12S	67E	0.003	STK	Y	12/19/1919	2.240297	LI	ATKIN, ANTHONY
205	5917		1157	12/19/1919	CER	SPR	NE	NW	13	12S	67E	0.003	STK	Y	12/19/1919	2.240297	LI	ATKINS, ANTHONY
205	59395T			11/18/1993	EXP	UG	SE	SE	13	04S	66E	0.022	MUN		7/3/1978	0.030689	LI	CALIENTE PUBLIC UTILITIES
205	5941			1/8/1920	CAN	OSW	SW	SW	14	09S	67E	1	IRR	Y	1/8/1920	400	LI	HUSTON, PEARL
205	5942		1687	1/8/1920	CER	OSW	NW	NW	23	09S	67E	0.375	IRR	Y	1/8/1920	271	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	5957			1/23/1920	CAN	STR	NE	NE	27	08S	67E	0.8	IRR		1/23/1920	0	LI	HENRIE, ETHEL S.
205	60330		16583	8/8/1994	CER	UG	SE	NE	34	14S	66E	0.063	IRR		10/6/1978	20	CL	PULSIPHER, DUSTY
205	60447E			9/13/1994	PER	UG	NW	SW	08	04S	67E	0.089	OTH		9/13/1994	64.51	LI	EIZMAN'S SERVICE
205	60879			1/30/1995	WDR	STR	NW	SE	01	07S	66E	3.968	IRR		1/20/1976	793.5	LI	BRADSHAW, INC.
		CHANGED BY: 66613			WDR	STR												
205	0102			5/7/1920	CAN	STR	SW	SW	35	05S	66E	0.75	IRR		5/7/1920		LI	MCGUFFIE, JOSEPH
205	61081		16811	3/28/1995	CER	UG	SW	NW	02	05S	66E	0.05	COM		3/28/1995	3	LI	NARCONON SOUTHERN CALIFORNIA
205	61165			4/24/1995	DEN	UG	SE	SE	01	13S	65E	6	IND		4/24/1995		CL	RIVERS END SAND AND GRAVEL
205	61271			5/31/1995	DEN	UG		LT07	00	13S	66E	2	IND		5/31/1995		CL	RIVERS END SAND & GRAVEL CO.
205	61272			5/31/1995	DEN	UG	SE	SE	01	13S	65E	2	IND		5/31/1995		CL	RIVERS END SAND & GRAVEL CO.
205	61289T			6/7/1995	EXP	STR	SW	SE	36	12S	65E	2	IND		11/24/1952	145	CL	STUART, ROBERT B.
205	61408T			7/18/1995	EXP	UG	SE	SE	01	13S	65E	1	IND		3/17/1980	145	CL	STUART, ROBERT B.
205	62396			8/20/1996	WDR	UG	SE	NE	01	13S	65E	2	IND		8/20/1996	0	CL	JOAN E. STUART
205	62397			8/20/1996	ABR	STR	SW	SE	36	12S	65E	2	IND		11/24/1952	0	LI	JOAN E. STUART
		CHANGED BY: 76055			CER	STR												
205	62398			8/20/1996	WDR	UG	SE	NE	01	13S	65E	1	IND	Y	3/17/1980	145	CL	JOAN E. STUART

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		CHANGED BY: 76056			WDR	UG												
205	62874		15428	2/24/1997	CER	UG	NE	NW	02	15S	66E	0.032	IRR		8/5/1977	5	CL	GRADY, DONALD H.
205	63175			6/12/1997	CAN	UG	SW	NE	22	06S	67E	0.001	OTH		6/12/1997	0.552402	LI	ROYAL STANDARD MINERALS, INC.
205	63219			7/2/1997	WDR	UG	SE	SE	32	13S	66E	0.78	MM		7/2/1997	0	CL	W & S SAND
205	63379			8/28/1997	DEN	UG	SW	SW	07	13S	66E	6	MUN	Y	8/28/1997	4344	CL	MOAPA VALLEY WATER DISTRICT
205	63380			8/28/1997	DEN	UG	SE	SE	26	12S	65E	6	MUN	Y	8/28/1997	4344	CL	MOAPA VALLEY WATER DISTRICT
205	63381			8/28/1997	DEN	UG	NE	NE	12	13S	65E	6	MUN	Y	8/28/1997	4344	CL	MOAPA VALLEY WATER DISTRICT
205	63410			9/5/1997	ABR	UG	NE	NW	19	13S	66E	0.9	COM		10/2/1958	0	CL	INFINITON LLC
		CHANGED BY: 69262			ABR	UG												
		CHANGED BY: 69263T			EXP	UG												
205	63411T			9/5/1997	EXP	UG	NE	NW	19	13S	66E	0.9	COM		10/2/1958	124.05	CL	BARR L.L.C.
205	6346			12/2/1920	CAN	SPR	SW	SW	14	06S	66E	0.003	STK	Y	12/2/1920	0	LI	SAWYER, WM.
205	6347			12/2/1920	CAN	SPR	SE	SE	14	06S	66E	0.003	STK	Y	12/2/1920	0	LI	STEELE, JOE
205	63481		17712	10/6/1997	CER	UG	NW	NW	27	14S	66E	0.028	IRR		2/8/1973	17.5	CL	COX BURTON & MARY ANN
		CHANGED BY: 66991			WDR	UG												
		CHANGED BY: 77117			ABR	UG												
205	6374			1/14/1921	CAN	SPR	NE	SE	02	06S	66E	0.1	STK	Y	1/14/1921	0.552402	LI	MCGUFFIE, J.W.
205	6375			1/14/1921	CAN	SPR	SW	NE	02	06S	66E	0.1	STK	Y	1/14/1921	0.552402	LI	REECE, HARVEY M.
205	63810			2/6/1998	DEN	UG	SE	SE	03	09S	67E	4.456	MM		2/6/1998	0	LI	HERZOG CONTRACTING CORP.
205	63836		19587	2/13/1998	CER	UG	NE	NE	27	14S	66E	0.033	IRR		8/17/1978	20.9	CL	WILLIAMS, LARRY AND SUSAN
		CHANGED BY: 83295			PER	UG												
205	6396		786	2/5/1921	CER	SPR	SE	NE	27	06S	67E	0.1	MM		2/5/1921	18.1	LI	AUSTEN, P.S.
205	6418			3/7/1921	DEN	STR	SE	SE	36	12S	65E	16	IRR	Y	3/7/1921	0	LI	SAIN, RENA K.

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205	6422			3/17/1921	DEN	STR	NE	SE	18	13S	66E	17	IRR	Y	3/17/1921	0	CL	HEWITT, JOHN R.
205	6425			3/21/1921	CAN	SPR						0.001	STK	Y	3/21/1921		LI	PLATT, GEORGE
205	6493		1499	6/20/1921	CER	STR	SW	NW	20	07S	66E	0.04	IRR	Y	6/20/1921	14.65	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST DATED
205	6496			6/22/1921	WDR	SPR	NW	NE	33	05S	67E	0.1	STK	Y	6/22/1921		LI	MACKIE, A.J.
205	6498			6/22/1921	CAN	SPR	NE	SW	28	05S	67E	0.1	STK	Y	6/22/1921		LI	MACKIE, A.J.
205	6506			7/11/1921	CAN	STR	SW	NE	34	07S	67E	1	IRR	Y	1/8/1912	160	LI	HENRIE, ETHEL S.
205	6507			7/11/1921	DEN	STR	SW	NW	35	07S	67E	1	IRR	Y	7/11/1921	400	LI	HENRIE, ETHEL S.
205	65136			5/24/1999	ABR	UG	NW	SE	22	14S	66E	0.167	IRR	Y	2/8/1973	0	CL	LEWIS, ROBERT C. & VIVIAN
		CHANGED BY: 68859			WDR	UG												
		CHANGED BY: 68985			PER	UG												
205	65137			5/24/1999	ABR	UG	NW	SE	22	14S	66E	0.096	IRR	Y	8/17/1978	0	CL	MOAPA MISSION, LLC
		CHANGED BY: 68860			WDR	UG												
		CHANGED BY: 68979			PER	UG												
205	65138			5/24/1999	ABR	UG	SW	SW	26	14S	66E	0.2	IRR	Y	5/3/1979	0	CL	MOAPA MISSION
		CHANGED BY: 68986			PER	UG												
205	65139			5/24/1999	ABR	UG	SW	SW	26	14S	66E	0.4	IRR	Y	11/15/1973	0	CL	LEWIS, ROBERT C.
		CHANGED BY: 68988			WDR	UG												
		CHANGED BY: 72921			WDR	UG												
		CHANGED BY: 77121			WDR	UG												
		CHANGED BY: 85819			PER	UG												
205	6530			8/8/1921	CAN	STR	NW	SW	24	12S	65E	1.5	IRR	Y	8/8/1921	0	LI	HAMILTON, W.B.
205	6558			9/1/1921	CAN	OSW	NW	SW	14	09S	67E	1	IRR	Y	9/1/1921	400	LI	LYMAN, BERT
205	65781		16719	12/27/1999	CER	UG	NW	NW	02	15S	66E	0.0388	IRR		8/5/1977	6	CL	BRINKERHOFF, REE & KATRINA

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205	6591			11/25/1921	DEN	SPR						0.25	STK	Y	11/25/1921		LI	CULVERWELL, CHAS.
205	66265			4/12/2000	WDR	UG	SW	SW	14	09S	67E	0.723	OTH		11/14/1977		LI	SCOTT, DEED
205	66334			5/5/2000	ABR	UG	NE	NW	13	12S	65E	1.67	IRR		12/15/1958	0	LI	GLENDALE OC IRREVOCABLE BUSINESS TRUST
		CHANGED BY: 66997			PER	UG												
205	66335			5/5/2000	ABR	UG	NE	NW	12	12S	65E	1.67	IRR		8/26/1960	0	LI	GLENDALE OC IRREVOCABLE BUSINESS TRUST
		CHANGED BY: 66996			PER	UG												
205	66336			5/5/2000	DEN	UG	NE	NW	13	12S	65E	4.19	IRR		12/26/1961		LI	LEWIS, VIVIAN (C/O)
		CHANGED BY: 66998			WDR	UG												
205	66337			5/5/2000	ABR	UG	NE	NW	13	12S	65E	1.58	IRR		8/6/1963	312.75	LI	MOAPA ALLIANCE BUSINESS TRUST
		CHANGED BY: 66994			PER	UG												
205	66338			5/5/2000	RFA	UG	NE	NW	13	12S	65E	0.97	IRR		8/27/1975	0	LI	ROBERT C. LEWIS AND VIVIAN C. LEWIS, CO-TRUSTEES OF THE ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST DATED JUNE 20, 1990
		CHANGED BY: 66995			WDR	UG												
205	66339			5/5/2000	ABR	UG	NE	NW	13	12S	65E	2.765	IRR		2/14/1977	0	LI	GLENDALE OC IRREVOCABLE BUSINESS TRUST
		CHANGED BY: 66992			PER	UG												
		CHANGED BY: 66999			PER	UG												
205	66613			7/26/2000	WDR	STR	SW	SE	01	07S	66E	3.968	IRR		1/20/1976		LI	BRADSHAW, INC.
205	66976			12/4/2000	PER	UG	NE	SW	01	12S	65E	0.4	MUN	Y	11/15/1973	192.5	LI	MOAPA MISSION, LLC
205	66977			12/4/2000	PER	UG	NE	SW	01	12S	65E	2.73	MUN	Y	6/13/1977	250.4	LI	GLENDALE OC IRREVOCABLE BUSINESS TRUST
205	66978			12/4/2000	PER	UG	SE	SW	01	12S	65E	1.025	MUN	Y	10/8/1976	600	LI	MOAPA ALLIANCE BUSINESS TRUST
205	66979			12/4/2000	PER	UG	NW	NW	12	12S	65E	0.098	MUN	Y	8/17/1978	70.59	LI	MOAPA MISSION, LLC
205	66980			12/4/2000	PER	UG	NW	NW	12	12S	65E	1.155	MUN	Y	10/8/1976	395	LI	MOAPA ALLIANCE BUSINESS TRUST
205	66981			12/4/2000	PER	UG	NE	NW	12	12S	65E	1.85	MUN	Y	10/8/1976	310	LI	GLENDALE OC IRREVOCABLE BUSINESS
205	66982			12/4/2000	PER	UG	SW	NW	12	12S	65E	0.813	MUN	Y	10/8/1976	270	LI	GLENDALE OC IRREVOCABLE BUSINESS TRUST

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205	66983			12/4/2000	PER	UG	SW	NW	12	12S	65E	0.347	MUN	Y	10/28/1975	130	LI	MOAPA PIONEERS 1919 TRUST DATED THE 4TH DAY OF JANUARY, 2010
205	66984			12/4/2000	PER	UG	SW	NW	12	12S	65E	0.158	MUN	Y	2/8/1973	22.913	LI	MOAPA MISSION, LLC
205	66985			12/4/2000	PER	UG	SW	NW	12	12S	65E	0.167	MUN	Y	2/8/1973	8.25	LI	MOAPA PIONEERS 1919 TRUST DATED THE 4TH DAY OF JANUARY, 2010
205	66986			12/4/2000	PER	UG	SW	NW	12	12S	65E	0.2	MUN	Y	5/3/1979	25	LI	MOAPA MISSION, LLC
205	66987			12/4/2000	PER	UG	NW	SW	12	12S	65E	1	MUN	Y	1/3/1978	375	LI	MOAPA PIONEERS 1919 TRUST DATED THE 4TH DAY OF JANUARY, 2010
205	66988			12/4/2000	WDR	UG	NW	SW	12	12S	65E	0	MUN		11/15/1973	125	LI	MOAPA VALLEY WATER DISTRICT
205	66989			12/4/2000	WDR	UG	SW	SW	12	12S	65E	0	MUN		8/27/1975	0	LI	MOAPA VALLEY WATER DISTRICT
205	66990			12/4/2000	PER	UG	SW	SW	12	12S	65E	1.97	MUN	Y	6/13/1977	300	LI	GLENDALE OC IRREVOCABLE BUSINESS TRUST
205	66991			12/4/2000	WDR	UG	SW	SW	12	12S	65E	0.028	MUN		2/8/1973	20	LI	MOAPA VALLEY WATER DISTRICT
205	66992			12/4/2000	PER	UG	NE	NW	13	12S	65E	1.3825	MUN	Y	2/14/1977	409.24	LI	GLENDALE OC IRREVOCABLE BUSINESS TRUST
205	66993			12/4/2000	PER	UG	NE	NW	13	12S	65E	2	MUN	Y	10/8/1976	450	LI	MOAPA ALLIANCE BUSINESS TRUST
205	66994			12/4/2000	PER	UG	SW	NW	13	12S	65E	1.68	MUN	Y	8/6/1963	312.75	LI	MOAPA ALLIANCE BUSINESS TRUST
205	66995			12/4/2000	WDR	UG	NW	NW	25	12S	65E	0.97	MUN		8/27/1975	192	LI	MOAPA VALLEY WATER DISTRICT
205	66996			12/4/2000	PER	UG	NW	NW	25	12S	65E	1.67	MUN	Y	8/28/1960	110	LI	GLENDALE OC IRREVOCABLE BUSINESS TRUST
205	66997			12/4/2000	PER	UG	NW	NW	25	12S	65E	1.67	MUN	Y	12/15/1958	155	LI	GLENDALE OC IRREVOCABLE BUSINESS TRUST
205	66998			12/4/2000	WDR	UG	SW	NW	25	12S	65E	4.19	MUN		12/26/1961	802.86	LI	MOAPA VALLEY WATER DISTRICT
205	66999			12/4/2000	PER	UG	SW	SW	25	12S	65E	1.3825	MUN	Y	2/14/1977	409.24	LI	GLENDALE OC IRREVOCABLE BUSINESS TRUST
205	6702			6/19/1922	WDR	SPR	SW	NW	01	08S	66E	0.1	MM	Y	6/19/1922	72.11915	LI	AMERICAN CLAY COMPANY
205	67339			3/15/2001	DEN	UG	NE	NW	27	14S	66E	0.057	IRR		1/25/1971	0	CL	PETERSON, CATHY
205	67435			4/18/2001	DEN	UG	SW	NW	24	12S	65E	0.69	IND		1/1/1925	0	LI	UNION PACIFIC RAILROAD COMPANY
205	67436			4/18/2001	DEN	UG	NW	NW	03	10S	67E	0.246	IND		1/1/1925	0	LI	UNION PACIFIC RAILROAD COMPANY
205	6758			9/6/1922	CAN	STR	SE	SE	10	09S	67E	0.8	IRR	Y	9/6/1922	400	LI	CONK., WALTER B.

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205	67687			6/19/2001	WDR	EFF	NW	SW	28	14S	66E	10	IRR		6/19/2001	0	CL	ROBERT C.& VIVIAN LEWIS 1990 F TRUST
205	68621			3/18/2002	CAN	UG	NW	SE	27	14S	66E	0.0484	IRR		8/5/1977	7.5	CL	CROWEL, DIANE MARIE
205	6871			3/10/1923	WDR	STR	NW	SE	25	04S	66E	0.15	IRR	Y	3/10/1923		LI	CONAWAY, JOHN H.
205	6872			3/10/1923	WDR	STR	NW	SE	25	04S	66E	0.12	IRR	Y	3/10/1923		LI	CONAWAY, EMMA
205	6876			3/30/1923	CAN	STR						0	IRR	Y	3/30/1923	0	LI	TENNILLE, THOMAS C.
205	6877			4/4/1923	DEN	STR	NW	SW	14	09S	67E	1.6	IRR	Y	4/4/1923	0	LI	HILBURN, A.L.
205	68859			6/3/2002	WDR	UG	NE	SE	27	14S	66E	0.1674	IRR		2/8/1973	8.25	CL	LEWIS, ROBERT C. & VIVIAN
205	68860			6/3/2002	WDR	UG	SW	SW	26	14S	66E	0.13	IRR		8/17/1978	94.116	CL	LEWIS, ROBERT C. & VIVIAN
205	6900			5/16/1923	WDR	STR	NW	SW	17	10S	67E	1.2	IRR		5/16/1923	0	LI	HILVURN, ALBERT LEE
205	69259			10/18/2002	ABR	UG	SE	NE	19	13S	66E	1	COM		1/13/1966	0	CL	DIAMOND WATER, LLC
		CHANGED BY: 75193			PER	UG												
205	69260			10/18/2002	ABR	UG	SE	NE	19	13S	66E	2.54	COM		6/1/1976	0	CL	DIAMOND WATER, LLC
		CHANGED BY: 73067T			WDR	UG												
		CHANGED BY: 71341T			EXP	UG												
		CHANGED BY: 73906T			EXP	UG												
		CHANGED BY: 75192T			EXP	UG												
		CHANGED BY: 73068			PER	UG												
		CHANGED BY: 75194			PER	UG												
		CHANGED BY: 73834			PER	UG												
205	69261T			10/18/2002	EXP	UG	SE	NE	19	13S	66E	0	COM		6/1/1976	0	CL	INFINITON LLC
205	69262			10/18/2002	ABR	UG	SE	NE	19	13S	66E	0.9	COM		10/2/1958	0	CL	DIAMOND WATER, LLC
		CHANGED BY: 73069			PER	UG												
205	69263T			10/18/2002	EXP	UG	SE	NE	19	13S	66E	0	COM		10/2/1958	0	CL	INFINITON LLC

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205	69337			11/26/2002	ABR	STR	NW	NE	19	13S	66E	0	COM		7/7/2000	0	CL	DIAMOND WATER, LLC
		CHANGED BY: 75195			PER	STR												
205	6939			7/14/1923	CAN	STR	SW	SE	36	12S	65E	0.81	IRR	Y	7/14/1924	0	LI	HUNTSMAN, EDWIN S.
205	7001			11/14/1923	CAN	SPR	NE	SW	08	12S	67E	0.25	STK	Y	11/14/1923		LI	CULVERWELL, CHARLES
205	70260			7/23/2003	PER	STR	SW	SE	01	07S	68E	3.971	IRR		1/1/1890	793.5	LI	RTT GOLD, LLC
205	70315T			8/18/2003	WDR	UG	SE	NE	19	13S	66E	1	COM		1/13/1966	0	CL	INFINITON, LLC
205	70406			9/15/2003	PER	UG	SW	NW	24	12S	65E	0.89	MUN		1/1/1925	399.07	LI	LINCOLN COUNTY WATER DISTRICT
205	70407			9/15/2003	PER	UG	NW	NW	03	10S	67E	0.2362	MUN		1/1/1904	170.99	LI	LINCOLN COUNTY WATER DISTRICT
205	70500		17512	10/6/2003	CER	UG	NE	SE	34	14S	66E	0.017	IRR	Y	4/11/1977	5	CL	DREYFUS, ROBERT AND SUSAN
205	70518			10/20/2003	WDR	UG	NW	NW	02	15S	66E	0.0111	IRR		4/11/1977	8	CL	EWING INVESTMENTS
205	71023		17581	4/9/2004	CER	UG	NE	NW	02	15S	66E	0.0349	IRR		8/5/1977	5.4	CL	GRADY, D. SHAWN AND/OR TERI
205	71024			4/9/2004	ABR	UG	NE	NW	02	15S	66E	0.0484	IRR		8/5/1977	0	CL	COX, H. BRUCE & SUE ANN
		CHANGED BY: 75031			PER	UG												
205	71341T			6/17/2004	EXP	UG	SE	NE	19	13S	66E	2.54	COM		6/1/1976	711.8	CL	DIAMOND WATER, LLC
205	7231			10/23/1924	CAN	STR	NW	NW	25	12S	65E	5	IRR	Y	10/23/1924	0	LI	BUNKER, ELOISE
205	72707		17625	5/6/2005	CER	UG	NE	NE	35	04S	66E	0.4	IRR	Y	5/6/2005	75	LI	AMES, JEFFREY A. AND LISA K.
205	72708		17626	5/6/2005	CER	UG	NE	NE	35	04S	66E	0.103	IRR	Y	5/6/2005	75	LI	AMES, JEFFREY A. AND LISA K.
205	72919			6/13/2005	WDR	SPR	NW	SW	24	12S	65E	0.6	IRR		2/23/1954	0	LI	LEWIS, ROBERT C. & VIVIAN
205	72920			6/13/2005	WDR	STR	NW	SW	24	12S	65E	1.35	IRR		7/29/1964	0	LI	LEWIS, ROBERT C. & VIVIAN
205	72921			6/13/2005	WDR	UG	NE	SE	27	14S	66E	0.4	IRR		11/15/1973	125	CL	LEWIS, ROBERT C. & VIVIAN
205	72922			6/13/2005	WDR	UG	NE	SE	27	14S	66E	0.0069	IRR		10/28/1975	8	CL	LEWIS, ROBERT C. & VIVIAN
205	72923			6/13/2005	WDR	UG	NE	SE	27	14S	66E	0	IRR		8/27/1975	0	CL	LEWIS, ROBERT C. & VIVIAN
205	73067T			7/19/2005	WDR	UG	SE	NE	19	13S	66E	0.5	COM		8/1/1976	140	CL	DIAMOND WATER, LLC

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205	73068			7/19/2005	PER	UG	SE	NE	19	13S	66E	0.5	COM	Y	8/1/1976	140	CL	DIAMOND WATER, LLC
205	73069			7/19/2005	PER	UG	SE	NE	19	13S	66E	0.9	COM	Y	10/2/1958	159.2	CL	DIAMOND WATER, LLC
205	73340		21177	10/17/2005	CER	UG	NW	NE	19	04S	67E	0.067	REC		10/17/2005	3	LI	NEVADA-PARKS DIVISION
205	73735		17841	1/20/2006	CER	UG	NE	SE	34	14S	66E	0.04	IRR	Y	4/11/1977	12	CL	DREYFUS, ROBERT AND SUSAN
205	73789			2/2/2006	CAN	OSW	SW	NE	35	04S	66E	0.3955	IRR		12/31/1877	79	LI	DUNNING, DANNIEL & JANICE
205	73834			2/13/2006	PER	UG	NE	NE	19	13S	66E	1.52	COM	Y	8/1/1976	355.9	CL	DIAMOND WATER, LLC
205	73906T			2/28/2006	EXP	UG	NE	NE	19	13S	66E	1.52	COM		8/1/1976	355.9	CL	DIAMOND WATER, LLC
205	75031			11/8/2006	PER	UG	NE	NW	27	14S	66E	0.0484	IRR		8/5/1977	7.5	CL	COX, H. BRUCE & SUE ANN
205	75192T			12/15/2006	EXP	UG	NE	NE	19	13S	66E	0.52	COM		8/1/1976	215.9	CL	DIAMOND WATER, LLC
205	75193			12/15/2006	PER	UG	NW	NE	19	13S	66E	1	COM	Y	1/13/1966	140	CL	DIAMOND WATER, LLC
		CHANGED BY: 76132T			EXP	UG												
205	75194			12/15/2006	PER	UG	NE	NE	19	13S	66E	0.52	COM	Y	8/1/1976	215.9	CL	DIAMOND WATER, LLC
205	75195			12/15/2006	PER	STR	SE	NE	19	13S	66E	5.4	COM		7/7/2000	1100	CL	DIAMOND WATER, LLC
205	75443			3/15/2007	CAN	UG	SE	SW	14	09S	67E	0.6	IRR		11/14/1977	0	LI	SCOTT, CATHERINE
205	75826			5/30/2007	ABR	UG	SE	SW	14	09S	67E	0.6	IRR	Y	11/14/1977	0	LI	DEED D. SCOTT AND CATHERINE S. SCOTT
		CHANGED BY: 83748			PER	UG												
205	76055		18551	7/11/2007	CER	STR	SW	SE	36	12S	65E	2	WLD		11/24/1952	145	LI	BLM
205	76056			7/11/2007	WDR	UG	SE	NE	01	13S	65E	1	WLD		3/17/1980	145	CL	JOAN E. STUART
205	76132T			8/3/2007	EXP	UG	NE	NE	19	13S	66E	1	COM		1/13/1966	140	CL	DIAMOND WATER, LLC
205	77117			6/9/2008	ABR	UG	SE	SE	34	14S	66E	0.0035	IRR		2/8/1973	0	CL	DIOGUARDI, MICHAEL N. AND DIANE M
		CHANGED BY: 85564			CER	UG												
		CHANGED BY: 88001			PER	UG												
205	77119			6/9/2008	WDR	UG	SW	SW	26	14S	66E	0	IRR		10/28/1975	5	CL	ROBERT C. & VIVIAN LEWIS

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205	77120			6/9/2008	WDR	UG	NE	SE	27	14S	66E	0.83	IRR		10/28/1975	135	CL	ROBERT C. & VIVIAN LEWIS
205	77121			6/9/2008	WDR	UG	SW	SW	26	14S	66E	0	IRR		11/15/1973	125	CL	ROBERT C. & VIVIAN LEWIS
205	7850			6/21/1926	WDR	STR	SE	NW	01	13S	65E	0.021	IRR	Y	6/21/1926	0	CL	MUDDY VALLEY IRRIGATION CO.
205	78084			10/21/2009	WDR	UG	SW	NE	08	04S	67E	1	MUN		6/12/1867	325	LI	CALIENTE CITY
205	792			1/17/1908	CAN	SPR				06S	68E	0	MM	Y	1/17/1908	0	LI	SMITH, PHIL K.
205	79632			2/22/2010	RFP	UG	SW	SW	07	13S	66E	6	MUN		2/22/2010	4344	CL	MOAPA VALLEY WATER DISTRICT
205	79633			2/22/2010	RFP	UG	NE	NE	12	13S	65E	6	MUN		2/22/2010	4344	CL	MOAPA VALLEY WATER DISTRICT
205	79634			2/22/2010	RFP	UG	NE	SE	26	12S	65E	6	MUN		2/22/2010	4344	CL	MOAPA VALLEY WATER DISTRICT
205	797			1/25/1908	CAN	SPR			08	07S	66E	0	STK	Y	1/25/1908	0	LI	RYAN, PATRICK
205	798			1/25/1908	CAN	SPR				04S	66E	0	STK	Y	1/25/1908	0	LI	CONWAY, JOSEPH
205	79946		18054	6/17/2010	CER	UG	SW	NW	22	14S	66E	0.27	IRR		6/13/1977	24.6	CL	WOLFLEY, TARA L. AND MATTHEW D. W&H
205	80043T			7/27/2010	EXP	UG	SW	NE	08	04S	67E	0.5	MUN		6/12/1067	10	LI	CALIENTE-CITY
205	80488			1/24/2011	CAN	UG	NE	NE	35	04S	66E	0.107	IRR		3/31/1959	25	LI	YOUNG, RONAL CHAD AND BRENDA
205	81130T			8/29/2011	EXP	UG	SW	NE	08	04S	67E	1	MUN	Y	6/12/1867	325	LI	CALIENTE-CITY
205	8181			6/20/1927	CAN	STR	SW	NW	23	08S	67E	1.6	IRR	Y	6/20/1927	0	LI	LYMAN, BERT
205	8205			6/29/1927	CAN	OSW	SE	SW	36	12S	65E	0.81	IRR	Y	6/29/1927	0	LI	BUNKER, JOHN M.
205	82662		20101	3/25/2013	CER	UG	NW	NW	27	14S	66E	0.0053	IRR		6/14/1972	1	CL	LEARNED, BENJAMIN L. OR BEVERLY J.
205	82894			6/12/2013	PER	UG	SE	NE	27	14S	66E	0.0345	IRR	Y	2/8/1973	5	CL	WOLFLEY, JARED M. & LISA A.
205	83295			12/5/2013	PER	UG	SE	NE	27	14S	66E	0.0036	IRR	Y	8/17/1978	2.629	CL	WOLFLEY, JARED M. AND LISA A.
205	83307			12/12/2013	PER	UG	SW	NE	08	04S	67E	0.978	MUN		5/14/1941	395	LI	CALIENTE-CITY
205	83308			12/12/2013	PER	UG	SW	NE	08	04S	67E	0.6	MUN		5/24/1946	104	LI	CALIENTE-CITY
205	83309			12/12/2013	WDR	UG	SW	NE	08	04S	67E	2	MUN		12/8/1060	1448	LI	CALIENTE PUBLIC UTILITIES
205	83310			12/12/2013	WDR	UG	SW	NE	08	04S	67E	6	MUN		6/12/1907	0	LI	CALIENTE-CITY

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205	83311			12/12/2013	WDR	UG	SE	NE	12	04S	66E	6	MUN		2/18/1971	0	LI	CALIENTE-CITY
205	83312			12/12/2013	PER	UG	SE	NE	12	04S	66E	1.5	MUN		7/18/1991	1085.93	LI	CALIENTE - CITY OF
205	8359		1895	10/22/1927	CER	OSW	SE	NW	17	10S	67E	0.225	IRR	Y	10/22/1927	162	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST DATED JUNE 20, 1990
205	83748			4/18/2014	PER	UG	SW	SW	14	09S	67E	0.6	IRR		11/14/1977	141.18	LI	SCOTT, DEED D. AND CATHERINE S.
205	8381			11/11/1927	ABR	STR	NW	NW	34	09S	67E	0.461	IRR	Y	11/11/1927	0	LI	AVERETT, MARY J.
		CHANGED BY: 10192			CER	STR												
205	845			3/4/1908	CAN	SPR				06S	67E	0	STK	Y	3/4/1908	0	LI	CARSON, RALPH
205	85293			7/10/2015	PER	UG	NE	SE	27	14S	66E	0.086	IRR	Y	2/8/1973	12.5	CL	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	85294			7/10/2015	PER	UG	NE	SE	27	14S	66E	0.069	IRR	Y	2/8/1973	10	CL	LEWIS, ROBERT C. AND VIVIAN
205	85427			9/9/2015	PER	UG	NE	SE	27	14S	66E	0.147	IRR	Y	2/8/1973	21.5	CL	LEWIS, ROBERT C. AND VIVIAN
205	85482			10/1/2015	PER	UG	SW	SW	26	14S	66E	0.015	IRR	Y	10/8/1976	5	CL	MEADOW VALLEY FARM LANDS IRRIGATION COMPANY
205	8553		2062	6/3/1928	CER	STR	NW	SW	20	07S	68E	0.018	STK	Y	6/3/1928	11.20148 5	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	85564		20827	10/28/2015	CER	UG	NW	SE	27	14S	66E	0.0014	IRR		2/8/1973	1	CL	DIOGUARDI, MICHAEL N. AND DIANE M.
205	85619			11/2/2015	PER	UG	NE	SE	27	14S	66E	0.4	IRR	Y	11/15/1973	125	CL	LEWIS, ROBERT C. AND VIVIAN
205	85620			11/2/2015	PER	UG	SW	SW	26	14S	66E	0.013	IRR	Y	10/28/1975	5	CL	LEWIS, ROBERT C. AND VIVIAN
205	85640			11/6/2015	WDR	UG	NE	SE	27	14S	66E	0.83	IRR		8/27/1975	135	CL	LEWIS, ROBERT C. AND VIVIAN
205	86001			5/22/2016	PER	UG	SW	SW	26	14S	66E	0.002	IRR		2/8/1973	1.5	CL	PAUL AND LUO JEANNE LEWIS 2000 TRUST
205	86981			6/6/2018	RFA	UG	NE	NE	35	04S	66E	0.107	IRR		3/31/1959	25	LI	YOUNG, RONAL CHAD AND BRENDA
205	9196		2345	1/4/1930	CER	OSW	SE	SE	04	10S	67E	0.28	IRR	Y	1/4/1930	134	LI	WEBER, WILLIAM R AND BUNDY, SALLY M
205	9256			5/31/1930	CAN	OSW	SW	NW	18	10S	67E	1.6	IRR		5/31/1930	0	LI	SPENCER, LETITIA VIOLET
205	9343			9/29/1930	CAN	STR	SW	SE	38	12S	65E	3	IRR	Y	9/29/1930	0	LI	STUART, BRADLEY R.
205	9439			4/20/1931	CAN	STR	NE	NE	02	09S	67E	1	IRD	Y	4/20/1931	0	LI	CONDIFF, W.A.
205	9458		1945	6/5/1931	CER	OSW	SE	NW	17	10S	67E	0.321	IRR		6/5/1931	233	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST

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205	9565		1946	12/14/1931	CER	STR	SW	NW	14	06S	67E	0.015	STK		12/14/1931	11.293552	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	9566		1947	12/14/1931	CER	OSW	NE	SW	24	10S	66E	0.016	STK		12/14/1931	11.201485	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	9567		1948	12/14/1931	CER	OSW	SW	NE	17	10S	67E	0.015	STK	Y	12/14/1931	11.201485	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	9568		1949	12/14/1931	CER	STR	NW	NW	26	06S	67E	0.016	STK		12/14/1931	11.201485	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	9684			5/31/1933	WDR	STR	SE	NE	28	07S	67E	0.08	IRR		5/31/1933	40	LI	MARIGER, VIVIAN K.
205	9857		2342	4/24/1935	CER	STR	NW	SE	15	05S	66E	0.433	IRR	Y	4/24/1935	210	LI	BLACK, PARLEY SR.
205	9897			9/11/1935	CAN	OSW	SE	SW	36	12S	65E	2	MM	Y	9/11/1935	0	LI	BIRNIE, ZOE
205	9916			12/13/1935	CAN	OSW	SE	SW	33	06S	65E	0.25	MM	Y	12/13/1935	181.003722	LI	RYAN, JAMES
205	9935		2463	2/1/1936	CER	STR	NW	NE	25	04S	66E	0.187	IRR	Y	2/1/1936	71	LI	RAINBOW LAND & CATTLE COMPANY, LLC
205	9988		2401	5/11/1936	CER	STR	NE	NE	13	06S	65E	0.26	MM	Y	5/11/1936	32.26	LI	CALIENTE CYANIDING CO.
205	R04287			5/3/1985	RES	SPR	SW	NE	17	05S	66E	0.001	OTH			0	LI	BLM
205	R04289			5/3/1985	RES	SPR	NE	SW	14	06S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04294			5/3/1985	RES	SPR	SE	SW	22	06S	67E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04295			5/3/1985	RES	SPR	SE	SW	03	05S	65E	0.001	WLD		4/17/1926	0	LI	BLM
205	R04296			5/3/1985	RES	SPR	SW	NE	06	05S	66E	0.005	OTH			0	LI	BLM
205	R04297			5/3/1985	RES	SPR	NE	SW	36	04S	65E	0.002	OTH		4/17/1926	0	LI	BLM
205	R04309			5/3/1985	RES	SPR	NE	NW	22	06S	67E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04311			5/3/1985	RES	SPR	NW	NE	23	10S	66E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04312			5/3/1985	RES	SPR	NW	NE	31	06S	69E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04313			5/3/1985	RES	SPR	NE	SW	17	07S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04314			5/3/1985	RES	SPR	SE	NE	33	04S	66E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04315			5/3/1985	RES	SPR	NW	SW	21	11S	67E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04316			5/3/1985	RES	SPR	SE	SW	33	06S	67E	0.001	OTH		4/17/1926	0	LI	BLM

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205	R04319			5/3/1983	RES	SPR	NE	SE	06	07S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04320			5/3/1985	RES	SPR	SE	SW	01	07S	67E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04321			5/3/1985	RES	SPR	NW	SE	23	05S	65E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04322			5/3/1985	RES	SPR	SW	NE	18	05S	66E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04323			5/3/1985	RES	SPR	SW	NE	13	04S	66E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04324			5/3/1985	RES	SPR	NE	SE	07	06S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04325			5/3/1985	RES	SPR	NE	SE	07	06S	66E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04326			5/18/1985	RES	SPR	NW	SE	27	07S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04327			5/3/1985	RES	SPR	NW	NE	07	07S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04328			5/3/1985	RES	SPR	SE	SW	08	07S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04329			5/3/1985	RES	SPR	NE	SW	07	07S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04330			5/3/1985	RES	SPR	NE	SE	05	07S	68E	0.002	OTH		4/17/1926	0	LI	BLM
205	R04331			5/3/1985	RES	SPR	SW	NW	04	07S	68E	0.002	OTH		4/17/1926	0	LI	BLM
205	R04332			5/3/1985	RES	SPR	SW	SE	07	06S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04333			5/3/1985	RES	SPR	NW	SW	21	06S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04334			5/3/1985	RES	SPR	SE	NW	29	06S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04335			5/3/1985	RES	SPR	SE	NW	12	07S	67E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04337			7/18/1985	RES	SPR	SW	NW	28	05S	66E	0.006	OTH			0	LI	BLM
205	R04338			5/3/1985	RES	SPR	SE	NE	33	05S	67E	0.001	OTH			0	LI	BLM
205	R04340			5/3/1985	DEN	SPR	SE	SW	13	06S	66E	0	OTH		4/17/1926		LI	BLM
205	R04341			5/3/1985	RES	SPR	NE	SW	14	06S	68E	0.001	OTH		4/17/1926	0	LI	BLM
205	R04342			5/3/1985	RES	SPR	SE	SW	11	06S	65E	0.001	OTH			0	LI	BLM
205	R09415			4/8/2004	RES	SPR	NE	NE	02	12S	67E	0.0015	STK		4/8/2004	0	LI	BLM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
205	V00804			10/31/1910	VST	SPR	NW	SE	32	04S	66E	0	STK		1/1/1885		LI	CONWAY, JOSEPH
205	V01076			12/16/1911	DEC	OSW	NW	SE	25	04S	66E	1.847	DEC		12/31/1877	329	LI	AMES, JEFFREY A. AND LISA K.
		CHANGED BY: 73789			CAN	OSW												
205	V01129			8/12/1912	DEC	STR	NW	NW	03	10S	67E	0.25	DEC		1/1/1905	0	LI	SAN PEDRO, LOS ANGELES & SALT LAKE R
205	V01130			8/16/1912	VST	UG	SW	NW	24	12S	65E	0.25	COM			0	LI	SAN PEDRO, LOS ANGELES & SALT LAKE R
205	V01229			2/20/1913	DEC	UG	NE	SW	07	07S	67E	0.25	DEC		1/1/1904	0	LI	SAN PEDRO, LOS ANGELES & SALT LAKE R
205	V01245			5/22/1913	DEC	STR	SE	NE	27	05S	66E	0.913	DEC		1/1/1873	182.4	LI	REBEL ROCK RANCH, LLC
205	V01262			9/6/1913	DEC	STR	SE	SE	34	04S	66E	1.693	DEC		1/1/1880	338.5	LI	325 EAST FOURTH ST
205	V01439			1/5/1916	VST	SPR	SW	SW	14	10S	66E	0.2	STK		1/1/1895	0	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	V01440			1/5/1916	VST	SPR	SW	NW	09	10S	66E	0.2	STK		1/1/1896	0	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	V01441			1/5/1916	VST	SPR	SE	SE	02	10S	65E	0.2	STK		1/1/1897	0	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	V01448			2/7/1916	VST	SPR	SW	SW	01	06S	67E	0.1	STK		1/1/1895	0	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST DATED JUNE 20, 1990
205	V01503			4/21/1917	VST	SPR	NW	NW	32	06S	68E	0.1	STK		1/1/1900	0	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	V01557			3/9/1918	DEC	STR	SW	SW	26	07S	67E	1.7	DEC		1/2/1870	340	LI	ROBERT C. AND VIVIAN C. LEWIS 1990 TRUST
205	V01616			1/1/1919	DEC	STR		NE	32	14S	66E	0.046	OTH		12/31/1904	0	CL	LOS ANGELES & SALT LAKE RAILROAD CO.
205	V01628			6/23/1919	VST	SPR	SW	SW	36	06S	66E	0.05	STK		1/1/1894	0	LI	DUFFIN, MARNIE RYAN
205	V01632			7/15/1919	VST	SPR	NW	NE	12	06S	65E	0.1	STK		1/1/1894	0	LI	DUFFIN, MAMIE RYAN
205	V01704			6/1/1920	DEC	STR	NW	SW	35	04S	66E	3.478	DEC		1/1/1880	695.5	LI	325 EAST FOURTH ST
205	V02274			10/26/1933	ABR	STR	SE	NE	12	07S	66E	3.971	DEC		1/1/1890	0	LI	BRADSHAW, INC.
		CHANGED BY: 60878			WDR	STR												
		CHANGED BY: 78260			PER	STR												
205	V02320			9/14/1942	VST	STR	SE	NE	03	05S	65E	0.25	STK		1/1/1900	0	LI	JERRY JOHNSTON OR JANET LIND
205	V02321			9/14/1942	VST	SPR	NE	SW	12	05S	65E	0.025	STK		1/1/1900	0	LI	CORP PRESIDING BISHOP CHURCH JC LDS

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('205') Run Date: 8/22/2019 9:20:21 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
205	V04345			5/9/1985	DEC	SPR	NE	SW	12	07S	66E	3.971	DEC		12/31/1889	783.5	LI	RTT GOLD, LLC
205	V04346			5/13/1985	VST	SPR	N2	N2	34	07S	68E	0.033	STK		1/1/1875	0	LI	PETERSON, JOY
205	V04347			5/13/1985	VST	SPR	SW	SW	01	07S	68E	0.02	STK		1/1/1885	0	LI	PETERSON, JOY
205	V04348			5/13/1985	VST	SPR	NW	NE	31	06S	69E	0.02	STK		1/1/1875	2.792699	LI	PETERSON, JOY
205	V04349			5/13/1985	VST	SPR	NW	NW	25	06S	68E	0.022	STK		1/1/1875	0	LI	PETERSON, JOY
205	V04350			5/13/1985	VST	SPR	NE	SW	14	06S	68E	0.022	STK		1/1/1875	0	LI	PETERSON, JOY
205	V04356			5/17/1985	VST	STR	SE	SE	04	10S	67E	0	IRR		1/1/1930	150	LI	BRUNDY, SALLY M.
205	V04357			5/17/1985	VST	STR	SE	SE	04	10S	67E	0.28	STK			0	LI	BRUNDY, SALLY M.; WEBER, WILLIAM R.
205	V04365			5/20/1985	DEC	UG	NE	SW	07	07S	67E	0.02	DEC		1/1/1910	0	LI	LESSEE- UNION PACIFIC RAILROAD CO.
205	V04366			5/20/1985	DEC	UG	NW	NW	03	10S	67E	0.0138	DEC		1/1/1904	10	LI	LINCOLN COUNTY & VIDLER WATER
		CHANGED BY: 67436			DEN	UG												
		CHANGED BY: 70407			PER	UG												
205	V04367			5/20/1985	DEC	UG	SW	NW	24	12S	65E	0	COM		1/1/1925	0	LI	VIDLER WATER CO & LINCOLN COUNTY
		CHANGED BY: 67435			DEN	UG												
		CHANGED BY: 70406			PER	UG												

Nevada Division of Water Resources

Hydrographic Abstracts

Hydrographic Abstract Report

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('206') Run Date: 8/22/2019 8:41:34 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
206	10348		2702	3/20/1939	CER	SPR	NE	SE	30	07S	66E	0.003	STK		3/20/1939	1.826517	LI	RANKIN, RICHARD AND MEREDITH 50%
206	11139		3083	7/12/1944	CER	SPR	NE	SW	29	07S	65E	0.00625	STK		7/12/1944	4.48	LI	CHURCH OF JC OF LSD
206	11427		3355	11/16/1945	CER	SPR	NE	SE	24	08S	65E	0.003	STK		11/16/1945	2.178919	LI	LDS
206	21662			11/28/1963	CAN	UG	SE	SE	12	07S	65E	0	STK		11/28/1963		LI	STEWART, C.D.
206	27926			11/29/1973	CAN	SPR		SW	09	09S	65E	0.016	STK		11/29/1973	11.201486	LI	SUMMA CORPORATION
206	27927			11/29/1973	CAN	RES		NE	14	09S	64E	0.016	STK		11/29/1973	11.232174	LI	SUMMA CORPORATION
206	2923			3/24/1914	DEN	UG	NE	NE	09	09S	65E	250	IRR	Y	3/24/1914	0	LI	GREAT WESTERN LAND, WATER & POWER CO
206	4710		3396	11/19/1917	CER	SPR	NE	NW	20	08S	65E	0.002	STK		11/19/1917	0.951350	LI	LDS
206	4750			11/30/1917	CAN	SPR				09S	64E	0.1	STK	Y	11/30/1917		LI	WEDGE, JOHN W.
206	52743			11/30/1988	DEN	SPR	SW	NE	28	07S	65E	0.007	STK		7/29/1919	0	LI	BALLOW, RACHAEL
206	5643		1528	7/29/1919	CER	SPR	SW	SE	18	07S	66E	0.05	STK		7/29/1919	7.28	LI	SCHLARMAN, RACHAEL 25%
		CHANGED BY: 52743			DEN	SPR												
206	5679		1018	11/28/1919	CER	SPR	SE	SE	15	07S	65E	0.003	STK	Y	11/28/1919	2.178919	LI	LDS
206	6007		676	3/5/1920	CER	SPR	NW	NE	07	08S	65E	0.003	STK	Y	3/5/1920	2.178919	LI	LDS
206	6069			5/4/1920	CAN	STR				09S	65E	16	IRR	Y	5/4/1920		LI	JOHN B. BRADSHAW CO.
206	6203			7/14/1920	DEN	SPR	NW	SW	29	08S	66E	0.1	STK	Y	7/14/1920		LI	GARDNER RANCH COMPANY
206	63416			8/10/1997	WDR	SPR		LT06	06	07S	66E	0.01	STK		8/10/1997		CL	TENNILLE, GEORGE R.
206	64888			12/11/1998	WDR	UG	SW	SE	25	08S	65E	10	IRR		12/11/1998	0	LI	LINCOLN COUNTY WATER DISTRICT
		CHANGED BY: 71722			WDR	UG												

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('206') Run Date: 8/22/2019 8:41:34 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
206	64669			12/11/1998	WDR	UG	SE	SW	31	09S	65E	10	IRR		12/11/1998	0	LI	LINCOLN COUNTY WATER DISTRICT
		CHANGED BY: 71723			WDR	UG												
206	6889		1250	4/28/1923	CER	RES	NE	SE	35	09S	64E	0	STK	Y	4/28/1923	10	LI	CORPORATION OF THE PRESIDING BISHOP OF THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS 50%
206	6890		1251	4/28/1923	CER	SPR	NE	NE	28	09S	64E	0.006	STK	Y	4/28/1923	1.09	LI	HIKO LAND AND CATTLE COMPANY
206	71010			4/6/2004	CAN	RES	NE	NE	24	10S	64E	0.00023	WLD		4/6/2004	0	LI	BLM
206	71722			9/22/2004	WDR	UG	SW	SE	25	08S	65E	10	MUN		12/11/1998	0	LI	LINCOLN COUNTY WATER DISTRICT
206	71723			9/22/2004	WDR	UG	SE	SW	31	09S	65E	10	MUN		12/11/1998	0	LI	LINCOLN COUNTY WATER DISTRICT
206	72218			2/14/2005	ABR	UG	SW	SE	25	08S	65E	6	MUN		2/14/2005	0	LI	COYOTE SPRINGS INVESTMENT, LLC
		CHANGED BY: 82647			WDR	UG												
		CHANGED BY: 82727			PER	UG												
206	72219			2/14/2005	ABR	UG	SE	SW	31	09S	65E	6	MUN		2/14/2005	0	LI	COYOTE SPRINGS INVESTMENT, LLC
		CHANGED BY: 82648			WDR	UG												
		CHANGED BY: 82728			PER	UG												
206	72220			2/14/2005	PER	UG	SE	SW	06	11S	64E	6	MUN	Y	2/14/2005	500	LI	COYOTE SPRINGS INVESTMENT, LLC
206	72221			2/14/2005	PER	UG	SE	SW	11	09S	65E	6	MUN	Y	2/14/2005	500	LI	COYOTE SPRINGS INVESTMENT, LLC
		CHANGED BY: 82649			WDR	UG												
		CHANGED BY: 82729			WDR	UG												
206	74147			4/10/2006	RFP	UG	SW	SE	25	08S	65E	6	MUN		1/1/1900	0	LI	LINCOLN COUNTY WATER DISTRICT
206	74148			4/10/2006	RFP	UG	SE	SW	31	09S	65E	6	MUN		1/1/1900	0	LI	LINCOLN COUNTY WATER DISTRICT
206	74149			4/10/2006	RFP	UG	SE	SW	06	11S	64E	6	MUN		1/1/1900	0	LI	LINCOLN COUNTY WATER DISTRICT
206	74150			4/10/2006	RFP	UG	SE	SW	11	09S	65E	6	MUN		1/1/1900	0	LI	LINCOLN COUNTY WATER DISTRICT
206	82647			3/19/2013	WDR	UG	SW	NW	14	10S	64E	6	MUN		2/14/2005	500	LI	LINCOLN COUNTY WATER DISTRICT AND VIDLER WATER COMPANY INC

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('206') Run Date: 8/22/2019 8:41:34 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
206	82648			3/19/2013	WDR	UG	NE	NW	28	10S	64E	6	MUN		2/14/2005	500	LI	LINCOLN COUNTY WATER DISTRICT AND VIDLER WATER COMPANY INC
206	82649			3/19/2013	WDR	UG	SE	SW	32	10S	64E	6	MUN		2/14/2005	500	LI	LINCOLN COUNTY WATER DISTRICT AND VIDLER WATER COMPANY INC
206	82727			4/17/2013	PER	UG	SW	NW	14	10S	64E	6	MUN	Y	2/14/2005	500	LI	COYOTE SPRINGS INVESTMENT LLC
206	82728			4/17/2013	PER	UG	NE	NW	28	10S	64E	6	MUN	Y	2/14/2005	500	LI	COYOTE SPRINGS INVESTMENT LLC
206	82729			4/17/2013	WDR	UG	SW	NW	32	10S	64E	6	MUN		2/14/2005	500	LI	COYOTE SPRINGS INVESTMENT LLC
206	9924		2508	1/2/1936	CER	SPR	SE	NE	24	08S	64E	0.005	STK	Y	1/2/1936	3.62	LI	CORP PRESIDING BISHOP CHURCH JC LDS 50%
206	R09412			4/6/2004	RES	SPR	SW	NW	09	10S	64E	0.0015	STK		4/6/2004	0	LI	BLM
206	V01359			3/22/1915	VST	SPR	SW	SE	28	09S	65E	0.025	STK		1/1/1893	0	LI	CHURCH OF JESUS CHRIST OF LDS 50%
206	V01360			3/22/1915	VST	SPR	SW	SE	16	08S	65E	0.025	STK		1/1/1886	0	LI	CHURCH OF JESUS CHRIST OF LDS 50%
206	V01361			3/22/1915	VST	SPR	SE	SE	30	08S	65E	0.025	STK		1/1/1891	0	LI	BALLOW, RACHAEL
206	V01602			2/6/1919	VST	SPR	NW	NW	25	08S	64E	0.025	STK		1/1/1900		LI	GARDNER RANCH COMPANY
206	V01603			2/6/1919	VST	SPR	SW	SE	23	08S	64E	0.013	STK		1/1/1900		LI	LOVE, H.E.
206	V01718			7/14/1920	VST	SPR	NW	NW	29	08S	65E	0	STK		1/1/1900		LI	GARDNER RANCH CO.

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Hydrographic Abstracts

Hydrographic Abstract Report

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('210') Run Date: 8/22/2019 8:48:14 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
210	10449		2721	12/4/1939	CER	RES	NE	NW	05	09S	64E	0.013	STK		12/4/1939	8.901188	LI	LDS
210	10477			3/18/1940	CAN	STR	SE	NE	02	10S	62E	0.007	STK		3/18/1940	5	LI	RICHARD J.W.
210	10478		3946	3/18/1940	CER	STR	SW	SE	11	10S	62E	0.007	STK		3/18/1940	5	LI	BUCK HORN CATTLE CO
210	10804			4/6/1942	DEN	UG	NW	NE	11	13S	63E	0.025	STK		4/6/1942	0	CL	BLACKBURN, LESLIE
210	11134			6/26/1944	CAN	SPR						0.05	STK		6/26/1944		LI	PERKINS, GEORGE M.
210	11525		3350	3/26/1946	CER	SPR	SW	NW	17	08S	64E	0.003	STK		3/26/1946	2.240297	LI	CHURCH OF J. CHRIST LATTER DAY SAINT
210	11641		3370	7/26/1946	CER	SPR	NE	SE	35	11S	61E	0.001	WLD		7/26/1946	0.736536	LI	USFWS
210	11645		3366	7/26/1946	CER	SPR	NE	SE	29	14S	61E	0.001	WLD		7/26/1946	0.429646	CL	USFWS
210	12632		3791	8/13/1948	CER	SPR	SE	NE	01	13S	61E	0.003	WLD		8/13/1948	2.178919	LI	USFWS
210	13510		3785	10/16/1950	CER	SPR	NW	NE	30	14S	61E	0	STK		10/16/1950	0.061378	CL	USFWS
210	14984			4/16/1953	WDR	UG	SE	NE	10	09S	62E	3	IRR		4/16/1953	800	LI	GRAINGER, BEN C.
210	15543			3/8/1954	WDR	UG	NW	SE	09	09S	62E	3	IRR		3/8/1954	1600	LI	WILLIAM W. ALLES
210	15591			4/7/1954	WDR	UG	NW	NE	09	10S	62E	6	IRR		4/7/1954		LI	ALLES, WILLIAM W.
210	15592			4/7/1954	WDR	UG	SE	NE	10	10S	62E	6	IRR		4/7/1954		LI	GRAINGER, BEN C.
210	1565			12/29/1909	DEN	SPR			28	14S	61E	0	IRR		12/29/1909	0	CL	KAISER LIVESTOCK
210	1568			12/29/1909	DEN	STR			13	15S	61E	0	IRR		12/29/1909	0	CL	KAISER LIVESTOCK CO
210	16378			4/13/1955	CAN	UG	NW	SE	15	10S	62E	8	IRD		4/13/1955	1280	LI	ROBERTS, HAROLD F.
210	16550			6/6/1955	WDR	UG	SE	SW	24	10S	62E	0	IRR		6/6/1955		LI	BOLINDER, ANNA H.
210	16551			6/6/1955	WDR	UG	NE	NW	36	10S	62E	0	IRR		6/6/1955		LI	AAMODT, MARGARET C.

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('210') Run Date: 8/22/2019 8:48:14 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
210	16552			6/6/1955	WDR	UG		SW	25	10S	62E	0	IRR		6/6/1955		LI	BOLINDER, JULIUS VERN
210	16568			6/17/1955	WDR	UG	NW	NW	23	10S	62E	0	IRR		6/17/1955		LI	GOTTFREDSON, DAVID B.
210	16769			10/21/1955	WDR	UG	NE	NE	23	10S	62E	3	IRR		10/21/1955		LI	GOTTFREDSON, IRMA G.
210	17892			3/19/1959	CAN	SPR			15	15S	62E	0	STK		3/19/1959		CL	HENDRICKS, JOHN S.
210	17893			3/19/1959	CAN	SPR				15S	62E	0	STK		3/19/1959		CL	HENDRICKS, JOHN A.
210	17894			3/19/1959	CAN	SPR						0	STK		3/19/1959		CL	HENDRICKS, JOHN A.
210	18079			6/23/1959	CAN	SPR				15S	62E	0	STK		6/23/1959		CL	HENDRICKS, JOHN A.
210	18080			6/23/1959	CAN	SPR				15S	62E	0	STK		6/23/1959		CL	HENDRICKS, HELEN W.
210	18081			6/23/1959	CAN	UG				15S	62E	0	STK		6/23/1959		CL	HENDRICKS, HELEN W.
210	18402			10/30/1959	DEN	SPR	NE	SW	12	15S	61E	0.001	STK		10/30/1959		CL	HENDRICKS, HELEN W.
210	18403			10/30/1959	DEN	SPR	NE	SE	07	15S	62E	0.001	STK		10/30/1959		CL	HENDRICKS, JOHN A.
210	18890			5/31/1960	CAN	SPR	SE	SE	30	14S	61E	0	STK		5/31/1960	0	CL	USFWS
210	19306		6011	11/1/1960	CER	SPR	SE	SE	30	14S	61E	0.001	STK		11/1/1960	0.04	CL	USFWS
210	19708		6069	3/31/1961	CER	SPR	NE	SE	07	15S	62E	0.001	STK		3/31/1961	0.061378	CL	USFWS
210	19709		6070	3/31/1961	CER	SPR	NE	SW	12	15S	61E	0.001	STK		3/31/1961	0.278201	CL	USFWS
210	25706			7/10/1970	CAN	UG	SE	NW	13	11S	62E	0.5	COM		7/10/1970	4.726106	LI	C. S., INC.
210	27925			11/29/1973	CAN	RES		NE	07	09S	64E	0	STK		11/29/1973		LI	SUMMA CORPORATION
210	3294		1391	3/8/1915	CER	SPR	NW	SE	24	11S	63E	0.013	STK	Y	3/8/1915	8.961168	LI	SCHLARMAN, RACHAEL
210	32947			7/28/1977	DEN	UG	NW	SE	25	10S	62E	0.22	QM		7/28/1977	0	LI	DESERT PARADISE INC.
210	33067			8/8/1977	DEN	UG	NW	NE	23	13S	63E	2.5	IRC		8/8/1977	800	CL	CONGER, DORIS
210	33068			8/8/1977	DEN	UG	NE	NE	23	13S	63E	2.5	IRC		8/8/1977	800	CL	CONGER, ERNEST R.
210	33069			8/8/1977	DEN	UG	SW	SE	11	13S	63E	2.5	IRC		8/8/1977	8000	CL	LEWIS, MALCOM LEE
210	33070			8/8/1977	DEN	UG	NE	SW	14	13S	63E	2.5	IRR		8/8/1977	0	CL	LEWIS, LOIS

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210	33071			8/8/1977	DEN	UG	NW	SW	14	13S	63E	2.5	IRC		8/8/1977	8000	CL	LEWIS, CLARVID A.
210	33072			8/8/1977	DEN	UG	NE	NW	14	13S	63E	2.5	IRC		8/8/1977	8000	CL	LEWIS, BARBARA
210	33073			8/8/1977	CAN	UG	NW	NE	11	13S	63E	2.5	IRC		8/8/1977	800	CL	BARNEBY, JEANNINE S.
210	33074			8/8/1977	CAN	UG	NE	NE	11	13S	63E	2.5	IRC		8/8/1977	800	CL	BARNEBY, DAVID G.
210	34096			10/13/1977	CAN	UG	SW	SW	32	12S	63E	2.7	IRR		10/13/1977		LI	BRADLEY, SUSAN L.
210	34176			10/17/1977	CAN	UG		NW	26	13S	63E	2.7	IRR		10/17/1977		CL	GLORE, FRED
210	34177			10/17/1977	CAN	UG		NE	26	13S	63E	2.7	IRR		10/17/1977		CL	GLORE, WAYNE JAMES
210	34178			10/17/1977	CAN	UG		SW	24	13S	63E	2.7	IRR		10/17/1977	100	CL	SENA, ARSENIO G.
210	34286			10/18/1977	CAN	UG		SE	14	13S	63E	2.7	IRC		10/18/1977		CL	SMART, FRED M.
210	34287			10/18/1977	DEN	UG	SW	NE	23	13S	63E	2.7	IRC		10/18/1977	0	CL	BRITZ, HERMAN
210	34300			10/19/1977	CAN	UG		SW	14	13S	63E	2.7	IRC		10/19/1977		CL	BRITZ, EARL F
210	34390			10/25/1977	DEN	UG	NE	NE	26	13S	63E	2.7	IRC		10/25/1977	0	CL	FULLER, DAVID PAUL
210	34397			10/25/1977	DEN	UG	NW	SE	26	13S	63E	2.7	IRC		10/25/1977	0	CL	FULLER, LEONIE M.
210	34398			10/25/1977	DEN	UG	SE	SE	23	13S	63E	2.7	IRC		10/25/1977	0	CL	HOLTON, VERA L.
210	34581			11/7/1977	DEN	UG	NE	SW	08	13S	63E	2.7	IRC		11/7/1977	0	CL	CHABAFY, RITA T.
210	34582			11/7/1977	DEN	UG	NE	NW	17	13S	63E	2.7	IRC		11/7/1977	0	CL	SZANTO, HUBERT S.
210	34583			11/7/1977	DEN	UG	SW	SE	08	13S	63E	2.7	IRC		11/7/1977	0	CL	CHABAFY, ATTILA M.
210	34584			11/7/1977	DEN	UG	NW	NE	17	13S	63E	2.7	IRC		11/7/1977	0	CL	PARKER, FRANCIS K.
210	35198			3/20/1978	DEN	UG	NW	NE	08	13S	63E	2.7	IRC		3/20/1978	0	CL	LALLEMENT, MELVIN R.
210	35199			3/20/1978	DEN	UG	SE	SW	05	13S	63E	2.7	IRC		3/20/1978	0	CL	HOPPER, MARGARET B.
210	35200			3/20/1978	DEN	UG	SW	SE	05	13S	63E	2.7	IRC		3/20/1978	0	CL	LALLEMENT, GRACE M.
210	35201			3/20/1978	DEN	UG	NE	NW	08	13S	63E	2.7	IRC		3/20/1978	0	CL	LALLEMENT, GRACIABEL H.
210	37202			3/26/1979	DEN	UG	NE	SE	11	13S	63E	5.4	IRD		3/26/1979	0	CL	EARL, MILTON S.

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210	37207			3/26/1979	DEN	UG	NE	SE	24	11S	62E	5.4	IRR		3/26/1979	0	CL	EARL, DAN
210	37208			3/26/1979	DEN	UG	NW	NE	13	11S	62E	5.4	IRD		3/26/1979	0	CL	EARL, LORNA
210	37215			3/26/1979	DEN	UG	NE	SE	23	13S	63E	5.4	IRD		3/26/1979	1600	CL	JOSEPH, KENNETH
210	37253			3/27/1979	DEN	UG	NE	SE	25	11S	62E	5.4	IRD		3/27/1979	0	CL	LEAVITT, MARIA
210	37276			3/26/1979	DEN	UG	NW	SW	07	11S	63E	5.4	IRR		3/26/1979		LI	MAX V LEAVITT
210	38364			6/19/1979	CAN	UG	NW	SW	17	15S	63E	5.4	IRR		6/19/1979		CL	JOHNSON, MARILYN E.
210	38556			7/16/1979	DEN	UG	NE	SW	02	13S	63E	5.4	IRD		7/16/1979	0	CL	LEAVITT, KATHY S.
210	38557			7/16/1979	DEN	UG	NW	NE	23	13S	63E	2.9	IRD		7/16/1979	0	CL	LEAVITT, EARL
210	40268			1/8/1980	DEN	UG	NE	NW	14	13S	63E	2.9	IRD		1/8/1980	0	CL	LEAVITT, EARL
210	4213		488	11/11/1916	CER	SPR	SW	NE	12	11S	61E	0.025	STK	Y	11/11/1916	18.07582 1	LI	LAMB, WM. G.
210	42864			11/20/1980	CAN	UG	SE	NE	29	12S	63E	15	QM		11/20/1980		LI	MX
210	43804			5/28/1981	WDR	UG	NE	SE	29	12S	63E	15	QM		5/28/1981	0	LI	MX
210	4393			4/11/1917	CAN	SPR	NW	NE	25	11S	63E	0.001	STK	Y	4/11/1917	0.552402	LI	LAMB, WILLIAM S.
210	44220			8/3/1981	WDR	UG	SE	SE	23	13S	63E	15	QM		8/3/1981	0	CL	MX
210	44720			10/29/1981	CAN	UG	SE	NW	25	13S	63E	0.005	STK		10/29/1981		LI	BLM
210	45891			7/2/1982	CAN	UG	SE	NE	29	12S	63E	16.2	IRD		7/2/1982	0	CL	MOAPA BAND OF PAIUTES
210	46627			2/10/1983	CAN	UG	SE	SE	36	08S	63E	0.015	STK		2/10/1983	5.52402	LI	LDS WELFARE
210	46777			3/31/1983	ABR	UG	SE	SE	23	13S	63E	10	IND		3/31/1983	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 70430			PER	UG												
		CHANGED BY: 70429			CER	UG												
		CHANGED BY: 77292			PER	UG												
210	46915			5/17/1983	DEN	UG	SE	SE	23	13S	63E	4.5	MM		5/17/1983	0	CL	NATASHA MINING COMPANY
210	46916			5/17/1983	DEN	UG	NE	NW	25	13S	63E	4.5	MM		5/17/1983	0	CL	NATASHA MINING COMPANY

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210	46917			5/17/1983	DEN	UG	SE	SE	23	13S	63E	4.5	MM		5/17/1983	0	CL	NATASHA MINING COMPANY
210	4717			11/19/1917	CAN	SPR	SE	SE	28	09S	63E	0.025	STK	Y	11/19/1917	0.552402	LI	D. L STEWART
210	4769			12/10/1917	CAN	RES			11	13S	63E	0.025	STK	Y	12/10/1917	0	CL	RICHARD, J.W.
210	49414			9/27/1985	ABR	UG	SE	SE	23	13S	63E	6	IND		9/27/1985	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77293			PER	UG												
210	49606			12/30/1985	DEN	UG	SE	SE	23	13S	63E	10	IND		12/30/1985	7238.000 65	CL	NEVADA POWER
210	49607			12/30/1985	DEN	UG	SE	SE	23	13S	63E	10	IND		12/30/1985	7238.000 65	CL	NEVADA POWER
210	49608			12/30/1985	ABR	UG	NW	NE	26	13S	63E	10	IND		12/30/1985	0	CL	NEVADA POWER
		CHANGED BY: 69448			ABR	UG												
210	49609			12/30/1985	DEN	UG	NW	NE	26	13S	63E	10	IND		12/30/1985	7238.000 65	CL	NEVADA POWER
210	49610			12/30/1985	DEN	UG	NW	NW	25	13S	63E	10	IND		12/30/1985	7238.000 65	CL	NEVADA POWER COMPANY
210	49660			1/27/1986	ABR	UG	SW	NW	13	11S	63E	0.138	IND		1/27/1986	0	LI	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77294			PER	UG												
210	49661			1/27/1986	ABR	UG	SE	NE	10	12S	63E	0.138	IND		1/27/1986	0	LI	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77295			PER	UG												
210	49662			1/27/1986	ABR	UG	SE	NE	10	13S	63E	0.138	IND		1/27/1986	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77296			PER	UG												
210	49978			7/15/1986	ABR	UG	SW	NW	13	11S	63E	2	IND		7/15/1986	0	LI	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77297			PER	UG												
210	49979			7/15/1986	ABR	UG	SE	SE	26	11S	63E	2	IND		7/15/1986	0	LI	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77298			PER	UG												
210	49980			7/15/1986	ABR	UG	NE	NE	03	12S	63E	2	IND		7/15/1986	0	LI	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77299			PER	UG												

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210	49981			7/15/1986	ABR	UG	SE	NE	10	12S	63E	2	IND		7/15/1986	0	LI	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77300			PER	UG												
210	49982			7/15/1986	ABR	UG	NW	SE	29	12S	63E	2	IND		7/15/1986	0	LI	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77301			PER	UG												
210	49983			7/15/1986	ABR	UG	NW	NW	03	13S	63E	2	IND		7/15/1986	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77302			PER	UG												
210	49984			7/15/1986	ABR	UG	SE	NE	10	13S	63E	2	IND		7/15/1986	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77303			PER	UG												
210	49985			7/15/1986	ABR	UG	NE	NE	20	13S	63E	2	IND		7/15/1986	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77304			PER	UG												
210	49986			7/15/1986	ABR	UG	NE	NE	21	13S	63E	2	IND		7/15/1986	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77305			PER	UG												
210	49987			7/15/1986	ABR	UG	NE	NE	01	13S	63E	2	IND		7/15/1986	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77306			PER	UG												
210	50409			12/10/1986	CAN	UG	SW	NW	14	13S	63E	0.5	MM		12/10/1986	0	CL	BARNELL MINING COMPANY
210	51912			3/10/1988	DEN	UG	SW	NE	25	13S	63E	15.46	MM		3/10/1988	0	CL	BLACK CANYON MINING CO.
210	54055			10/17/1989	DEN	UG	SE	SW	05	13S	63E	6	MUN		10/17/1989	4343.905 194	CL	LAS VEGAS VALLEY WATER DISTRICT
210	54056			10/17/1989	DEN	UG	SE	SE	32	13S	63E	6	MUN		10/17/1989	4344.212 084	CL	LAS VEGAS VALLEY WATER DISTRICT
210	54057			10/17/1989	DEN	UG	SE	NW	16	14S	63E	6	MUN		10/17/1989	4343.905 194	CL	LAS VEGAS VALLEY WATER DISTRICT
210	54058			10/17/1989	DEN	UG	NE	NE	01	13S	63E	10	MUN		10/17/1989	7239.841 99	CL	LAS VEGAS VALLEY WATER DISTRICT
210	54059			10/17/1989	DEN	UG	NW	NW	19	13S	64E	10	MUN		10/17/1989	7239.841 99	CL	LAS VEGAS VALLEY WATER DISTRICT
210	61458			8/11/1995	EXP	UG	SE	NW	24	11S	62E	1	MM		8/11/1995	0	LI	BEDROC, INC.
		CHANGED BY: 70861			EXP	UG												

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		CHANGED BY: 70662			EXP	UG												
210	61459			8/11/1995	DEN	UG	SE	NE	24	11S	62E	2.5	IRR		8/11/1995	0	LI	BEDROC, INC.
210	62462			9/13/1996	ABR	SPR	E2	W2	24	11S	62E	0.35	MM		9/13/1996	0	LI	BEDROC LIMITED
		CHANGED BY: 70660			EXP	OGW												
210	62865			2/20/1997	DEN	UG	SE	NW	13	11S	62E	0.5	MM		2/20/1997	0	LI	C.S., INC.
210	63272			7/24/1997	DEN	UG	SW	SW	12	12S	63E	10	QM		7/24/1997	0	CL	COYOTE SPRINGS INVESTMENT, LLC
210	63273			7/24/1997	DEN	UG	NW	NW	12	12S	63E	10	QM		7/24/1997	0	CL	COYOTE SPRINGS INVESTMENT, LLC
210	63274			7/24/1997	DEN	UG	NE	NW	15	13S	63E	10	QM		7/24/1997	0	CL	COYOTE SPRINGS INVESTMENT, LLC
210	63275			7/24/1997	DEN	UG	NE	NE	11	13S	63E	10	QM		7/24/1997	0	CL	COYOTE SPRINGS INVESTMENT, LLC
210	63276			7/24/1997	DEN	UG	SW	SE	13	11S	63E	10	QM		7/24/1997	0	CL	COYOTE SPRINGS INVESTMENT, LLC
210	6362			12/23/1920	DEN	SPR	SW	NE	24	11S	62E	2	IRR	Y	12/23/1920		LI	FOREMASTER, JOHN P.
210	6363			12/23/1920	WDR	SPR	NE	SW	24	11S	62E	2	IRR	Y	12/23/1920		LI	FOREMASTER, CARL E.
210	6364			12/23/1920	WDR	SPR	NE	SW	13	11S	62E	1.6	IRR	Y	12/23/1920		LI	RICHARD, JOHN W.
210	63867			2/24/1998	DEN	UG	NW	SW	12	13S	63E	10	QM		2/24/1998	0	CL	COYOTE SPRINGS INVESTMENT, LLC
210	63868			2/24/1998	DEN	UG	NW	SW	13	13S	63E	10	QM		2/24/1998	0	CL	COYOTE SPRINGS INVESTMENT, LLC
210	63869			2/24/1998	DEN	UG	SW	SW	11	13S	63E	10	QM		2/24/1998	0	CL	COYOTE SPRINGS INVESTMENT, LLC
210	63870			2/24/1998	DEN	UG	SE	SE	12	13S	63E	10	QM		2/24/1998	0	CL	COYOTE SPRINGS INVESTMENT, LLC
210	63871			2/24/1998	DEN	UG	SE	SE	13	13S	63E	10	QM		2/24/1998	0	CL	COYOTE SPRINGS INVESTMENT, LLC
210	63872			2/24/1998	DEN	UG	SE	SW	11	12S	63E	10	QM		2/24/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC
210	63873			2/24/1998	DEN	UG	SW	SW	25	12S	63E	10	QM		2/24/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC
210	63874			2/24/1998	DEN	UG	SW	SW	13	12S	63E	10	QM		2/24/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC
210	63875			2/24/1998	DEN	UG	SW	SW	36	11S	63E	10	QM		2/24/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC
210	63876			2/24/1998	DEN	UG	NE	NE	22	11S	63E	10	QM		2/24/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC

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210	64039			4/17/1998	DEN	UG	NE	SE	28	14S	63E	10	QM		4/17/1998	0	CL	DRY LAKE WATER, L.L.C.
210	64186			6/3/1998	DEN	UG	NW	SE	36	12S	63E	10	QM		6/3/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC
210	64187			6/3/1998	DEN	UG	SW	SE	35	12S	63E	10	QM		6/3/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC
210	64188			6/3/1998	DEN	UG	NE	SW	34	12S	63E	10	QM		6/3/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC
210	64189			6/3/1998	DEN	UG	NE	SW	27	12S	63E	10	QM		6/3/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC
210	64190			6/3/1998	DEN	UG	NW	NE	25	12S	63E	10	QM		6/3/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC
210	64191			6/3/1998	DEN	UG	NW	SW	24	12S	63E	10	QM		6/3/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC
210	64192			6/3/1998	DEN	UG	NE	SW	26	12S	63E	10	QM		6/3/1998	0	LI	COYOTE SPRINGS INVESTMENT, LLC
210	67892			8/8/2001	DEN	UG	NE	SE	28	14S	63E	10	QM		8/8/2001	0	CL	DRY LAKE WATER, L.L.C.
210	69448			1/6/2003	ABR	UG	NE	NE	28	13S	63E	10	IND		12/30/1985	0	CL	NEVADA POWER COMPANY
		CHANGED BY: 76501			CAN	UG												
		CHANGED BY: 77164			PER	UG												
210	70429		17035	9/24/2003	CER	UG	SE	SW	14	13S	63E	5	MUN	Y	3/31/1983	1500	CL	CLARK COUNTY COYOTE SPRINGS WATER RESOURCES GID
		CHANGED BY: 77338T			EXP	UG												
		CHANGED BY: 77339T			EXP	UG												
		CHANGED BY: 80592			RFA	UG												
		CHANGED BY: 85527T			EXP	UG												
		CHANGED BY: 82051T			EXP	UG												
		CHANGED BY: 74094			PER	UG												
210	70430			9/24/2003	PER	UG	SW	SE	22	13S	63E	4.2	MUN	Y	3/31/1983	1140	CL	COYOTE SPRINGS INVESTMENT, LLC
		CHANGED BY: 72170T			WDR	UG												
		CHANGED BY: 72144			WDR	UG												
		CHANGED BY: 72143T			WDR	UG												

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('210') Run Date: 8/22/2019 8:48:14 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
		CHANGED BY: 77337T			EXP	UG												
		CHANGED BY: 70430R01			RLP	UG												
		CHANGED BY: 74095			PER	UG												
210	70430R01			2/5/2016	RLP	UG	SW	SE	22	13S	63E	0.92	WLD		3/31/1983	460	CL	COYOTE SPRINGS INVESTMENT LLC
210	70859			1/30/2004	EXP	UG	NW	SE	24	11S	62E	0.35	IRR		1/22/1919	160	LI	BEDROC LIMITED, A NEVADA LLC
210	70860			1/30/2004	EXP	OGW	NW	SE	24	11S	62E	0.35	MM		8/13/1996	0	LI	BEDROC LIMITED, A NEVADA LLC
210	70861			1/30/2004	EXP	UG	SE	NW	24	11S	62E	0.25	MM		8/11/1995	0	LI	BEDROC LIMITED, A NEVADA LLC
210	70862			1/30/2004	EXP	UG	NW	SE	24	11S	62E	0.25	MM		8/11/1995	0	LI	BEDROC LIMITED, A NEVADA LLC
210	71031			4/13/2004	RFA	UG	NW	SE	24	11S	62E	0.35	COM		4/13/2004	200	LI	BEDROC LIMITED, A NEVADA LLC
		CHANGED BY: 85251			RFA	UG												
		CHANGED BY: 85252			RFA	UG												
		CHANGED BY: 85253			RFA	UG												
		CHANGED BY: 85254			RFA	UG												
210	72143T			1/21/2005	WDR	UG	NW	SW	22	13S	63E	4.2	MUN		3/31/1983	2100	CL	COYOTE SPRINGS INVESTMENT, LLC
210	72144			1/21/2005	WDR	UG	NW	SW	22	13S	63E	4.2	MUN		3/31/1983	2100	CL	COYOTE SPRINGS INVESTMENT, LLC
210	72170T			1/28/2005	WDR	UG	SE	SE	23	13S	63E	2.9007	MUN		3/31/1983	2100	CL	COYOTE SPRINGS INVESTMENT LLC
210	72838			5/26/2005	DEN	UG	NW	SE	24	11S	62E	0.2763	MM		5/26/2005	200	LI	BEDROC LIMITED, A NEVADA LLC
210	72839			5/26/2005	DEN	UG	SE	NW	24	11S	62E	0.2763	MM		5/26/2005	200	LI	BEDROC LIMITED, A NEVADA LLC
210	72840			5/26/2005	DEN	UG	NW	SE	24	11S	62E	0.2763	MM		5/26/2005	200	LI	BEDROC LIMITED, A NEVADA LLC
210	72841			5/26/2005	DEN	UG	SE	NW	24	11S	62E	0.2763	MM		5/26/2005	200	LI	BEDROC LIMITED, A NEVADA LLC
210	74094			4/3/2006	PER	UG	SW	SE	10	13S	63E	2	MUN	Y	3/31/1983	1000	CL	CLARK COUNTY COYOTE SPRINGS WATER RESOURCES GID
		CHANGED BY: 80593			RFA	UG												
210	74095			4/3/2006	PER	UG	NW	NE	05	13S	63E	1	MUN	Y	3/31/1983	500	CL	COYOTE SPRINGS INVESTMENT, LLC

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
210	76501			11/26/2007	CAN	UG	NE	NE	26	13S	63E	10	IND		12/30/1985	5000	CL	NEVADA POWER COMPANY
210	77164			6/18/2008	PER	UG	NE	NE	26	13S	63E	10	IND		12/30/1985	2500	CL	NEVADA POWER COMPANY
		CHANGED BY: 87737			WDR	UG												
		CHANGED BY: 87738			RFP	UG												
		CHANGED BY: 87736			RFP	UG												
		CHANGED BY: 87735			RFP	UG												
210	77291			8/13/2008	PER	UG	SE	SW	14	13S	63E	15	MUN	Y	8/13/2008	9000	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77292			8/13/2008	PER	UG	NE	NE	26	13S	63E	0.8	MUN	Y	3/31/1983	400	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 77707T			EXP	UG												
		CHANGED BY: 77708T			EXP	UG												
		CHANGED BY: 77709T			EXP	UG												
210	77293			8/13/2008	PER	UG	NE	NE	26	13S	63E	8	MUN	Y	9/27/1985	4000	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 85853T			EXP	UG												
		CHANGED BY: 85854T			EXP	UG												
		CHANGED BY: 85855T			EXP	UG												
		CHANGED BY: 85852T			EXP	UG												
		CHANGED BY: 86959T			EXP	UG												
		CHANGED BY: 86960T			EXP	UG												
		CHANGED BY: 86962T			EXP	UG												
		CHANGED BY: 87102T			EXP	UG												
		CHANGED BY: 86195T			EXP	UG												
		CHANGED BY: 86961T			EXP	UG												
210	77294			8/13/2008	PER	UG	NE	NE	26	13S	63E	0.138	MUN	Y	1/27/1986	100	CL	SOUTHERN NEVADA WATER AUTHORITY

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('210') Run Date: 8/22/2019 8:48:14 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
210	77295			8/13/2008	PER	UG	NE	NE	26	13S	63E	0.138	MUN	Y	1/27/1986	100	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77296			8/13/2008	PER	UG	NE	NE	26	13S	63E	0.138	MUN	Y	1/27/1986	100	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77297			8/13/2008	PER	UG	NE	NE	26	13S	63E	2	MUN	Y	7/15/1986	1447.93	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77298			8/13/2008	PER	UG	NE	NE	26	13S	63E	2	MUN	Y	7/15/1986	1447.93	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77299			8/13/2008	PER	UG	NE	NE	26	13S	63E	2	MUN	Y	7/15/1986	1447.93	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77300			8/13/2008	PER	UG	NE	NE	26	13S	63E	2	MUN	Y	7/15/1986	1447.93	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77301			8/13/2008	PER	UG	NE	NE	25	13S	63E	2	MUN	Y	7/15/1986	1447.93	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77302			8/13/2008	PER	UG	NE	NE	26	13S	63E	2	MUN	Y	7/15/1986	1447.93	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77303			8/13/2008	PER	UG	NE	NE	26	13S	63E	2	MUN	Y	7/15/1986	1447.93	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77304			8/13/2008	PER	UG	NE	NE	26	13S	63E	2	MUN	Y	7/15/1986	1447.93	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77305			8/13/2008	PER	UG	NE	NE	26	13S	63E	2	MUN	Y	7/15/1986	1447.93	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77306			8/13/2008	PER	UG	NE	NE	26	13S	63E	2	MUN	Y	7/15/1986	1447.93	CL	SOUTHERN NEVADA WATER AUTHORITY
210	77337T			8/22/2008	EXP	UG	SW	SE	10	13S	63E	3.2	MUN		3/31/1983	0	CL	COYOTE SPRINGS INVESTMENT LLC, A NEVADA LIMITED LIABILITY COMPANY
210	77338T			8/22/2008	EXP	UG	NW	NE	05	13S	63E	2.5	MUN		3/31/1983	0	CL	CLARK COUNTY-COYOTE SPRINGS WATER RESOURCES GENERAL IMPROVEMENT DISTRICT
210	77339T			8/22/2008	EXP	UG	NW	NE	05	13S	63E	0.5	MUN		3/31/1983	0	CL	COYOTE SPRINGS INVESTMENT LLC, A NEVADA LIMITED LIABILITY COMPANY
210	77340			8/22/2008	PER	EFF	SE	SE	23	13S	63E	4.64	STO		8/22/2008	3359	CL	COYOTE SPRINGS REUSE WATER COMPANY LLC, A NEVADA LIMITED LIABILITY COMPANY
		CHANGED BY: 77340S01			PER	EFF												
		CHANGED BY: 77340S02			PER	EFF												
210	77340S01			8/22/2008	PER	EFF	SE	SE	23	13S	63E	4.64	IRR		8/22/2008	3359	CL	COYOTE SPRINGS REUSE WATER COMPANY LLC, A NEVADA LIMITED LIABILITY COMPANY
210	77340S02			8/22/2008	PER	EFF	SE	SE	23	13S	63E	4.64	IND		8/22/2008	3359	CL	COYOTE SPRINGS REUSE WATER COMPANY LLC, A NEVADA LIMITED LIABILITY COMPANY
210	77707T			12/22/2008	EXP	UG	NW	NE	28	11S	63E	0.1	OTH		3/31/1983	0	LI	SOUTHERN NEVADA WATER AUTHORITY

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('210') Run Date: 8/22/2019 8:48:14 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
							POINT OF DIVERSION											
210	77708T			12/22/2008	EXP	UG	NW	NE	21	11S	63E	0.1	OTH		3/31/1983	0	LI	SOUTHERN NEVADA WATER AUTHORITY
210	77709T			12/22/2008	EXP	UG	SE	SW	20	11S	63E	0.1	OTH		3/31/1983	0	LI	SOUTHERN NEVADA WATER AUTHORITY
210	79290			1/28/2010	DEN	UG	SE	SW	05	13S	63E	6	MUN		1/28/2010	0	CL	SOUTHERN NEVADA WATER AUTHORITY
210	79297			1/28/2010	DEN	UG	SE	SE	32	13S	63E	6	MUN		1/28/2010	0	CL	SOUTHERN NEVADA WATER AUTHORITY
210	79298			1/28/2010	DEN	UG	SE	NW	16	14S	63E	6	MUN		1/28/2010	0	CL	SOUTHERN NEVADA WATER AUTHORITY
210	79299			1/28/2010	DEN	UG	NE	NE	01	13S	63E	10	MUN		1/28/2010	0	CL	SOUTHERN NEVADA WATER AUTHORITY
210	79300			1/28/2010	DEN	UG	NW	NW	19	13S	64E	10	MUN		1/28/2010	0	CL	SOUTHERN NEVADA WATER AUTHORITY
210	79497			2/11/2010	DEN	UG	SW	SE	10	13S	63E	1.5	MUN		2/11/2010	750	CL	CLARK COUNTY COYOTE SPRINGS WATER RESOURCES GID
210	79498			2/11/2010	DEN	UG	SE	SW	14	13S	63E	2.5	MUN		2/11/2010	1250	CL	CLARK COUNTY COYOTE SPRINGS WATER RESOURCES GID
210	79518			2/11/2010	DEN	UG	NE	NE	28	13S	63E	15	MUN		2/11/2010	9000	CL	SNWA
210	80592			2/18/2011	RFA	UG	NW	NE	05	13S	63E	2.5	MUN		3/31/1983	1250	CL	CLARK COUNTY COYOTE SPRINGS WATER RESOURCES GID
210	80593			2/18/2011	RFA	UG	SW	SE	22	13S	63E	1.5	MUN		3/31/1983	750	CL	CLARK COUNTY COYOTE SPRINGS WATER RESOURCES GID
210	82051T			8/13/2012	EXP	UG	NW	NE	05	13S	63E	0.5	MUN		3/31/1983	0	CL	COYOTE SPRINGS INVESTMENT, LLC
210	83044			8/26/2013	ABR	UG	NW	SE	24	11S	62E	0.5	IRR		10/22/1919	0	LI	BEDROC LIMITED LLC
		CHANGED BY: 85249			PER	UG												
		CHANGED BY: 85250			PER	UG												
210	83590			3/3/2014	WDR	UG	NW	SE	24	11S	62E	0.35	COM		3/3/2014	200	LI	BEDROC LIMITED
210	85249			6/23/2015	PER	UG	NW	SE	24	11S	62E	0.16	COM	Y	10/22/1919	109.8	LI	BEDROC LIMITED LLC
210	85250			6/23/2015	PER	UG	SE	NW	24	11S	62E	0.34	COM	Y	10/22/1919	233.2	LI	BEDROC LIMITED LLC
210	85251			6/23/2015	RFA	UG	SE	NW	24	11S	62E	0.2	COM		4/13/2004	0	LI	BEDROC LIMITED LLC
210	85252			6/23/2015	RFA	UG	NE	SW	24	11S	62E	0.1	COM		4/13/2004	0	LI	BEDROC LIMITED LLC
210	85253			6/23/2015	RFA	UG	SE	SW	24	11S	62E	0.15	COM		4/13/2004	0	LI	BEDROC LIMITED LLC
210	85254			6/23/2015	RFA	UG	SE	SW	24	11S	62E	0.15	COM		4/13/2004	0	LI	BEDROC LIMITED LLC

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('210') Run Date: 8/22/2019 8:48:14 AM

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210	85527T			10/13/2015	EXP	UG	NW	NE	05	13S	63E	0.5	MUN		3/31/1983	250	CL	COYOTE SPRINGS INVESTMENT LLC
210	87496			11/22/2017	RFA	UG	SE	NW	24	11S	62E	0.2	COM		11/22/2017	0	LI	BEDROC LIMITED, LLC
210	87497			11/22/2017	RFA	UG	NE	SW	24	11S	62E	0.1	COM		11/22/2017	0	LI	BEDROC LIMITED, LLC
210	87498			11/22/2017	RFA	UG	SE	SW	24	11S	62E	0.15	COM		11/22/2017	0	LI	BEDROC LIMITED, LLC
210	87499			11/22/2017	RFA	UG	SE	SW	24	11S	62E	0.15	COM		11/22/2017	0	LI	BEDROC LIMITED, LLC
210	87500			11/22/2017	RFA	UG	SE	SW	24	11S	62E	0.1	COM		11/22/2017	0	LI	BEDROC LIMITED, LLC
210	9818			11/23/1934	DEN	SPR	NW	SW	28	14S	61E	0.025	STK		11/23/1934		CL	WEST, RAYMOND A.
210	V01353			3/8/1915	VST	SPR	NE	SW	13	11S	62E	0.125	STK			3.37579	LI	LDS
210	V04545			10/24/1985	ABR	UG	SE	NW	24	11S	62E	0.35	IRR		10/22/1919	0	LI	BEDROC LIMITED
		CHANGED BY: 70859			EXP	UG												
		CHANGED BY: 83044			ABR	UG												

Nevada Division of Water Resources

Hydrographic Abstracts

Hydrographic Abstract Report

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('215')

Run Date: 8/22/2019 8:51:32 AM

Basin	App	Prev App / Change of App	Cert	Filing Date	Status	Source	Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
215	10092		4476	2/16/1937	CER	SPR	SE	SE	12	18S	67E	0.44	WLD		2/16/1937	0	CL	U.S.-NATIONAL PARK SERVICE
215	10098			3/12/1937	WDR	SPR	NW	NE	07	18S	68E	2	REC		3/12/1937	0	CL	BLM
215	10202			2/2/1938	WDR	OSW	SW	SW	14	21S	63E	5	WLD		2/2/1938	0	CL	U.S.-AGRICULTURE DEPARTMENT
215	10779		3118	1/28/1942	CAN	STR	SE	NW	11	22S	64E	45	MM		1/28/1942	32578.76 7242	CL	SAGUARO POWER COMPANY
215	10709		3119	3/28/1942	CAN	STR	SE	NW	11	22S	64E	12	MUN		3/28/1942	8687.196 608	CL	DEFENSE PLANT CORPORATION
215	10800			3/30/1942	ABR	STR	SE	NE	19	21S	64E	5	MM		3/30/1942	0	CL	METALS RESERVE COMPANY
		CHANGED BY: 10861			CAN	STR												
215	10861		4101	8/5/1942	CAN	STR	SE	NW	11	22S	64E	5	MM		3/30/1942	3619.859 617	CL	HYDROMANAGEMENT CORPORATION
215	13424		5964	6/18/1950	CAN	RES	SE	NW	11	22S	64E	24	MUN		6/18/1950	8756.952 705	CL	LAS VEGAS VALLEY WATER DISTRICT
215	14512			9/1/1952	CAN	SPR	SE	SE	12	18S	67E	0.25	MM		9/1/1952	0	CL	CRABTREE, RALPH E.
215	1553			12/10/1909	CAN	STR				21S	65E	0	MM		12/10/1909	0	CL	MACE, CLEMENT H.
215	15571			3/26/1954	CAN	STR	SE	NW	11	22S	64E	2	MM		3/26/1954	0	CL	MANGANESE INC.
215	15725			6/6/1954	DEN	SPR	NW	NE	07	18S	68E	1	MM		6/6/1954		CL	MCDONALD, W.H.
215	15733			7/12/1954	CAN	UG	SE	SW	24	22S	64E	0.7	OM		7/12/1954	506.7674 57	CL	RICHARDSON, JACK A.
215	16129			2/23/1955	DEN	SPR	SW	SE	06	18S	68E	1.5	OTH		2/23/1955		CL	MCDONALD, W.H.
215	16485			5/18/1955	CAN	STR	NW	NW	18	19S	67E	0.25	MM		5/18/1955		CL	NATIONAL EXPLORATION LABORATORIES
215	16577			6/27/1955	CAN	OSW	SE	NW	11	22S	64E	34.5	MUN		6/27/1955	0	CL	HENDERSON-CITY
215	17087			10/9/1956	CAN	RES	NE	SE	24	22S	64E	0.1	COM		10/9/1956	72.39535 1	CL	LAKEVIEW COMPANY
215	17494			2/21/1958	DEN	STR	SE	NW	11	22S	64E	13.27	IND		2/21/1958	0	CL	STAUFFER CHEMICAL COMPANY

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('215') Run Date: 8/22/2019 8:51:32 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
215	17495			2/21/1958	DEN	STR	SE	NW	11	22S	64E	65.76	IND		2/21/1958	0	CL	NATIONAL LEAD
215	17496			2/21/1958	DEN	STR	SE	NW	11	22S	64E	13.464	IND		2/21/1958	0	CL	AMERICAN POTASH & CHEMICAL CORP.
215	17500			3/5/1958	WDR	STR	SE	NW	11	22S	64E	0	MUN		3/5/1958	225000.9 14783	CL	COLORADO RIVER COMMISSION OF NEVADA
215	17501			3/5/1958	WDR	STR	SE	NW	11	22S	64E	0	IND		3/5/1958	75000.29 4698	CL	COLORADO RIVER COMMISSION OF NEVADA
215	17502			3/5/1958	WDR	STR			09	18S	68E	0	MUN		3/5/1958	100000.4 1339	CL	COLORADO RIVER COMMISSION OF NEVADA
215	17503			3/5/1958	WDR	STR			09	18S	68E	0	MUN		3/5/1958	25000.08 8003	CL	COLORADO RIVER COMMISSION OF NEVADA
215	17504			3/5/1958	WDR	STR			09	18S	68E	0	IND		3/5/1958	25000.08 8003	CL	COLORADO RIVER COMMISSION OF NEVADA
215	18345			9/22/1959	WDR	STR	SW	NE	16	21S	64E	1	IND		9/22/1959	0	CL	FIBREBOARD PAPER PRODUCTS CORP.
215	1939			2/2/1911	WDR	STR	SE	SE	10	18S	68E	8	IRR		2/2/1911	0	CL	SYPHUS, LEVI W
215	1973			3/6/1911	CAN	SPR	SW	SW	07	18S	68E	2.4	IRR	Y	3/6/1911	0	CL	NEVADA FIRE INSURANCE COMPANY
215	19936		5621	6/23/1961	FOR	UG	SW	SW	05	19S	68E	0.248	QM		6/23/1961	0	CL	LAKE MEAD
215	20117			10/4/1961	CAN	LAK	SE	SE	10	22S	64E	0	COM		10/4/1961	0	CL	NELLIS, G.B.
215	20715			9/17/1962	CAN	STR	NE	SE	24	22S	64E	1	COM		9/17/1962	723.9841 99	CL	LAKEVIEW COMPANY
215	21924			4/3/1964	ABR	STR	SW	NW	13	21S	63E	60	MUN		4/3/1964	8	CL	PORT HOLIDAY AUTHORITY
		CHANGED BY: 23620			CAN	EFF												
215	2432			5/27/1912	CAN	SPR	SW	SW	07	18S	68E	1.1	IRR	Y	5/27/1912	0	CL	NEVADA FIRE INSURANCE COMPANY
215	2433			5/27/1912	CAN	SPR	NE	NW	07	18S	68E	2.4	PWR	Y	5/27/1912	0	CL	SYPHUS, LEVI W.
215	24529			6/14/1968	CAN	UG	SW	NW	07	20S	65E	1	IND		6/14/1968	0	CL	DELKIN, A.C.
215	26200			7/13/1971	WDR	STR	SW	SW	22	21S	63E	350	MUN		7/13/1971	774003.1 58674	CL	CLARK COUNTY
215	26783			6/20/1972	WDR	STR	SE	NW	11	22S	64E	15	OTH		6/20/1972	25	CL	NEVADA-DEPARTMENT OF WILDLIFE
215	2869			1/2/1914	CAN	SPR				18S	66E	2.75	PWR	Y	1/2/1914	0	CL	MONTGOMERY, M.M.
215	2935			4/6/1914	CAN	STR	NW	NW	13	17S	68E	4.4	IRR	Y	4/6/1914	0	CL	NEVADA IRRIGATION CO.
215	29368		9933	5/5/1975	ABR	UG	NW	NE	30	17S	67E	0.06	QM		5/5/1975	0	CL	NEVADA-PARKS DIVISION

Basin	App	Prev App / Change of App	Cert	Filing Date	Status	Source	Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
		CHANGED BY: 76939			WDR	UG												
		CHANGED BY: 48816			CER	UG												
		CHANGED BY: 86954			PER	UG												
215	29814			11/28/1975	PER	OSW	NE	NW	11	22S	64E	638	MUN		11/28/1975	0	CL	COLORADO RIVER COMMISSION OF NEVADA
		CHANGED BY: 53768T			WDR	STR												
215	34545			11/1/1977	WDR	UG	NW	NW	31	17S	66EH	0.56	OTH		11/1/1977		CL	NEVADA-PARKS DIVISION
215	37199			3/26/1979	CAN	UG	SE	SE	05	20S	64E	5.4	COM		3/26/1979	928.2808 72	CL	TCA INC.
215	3852			3/30/1916	CAN	STR	SW	NE	08	20S	66E	4.8	IRR	Y	3/30/1916	0	CL	GANN, WILLIAM REGNALD
215	41208		11261	4/30/1980	FOR	UG	SW	SW	25	22S	64E	0.17	COM		4/30/1980	37.74747	CL	LAKEVIEW COMPANY
215	41394			5/19/1980	CAN	UG	NE	SW	08	20S	64E	0.5	MM		5/19/1980	78.7225	CL	FARGO PACIFIC ROCK AND SAND INC.
215	41786		11262	7/16/1980	FOR	UG	SW	SW	25	22S	64E	0.15	COM		7/16/1980	69.29576 2	CL	LAKEVIEW COMPANY
215	42678		14933	10/16/1980	FOR	UG	SE	SE	28	21S	63E	0.891	MM		10/16/1980	0	CL	MEEK, LEROY
		CHANGED BY: 47477			DEN	UG												
		CHANGED BY: 64578			DEN	UG												
215	45746S01			7/17/1989	WDR	EFF	NW	NW	23	21S	63E	0.8	OTH		7/17/1989	33.8	CL	WASHINGTON CONSTRUCTION CO.
215	46027			8/18/1982	DEN	OSW	SE	SW	22	21S	63E	25	IRR		8/18/1982	5000	CL	WIESNER, ALFRED A.
215	46028			8/18/1982	DEN	OSW	SE	SW	22	21S	63E	25	IRR		8/18/1982	0	CL	WIESNER, ALFRED A.
215	46029			8/18/1982	PER	UG	NE	NW	23	21S	63E	5	QM	Y	11/27/2000	2200.002 343	CL	LAKE LAS VEGAS JOINT VENTURE, INC.
215	46030			8/18/1982	PER	UG	NE	NE	22	21S	63E	5	QM	Y	11/27/2000	2200.002 343	CL	LAKE LAS VEGAS JOINT VENTURE, INC.
215	47477			12/1/1983	DEN	UG	SE	NE	28	21S	63E	0.891	MM		10/16/1980	230.1675	CL	MEEK, LEROY
215	48816		13552	2/1/1985	CER	UG	NW	SW	30	17S	67E	0.045	QM	Y	5/5/1975	4.471	CL	NEVADA-PARKS DIVISION
215	494			5/27/1907	CAN	STR			01	21S	66E	5000	PWR	Y	5/27/1907	0	CL	SMITH, O.J.
215	50988			6/1/1987	CAN	STR	NE	NW	11	22S	64E	638	MUN		6/1/1987	0	CL	LAS VEGAS VALLEY WATER DISTRICT

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('215') Run Date: 8/22/2019 8:51:32 AM

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215	51859			2/23/1988	WDR	STR	NE	NW	11	22S	64E	638	MUN		2/23/1988	0	CL	LAS VEGAS VALLEY WATER DISTRICT
215	52254			8/21/1988	ABR	UG	SE	SE	29	20S	64E	1.5	MM		8/21/1988	0	CL	INTERNATIONAL SILICA CORPORATION
		CHANGED BY: 62841T			WDR	UG												
		CHANGED BY: 62691			ABR	UG												
215	52374			8/4/1988	ABR	UG	NE	SE	29	20S	64E	0.33	MM		8/4/1988	0	CL	INTERNATIONAL SILICA CORPORATION
		CHANGED BY: 62842T			WDR	UG												
		CHANGED BY: 62693			ABR	UG												
215	52375			8/4/1988	WDR	UG	SE	NE	29	20S	64E	3	MM		8/4/1988		CL	HEISEN, CHARLES
215	52814			10/18/1988	ABR	UG	NE	SE	29	20S	64E	1.5	MM		10/18/1988	0	CL	INTERNATIONAL SILICA CORPORATION
		CHANGED BY: 62843T			WDR	UG												
		CHANGED BY: 62692			ABR	UG												
215	52738			11/29/1988	CAN	UG	SW	SE	14	21S	63E	2	OTH		11/29/1988	723.9535 1	CL	LAKE AT LAS VEGAS JOINT VENTURE
		CHANGED BY: 53704			WDR	UG												
215	53029			3/16/1989	WDR	OSW	NW	SE	14	21S	63E	0.8	OTH		3/16/1989	0	CL	WASHINGTON CONSTRUCTION COMPANY
215	53386			6/15/1989	CAN	UG	NW	SW	25	20S	63E	3	MM		6/15/1989	0	CL	HEISEN, CHARLES
215	5365			1/20/1919	CAN	STR	SW	NE	13	17S	68E	5.8	IRR	Y	1/20/1919		CL	BAUER, ALBERT L.
215	53704			7/21/1989	WDR	UG	NW	SW	22	21S	63E	2	OTH		8/25/1990	723.9535 1	CL	LAKE LAS VEGAS JOINT VENTURE, INC.
		CHANGED BY: 54439			WDR	UG												
215	53768T			8/16/1989	WDR	STR	SE	SW	30	21S	63E	0.1	MM		11/28/1975	0	CL	NEVADA READY MIX
215	5380			2/1/1919	WDR	SPR	SW	SW	07	18S	68E	5.9	IRR		2/1/1919		CL	NEVADA FIRE INSURANCE CO.
215	53829			9/8/1989	PER	UG	NW	SW	22	21S	63E	1	QM	Y	1/4/2001	723.97	CL	LAKE LAS VEGAS JOINT VENTURE, INC.
		CHANGED BY: 70441T			EXP	UG												
215	53830			9/8/1989	ABR	UG	NW	SE	14	21S	63E	1	QM		9/8/1989	0	CL	LAKE LAS VEGAS JOINT VENTURE, INC.

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		CHANGED BY: 56232T			EXP	UG												
		CHANGED BY: 56150			PER	UG												
215	53831			9/8/1989	PER	UG	NW	NE	15	21S	63E	1	QM	Y	1/4/2001	723.9535 1	CL	LAKE LAS VEGAS JOINT VENTURE, INC.
		CHANGED BY: 56233			WDR	UG												
215	54037			10/17/1989	WDR	UG	SW	NE	09	18S	68E	10	MUN		10/17/1989	0	CL	LAS VEGAS VALLEY WATER DISTRICT
215	5404			3/6/1919	CAN	STR	NW	SE	11	21S	65E	0	PWR	Y	3/6/1919	0	CL	MACE, CLEMENT H.
215	54129			10/30/1989	ABR	UG	NW	SW	07	20S	64E	2.3	IND		10/30/1989	0	CL	NEVADA COGENERATION ASSOCIATES #1
		CHANGED BY: 55270			ABR	UG												
		CHANGED BY: 55269			CER	UG												
215	5427			3/17/1919	CAN	STR	SW	NE	13	17S	68E	10	IRR	Y	3/17/1919		CL	LEWIS, JOHN F.
215	54370			1/23/1990	CAN	UG	SW	SE	29	20S	64E	7	COM		1/23/1990	0	CL	CONCRETE PRODUCTS COMPANY
215	54380			1/26/1990	CAN	UG	SW	SW	15	20S	63E	35	COM		1/26/1990	0	CL	CONCRETE PRODUCTS COMPANY
215	54421			2/9/1990	WDR	UG	NW	NE	22	21S	63E	0.45	OTH		2/9/1990		CL	WASHINGTON CONSTRUCTION COMPANY
215	54438			2/14/1990	CAN	UG			07	20S	64E	2.3	IND		2/14/1990	0	CL	BONNEVILLE NEVADA CORPORATION
215	54439			2/14/1990	WDR	UG	NW	NW	23	21S	63E	0.8	CON		11/29/1988		CL	THE LAS VEGAS JOINT VENTURE, INC.
215	54475			2/26/1990	DEN	UG	SE	NE	28	21S	63E	3	QM		2/26/1990	0	CL	HEISEN, CHARLES
215	54476			2/26/1990	DEN	UG	SE	NE	28	21S	63E	3	QM		2/26/1990	0	CL	HEISEN, CHARLES
215	54477			2/26/1990	DEN	UG	SE	NE	28	21S	63E	3	QM		2/26/1990		CL	HEISEN, CHARLES
215	54478			2/26/1990	DEN	UG	SE	NE	28	21S	63E	3	QM		2/26/1990	0	CL	HEISEN, CHARLES
215	54479			2/26/1990	DEN	UG	SE	NE	28	21S	63E	3	QM		2/26/1990	0	CL	HEISEN, CHARLES
215	54480			2/26/1990	DEN	UG	SE	NE	28	21S	63E	3	QM		2/26/1990	0	CL	HEISEN, CHARLES
215	54481			2/26/1990	DEN	UG	NW	NW	27	21S	63E	3	IND		2/26/1990	0	CL	HEISEN, CHARLES
215	54482			2/26/1990	DEN	UG	NW	NW	27	21S	63E	3	MM		2/26/1990	0	CL	HEISEN, CHARLES

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215	5494			5/9/1918	CAN	STR	SW	NE	08	20S	68E	6	IRR	Y	5/9/1918	0	CL	STEWART, LESLIE E.
215	55268			9/13/1990	DEN	UG		LT03	28	21S	63E	5	QM		9/13/1990	2016.25	CL	THREE KIDS ENTERPRISES, INC.
215	55269		17123	9/13/1990	CER	UG	SE	SE	13	19S	63E	1.15	IND	Y	10/30/1989	96	CL	NEVADA COGENERATION ASSOCIATES #1
215	55270			9/13/1990	ABR	UG			01	20S	63E	1.15	IND		10/30/1989	0	CL	NEVADA COGENERATION ASSOCIATES #1
		CHANGED BY: 58130T			EXP	UG												
		CHANGED BY: 58031			CER	UG												
215	55271			9/13/1990	ABR	UG	SW	SE	13	19S	63E	2.3	IND		9/13/1990	0	CL	NEVADA COGENERATION ASSOC. #1 & #2
		CHANGED BY: 58129T			EXP	UG												
		CHANGED BY: 58032			CER	UG												
215	55517			12/10/1990	ABR	UG	NE	SE	29	20S	64E	2	MM		12/10/1990	0	CL	GLASIER, DARRYL W.
		CHANGED BY: 64547			ABR	UG												
215	5593			7/3/1919	DEN	STR	SE	NW	12	21S	65E	5000	PWR	Y	7/3/1919	0	CL	WILLIAMS, HARRY N.
215	58150			4/5/1991	PER	UG	NE	NE	15	21S	63E	1	QM	Y	1/4/2001	723.97	CL	LAKE LAS VEGAS JOINT VENTURE, INC.
215	58232T			4/26/1991	EXP	UG	NE	NE	15	21S	63E	1	QM		9/8/1989	723.9535 1	CL	LAKE LAS VEGAS JOINT VENTURE, INC.
215	58233			4/26/1991	WDR	UG	SE	NE	22	21S	63E	1	QM		9/8/1989	0	CL	LAKE LAS VEGAS JOINT VENTURE, INC.
215	58031		17124	8/31/1992	CER	UG	NE	SE	13	19S	63E	1.15	IND	Y	10/30/1989	824	CL	NEVADA COGENERATION ASSOCIATES #1
215	58032		17125	8/31/1992	CER	UG	NE	SE	13	19S	63E	2.3	IND	Y	9/13/1990	826	CL	NEVADA COGENERATION ASSOCIATES
215	58047			9/4/1992	CAN	UG	SE	SW	08	20S	65E	1.5	MM	Y	9/4/1992	718	CL	DAWSON, LAREEN ET AL
215	58048			9/4/1992	CAN	UG	SW	SE	08	20S	65E	1.5	MM	Y	9/4/1992	718	CL	DAWSON, LAREEN ET AL
215	58049			9/4/1992	CAN	UG	NE	SE	08	20S	65E	1.5	MM	Y	9/4/1992	718	CL	DAWSON, LAREEN ET AL
215	58050			9/4/1992	CAN	UG	SE	NW	08	20S	65E	1.5	MM	Y	9/4/1992	718	CL	DAWSON, LAREEN ET AL
215	58051			9/4/1992	CAN	UG	SW	SE	05	20S	64E	1.5	MM	Y	9/4/1992	250	CL	DAWSON, LAREEN ET AL
		CHANGED BY: 79908			DEN	UG												

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215	58129T			9/25/1992	EXP	UG	NE	SE	13	19S	63E	2.3	PWR		9/13/1990	1665	CL	NEVADA COGENERATION ASSOCIATES 1 & 2
215	58130T			9/25/1992	EXP	UG	NE	SE	13	19S	63E	1.15	PWR		9/13/1990	832.5	CL	NEVADA COGENERATION ASSOCIATES 1 & 2
215	58390		14303	12/11/1992	CER	OSW	SE	SW	22	21S	63E	0	OM		12/11/1992	2029	CL	LAKE LAS VEGAS MASTER ASSOCIATION
215	58589			3/9/1993	RFP	STR	NE	NW	11	22S	64E	100	MUN		3/9/1993	30000	CL	SOUTHERN NEVADA WATER AUTHORITY
215	58590			3/9/1993	RFP	STR	NE	NW	11	22S	64E	700	MUN		3/9/1993	150000	CL	SOUTHERN NEVADA WATER AUTHORITY
215	58592			3/9/1993	DEN	UG	NE	SE	13	19S	63E	0.274	PWR		3/9/1993	0	CL	NEVADA COGENERATION ASSOCIATES 1 & 2
215	58593			3/9/1993	DEN	UG	NE	SE	13	19S	63E	0.274	PWR		3/9/1993	0	CL	NEVADA COGENERATION ASSOCIATES 1 & 2
215	58594			3/9/1993	DEN	UG	SE	SE	13	19S	63E	0.274	PWR		3/9/1993	0	CL	NEVADA COGENERATION ASSOCIATES 1 & 2
215	6021			3/20/1920	CAN	STR	NE	SE	18	21S	65E	1.6	IRR	Y	3/20/1920	0	CL	HESSE, JOHN F.
215	61597			10/10/1995	CAN	UG	SE	SE	02	20S	63E	2.01	MM	Y	10/10/1995	250	CL	DAWSON, LAREEN ET AL
		CHANGED BY: 68021			WDR	UG												
		CHANGED BY: 70909			DEN	UG												
215	61598			10/10/1995	CAN	UG	NE	NE	15	20S	64E	2.01	MM	Y	10/10/1995	250	CL	DAWSON, LAREEN ET AL
		CHANGED BY: 68020			WDR	UG												
		CHANGED BY: 70910			DEN	UG												
215	61599			10/10/1995	CAN	UG	SW	NW	07	20S	65E	2.01	MM	Y	10/10/1995	1088.8	CL	DAWSON, LAREEN ET AL
		CHANGED BY: 68022			WDR	UG												
215	61600			10/10/1995	CAN	UG	NE	NE	07	20S	65E	2.01	MM	Y	10/10/1995	1088.8	CL	DAWSON, LAREEN ET AL
		CHANGED BY: 68019			WDR	UG												
215	62691			12/24/1996	ABR	UG	SE	SE	29	20S	64E	1.5	MM	Y	8/21/1988	0	CL	INTERNATIONAL SILICA CORPORATION
		CHANGED BY: 64542			ABR	UG												
		CHANGED BY: 72761			PER	UG												
215	62692			12/24/1996	ABR	UG	NE	SE	29	20S	64E	1.5	MM	Y	10/18/1988	0	CL	INTERNATIONAL SILICA CORPORATION

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		CHANGED BY: 63312			ABR	UG												
		CHANGED BY: 64541			ABR	UG												
		CHANGED BY: 72762			PER	UG												
215	62693			12/24/1996	ABR	UG	NE	SE	29	20S	64E	0.33	MM		8/4/1988	0	CL	INTERNATIONAL SILICA CORPORATION
		CHANGED BY: 63313			ABR	UG												
215	62841T			2/6/1997	WDR	UG	SE	SE	29	20S	64E	1.5	MM		6/21/1988	1085.930 265	CL	INTERNATIONAL SILICA CORPORATION
215	62842T			2/6/1997	WDR	UG	NE	SE	29	20S	64E	0.33	MM		8/4/1988	241.3076 07	CL	INTERNATIONAL SILICA CORPORATION
215	62843T			2/6/1997	WDR	UG	NE	SE	29	20S	64E	1.5	MM		10/18/1988	1085.930 265	CL	INTERNATIONAL SILICA CORPORATION
215	63312			8/8/1997	ABR	UG	NE	SE	29	20S	64E	0.56	MM	Y	10/18/1988	0	CL	INTERNATIONAL SILICA CORPORATION
		CHANGED BY: 64540			ABR	UG												
		CHANGED BY: 72759			PER	UG												
215	63313			8/8/1997	ABR	UG	NE	SE	29	20S	64E	0.33	MM	Y	10/18/1988	0	CL	PACIFIC COAST BUILDING PRODUCTS
		CHANGED BY: 67627			WDR	UG												
		CHANGED BY: 72760			PER	UG												
215	64041			4/17/1998	DEN	UG	NE	NW	36	19S	63E	10	OM		4/17/1998	0	CL	DRY LAKE WATER, L.L.C.
215	6406			2/24/1921	WDR	SPR	NW	NE	07	18S	68E	2.4	IRR	Y	2/24/1921	0	CL	NEVADA FIRE INSURANCE CO.
215	64540			10/19/1998	ABR	UG	SW	NW	18	19S	64E	0.165	IND	Y	10/18/1988	0	CL	DRY LAKE WATER COMPANY, LLC
		CHANGED BY: 68166			ABR	UG												
215	64541			10/19/1998	ABR	UG	SW	NW	18	19S	64E	0.19	IND	Y	10/18/1988	0	CL	DRY LAKE WATER COMPANY, LLC
		CHANGED BY: 68164			ABR	UG												
215	64542			10/19/1998	ABR	UG	SW	NW	18	19S	64E	0.75	MM	Y	6/21/1988	0	CL	DRY LAKE WATER COMPANY, LLC
		CHANGED BY: 68165			ABR	UG												
215	64547			10/21/1998	ABR	UG	SW	NW	18	19S	64E	2	IND	Y	12/10/1990	0	CL	DRY LAKE WATER COMPANY, LLC

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		CHANGED BY: 66163			ABR	UG												
215	64578			11/2/1998	DEN	UG	SE	SE	28	21S	63E	0.1515	QM		10/16/1980	47.88	CL	THOMPSON, PHYLLIS E.
215	64960E			3/9/1999	EXP	UG	NW	SW	05	19S	68E	0.005	ENV		3/9/1999	0.030689	CL	ECHO BAY RESORT (DBA)
215	6521			7/22/1921	DEN	STR	NW	SE	36	20S	66E	15000	PWR	Y	7/22/1921	0	CL	PUBLIC SERVICE COMMISSION-NEVADA
215	6532			8/8/1921	DEN	STR	NW	SE	36	20S	66E	15000	STO	Y	8/8/1921	0	CL	LOS ANGELES-CITY
215	6580			10/27/1921	DEN	STR	SW	NE	12	21S	65E	0	PWR	Y	10/27/1921	2731011.440057	CL	SOUTHERN CALIFORNIA EDISON COMPANY
215	6581			10/27/1921	DEN	STR	SW	NE	12	21S	65E	18000	PWR	Y	10/27/1921	0	CL	SOUTHERN CALIFORNIA EDISON CO.
215	6608			1/7/1922	CAN	STR	NE	SW	14	21S	63E	1	IRR	Y	1/7/1922	0	CL	WOODARD, J.W.
215	66085E			2/17/2000	EXP	UG	NW	SW	05	19S	68E	0.005	ENV		2/17/2000	0.55	CL	SEVEN CROWN RESORTS, INC
215	66108			2/28/2000	PER	UG	NE	NW	35	21S	63E	0.06	COM		2/28/2000	1.350316	CL	LAKER PLAZA, INC.
215	66163			3/17/2000	ABR	UG	SW	NW	18	19S	64E	2	QM	Y	12/10/1990	0	CL	DRY LAKE WATER, L.L.C.
		CHANGED BY: 69791T			WDR	UG												
		CHANGED BY: 67139T			EXP	UG												
		CHANGED BY: 68652T			EXP	UG												
		CHANGED BY: 68353			ABR	UG												
215	66164			3/17/2000	ABR	UG	SW	NW	18	19S	64E	0.19	QM	Y	10/18/1988	0	CL	DRY LAKE WATER, L.L.C.
		CHANGED BY: 68653T			EXP	UG												
		CHANGED BY: 69792T			WDR	UG												
		CHANGED BY: 67140T			EXP	UG												
		CHANGED BY: 68352			ABR	UG												
215	66165			3/17/2000	ABR	UG	SW	NW	18	19S	64E	0.75	QM	Y	6/21/1988	0	CL	DRY LAKE WATER COMPANY, L.L.C.
		CHANGED BY: 67141T			EXP	UG												
		CHANGED BY: 68654T			EXP	UG												

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		CHANGED BY: 69793T			WDR	UG												
		CHANGED BY: 68351			ABR	UG												
215	68166			3/17/2000	ABR	UG	SW	NW	18	19S	64E	0.165	OM	Y	10/18/1988	0	CL	DRY LAKE WATER COMPANY, L.L.C.
		CHANGED BY: 69794T			WDR	UG												
		CHANGED BY: 68655T			EXP	UG												
		CHANGED BY: 68350			PER	UG												
215	66872			10/16/2000	WDR	UG	SW	SW	26	21S	63E	0	OM		2/19/1952	1	CL	BERTUCCINI, PAUL DINO
215	66973E			12/4/2000	EXP	UG	NW	SW	05	19S	68E	0.005	ENV		12/4/2000	0.55	CL	SEVEN CROWN RESORTS DBA ECHO BAY RES
215	67139T			1/16/2001	EXP	UG	NE	NE	13	19S	63E	1.175	OM	Y	4/17/1998	348	CL	DRY LAKE WATER COMPANY, LLC.
215	67140T			1/16/2001	EXP	UG	NW	NW	12	19S	63E	0.19	OM	Y	4/17/1998	137.55	CL	DRY LAKE WATER COMPANY, LLC.
215	67141T			1/16/2001	EXP	UG	NW	NE	13	19S	63E	0.414	OM	Y	6/21/1988	300	CL	DRY LAKE WATER COMPANY, LLC.
215	67527			5/15/2001	WDR	UG	SE	SE	29	20S	64E	0.33	MM		10/18/1988	0	CL	SANDIA CONSTRUCTION INC.,A NEV. CORP
215	67893			8/8/2001	DEN	UG	NE	NW	36	19S	63E	10	OM		8/8/2001	0	CL	DRY LAKE WATER, L.L.C.
215	68019			9/18/2001	WDR	UG	NE	NE	13	19S	63E	2.01	OM		10/10/1995	1455.160 313	CL	DAWSON, LAREEN ET AL
215	68020			9/18/2001	WDR	UG	NW	NW	12	19S	63E	2.01	OM		10/10/1995	1455.160 313	CL	DAWSON, LAREEN ET AL
215	68021			9/18/2001	WDR	UG	NE	NE	13	19S	63E	2.01	OM		10/10/1995	1455.160 313	CL	DAWSON, LAREEN ET AL
215	68022			9/18/2001	WDR	UG	NW	NE	13	19S	63E	2.01	OM		10/10/1995	1455.160 313	CL	DAWSON, LAREE ET AL
215	68072			10/9/2001	WDR	UG	NW	NW	04	20S	64E	15	PWR		10/9/2001	0	CL	SILVER STATE WATER CO., LLC
215	6815			11/8/1922	DEN	STR			28	22S	65E	180000	PWR	Y	11/8/1922	0	CL	STETSON, G. HENRY
215	6816			11/8/1922	DEN	STR				21S	65E	180000	PWR	Y	11/8/1922	0	CL	STETSON, G. HENRY
215	6817			11/8/1922	DEN	STR				21S	65E	0	PWR	Y	11/6/1922	0	CL	STETSON, G. HENRY
215	6818			11/8/1922	DEN	STR				21S	65E	0	PWR	Y	11/8/1922	0	CL	STETSON, G. HENRY
215	6833			12/8/1922	CAN	OSW	NE	SW	11	20S	65E	29	MM	Y	12/8/1922	2000.002 13	CL	WEST END CHEMICAL COMPANY

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('215') Run Date: 8/22/2019 8:51:32 AM

Basin	App	Prev App / Change of App	Cert	Filing Date	Status	Source	Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
							POINT OF DIVERSION											
215	68350			1/11/2002	PER	UG	NE	NE	13	19S	63E	0.165	QM	Y	10/18/1988	33.44	CL	DRY LAKE WATER, LLC
		CHANGED BY: 87597T			DEN	UG												
		CHANGED BY: 87065T			EXP	UG												
		CHANGED BY: 88873T			PER	UG												
		CHANGED BY: 88874T			PER	UG												
215	68351			1/11/2002	ABR	UG	NE	NE	13	19S	63E	0.75	QM	Y	6/21/1988	0	CL	DRY LAKE WATER, LLC
		CHANGED BY: 88875T			PER	UG												
215	68352			1/11/2002	ABR	UG	NE	NE	13	19S	63E	0.19	QM	Y	10/18/1988	0	CL	DRY LAKE WATER, LLC
		CHANGED BY: 87596T			DEN	UG												
		CHANGED BY: 87066T			EXP	UG												
		CHANGED BY: 88876T			PER	UG												
215	68353			1/11/2002	ABR	UG	NW	NE	13	19S	63E	2	QM	Y	12/10/1990	0	CL	DRY LAKE WATER, LLC
		CHANGED BY: 88877T			PER	UG												
215	68852T			3/26/2002	EXP	UG	NW	NE	13	19S	63E	2	QM	Y	4/17/1998	592.06	CL	DRY LAKE WATER COMPANY, LLC
215	68853T			3/26/2002	EXP	UG	NE	NE	13	19S	63E	0.19	QM	Y	4/17/1998	137.55	CL	DRY LAKE WATER COMPANY, LLC
215	68854T			3/26/2002	EXP	UG	NE	NE	13	19S	63E	0.75	QM	Y	6/21/1988	542.98	CL	DRY LAKE WATER COMPANY, LLC
215	68855T			3/26/2002	EXP	UG	NE	NE	13	19S	63E	0.165	QM	Y	6/21/1988	119.44	CL	DRY LAKE WATER COMPANY, LLC
215	6886			2/28/1923	CAN	SPR				20S	65E	0	QM	Y	2/28/1923		CL	TRACY, E.H.
215	69319E			11/13/2002	CAN	OSW	SE	SW	22	21S	63E	638	QM		11/13/2002	2029	CL	TRILYN PARTNERS, LLC
215	69791T			3/31/2003	WDR	UG	NW	NE	13	19S	63E	2	QM		4/17/1998	592.06	CL	DRY LAKE WATER, LLC
215	69792T			3/31/2003	WDR	UG	NE	NE	13	19S	63E	0.19	QM		4/17/1998	137.58	CL	DRY LAKE WATER, LLC
215	69793T			3/31/2003	WDR	UG	NE	NE	13	19S	63E	0.75	QM		6/21/1988	542.98	CL	DRY LAKE WATER, LLC
215	69794T			3/31/2003	WDR	UG	NE	NE	13	19S	63E	0.165	QM		6/21/1988	119.44	CL	DRY LAKE WATER, LLC

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215	70441T			9/26/2003	EXP	UG	SW	SW	22	21S	63E	1	OM	Y	1/4/2001	723.97	CL	LAKE LAS VEGAS JOINT VENTURE, INC.
215	70515			10/16/2003	CAN	OSW	SE	SW	22	21S	63E	0	OM		10/16/2003	0	CL	LAKE AT LAS VEGAS JOINT VENTURE
215	70863			2/2/2004	WDR	OSW		SE	22	21S	63E	0	OM		2/2/2004	0	CL	LAKE LAS VEGAS JOINT VENTURE
215	72759			5/11/2005	PER	UG	NE	SE	29	20S	64E	0.3951	MM	Y	10/18/1988	285.96	CL	PACIFIC COAST BUILDING PRODUCTS, INC
215	72760			5/11/2005	PER	UG	NE	SE	29	20S	64E	0.33	MM	Y	10/18/1988	241.32	CL	PACIFIC COAST BUILDING PRODUCTS, INC
		CHANGED BY: 85758T			EXP	UG												
		CHANGED BY: 85757T			EXP	UG												
215	72761			5/11/2005	PER	UG	SE	SE	29	20S	64E	0.75	MM	Y	6/21/1988	527.275	CL	PACIFIC COAST BUILDING PRODUCTS, INC
		CHANGED BY: 89063T			RFA	UG												
215	72762			5/11/2005	PER	UG	NE	SE	29	20S	64E	0.17	MM	Y	10/18/1988	121.88	CL	PACIFIC COAST BUILDING PRODUCTS, INC
215	751			12/10/1907	CAN	SPR		NW	07	18S	68E	0	IRR	Y	12/10/1907	0	CL	SYPHUS, E.H. ET AL
215	76354			10/5/2007	DEN	UG	NW	SW	26	20S	64E	20	PWR		10/5/2007	0	CL	MICHAEL RUETH BLUEWATER DIAMOND MINE
215	76617			1/11/2008	DEN	UG	SE	NW	27	20S	64E	20	PWR		1/11/2008	0	CL	MICHAEL A RUETH BLUEWATER DIAMOND MINE
215	76806			3/11/2008	ABR	UG	SW	SW	30	17S	67E	0.1	OM		3/11/2008	4	CL	NEVADA-PARKS DIVISION
		CHANGED BY: 86265			PER	UG												
215	76861			3/27/2008	PER	EFF	NE	SW	07	20S	64E	0.385	STO		3/27/2008	108	CL	NEVADA COGENERATION ASSOCIATES #2
		CHANGED BY: 76861S03			DEN	EFF												
		CHANGED BY: 76861S02			PER	EFF												
		CHANGED BY: 76861S01			PER	EFF												
		CHANGED BY: 76861S04			PER	EFF												
215	76861S01			6/30/2009	PER	EFF	NE	SW	07	20S	64E	0.075	MM		3/27/2008	54	CL	PIONEER GYPSUM MINING INC
215	76861S02			7/30/2009	PER	EFF	NE	SW	07	20S	64E	0.075	OTH		3/27/2008	54	CL	PABCO BUILDING PRODUCTS LLC
215	76861S03			2/10/2016	DEN	EFF	NE	SW	07	20S	64E	0.155	COM		2/10/2016	112	CL	V.T. CONSTRUCTION, INC.

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215	76861S04			7/12/2018	PER	EFF	NE	SW	07	20S	64E	0.235	CON		3/27/2008	170.73	CL	STURGEON ELECTRIC COMPANY
215	76939			4/15/2008	WDR	UG	NE	SW	08	18S	66EH	0.0158	OM		5/5/1975	2.3935	CL	NEVADA-PARKS DIVISION
215	770			12/31/1907	CAN	STR			07	18S	68E	0	PWR	Y	12/31/1907	0	CL	SYPHUS, E.H. ET.AL.
215	7749			5/12/1926	WDR	STR	NW	NW	13	17S	68E	29.4	IRR	Y	5/12/1926	0	CL	NEVADA FIRE INSURANCE COMPANY
215	7834			7/31/1926	DEN	STR	NW	NW	13	17S	68E	12.5	IRR	Y	7/31/1926	0	CL	SYPHUS, LEVI W. TRUSTEE
215	79463			2/2/2010	RFP	STR	NE	NW	11	22S	64E	700	MUN		2/2/2010	150000	CL	SOUTHERN NEVADA WATER AUTHORITY
215	79464			2/2/2010	RFP	STR	NE	NW	11	22S	64E	100	MUN		2/2/2010	30000	CL	SOUTHERN NEVADA WATER AUTHORITY
215	79908			6/15/2010	DEN	UG	SW	SE	05	20S	64E	1.5	MM		9/4/1992	250	CL	JAMES DAWSON 10%
215	79909			6/15/2010	DEN	UG	SE	SE	02	20S	63E	2.01	MM		10/10/1995	250	CL	JAMES DAWSON 10%
215	79910			6/15/2010	DEN	UG	NE	NE	15	20S	64E	2.01	MM		10/10/1995	250	CL	JAMES DAWSON 10%
215	85757T			12/23/2015	EXP	UG	SE	NW	12	20S	63E	0.0825	MM		10/18/1988	80.33	CL	PACIFIC COAST BUILDING PRODUCTS, LLC
215	85758T			12/23/2015	EXP	UG	SW	NW	12	20S	63E	0.0825	MM		10/18/1988	80.33	CL	PACIFIC COAST BUILDING PRODUCTS, LLC
215	8618			7/13/1928	CAN	SPR	NE	SE	12	18S	67E	1.75	IRR	Y			CL	SYPHUS, LEVI W.
215	86265			6/10/2016	PER	UG	SE	SW	30	17S	67E	0.1	OM	Y	3/11/2006	4	CL	NEVADA-STATE PARKS DIVISION
215	86954			2/24/2017	PER	UG	NW	SW	30	17S	67E	0.0156	OM	Y	5/5/1975	2.39	CL	NEVADA-STATE PARKS DIVISION
215	87065T			4/19/2017	EXP	UG	NE	NE	13	19S	63E	0.159	OM	Y	10/18/1988	0	CL	DRY LAKE WATER, LLC
215	87066T			4/19/2017	EXP	UG	NE	NE	13	19S	63E	0.186	OM	Y	10/18/1988	0	CL	DRY LAKE WATER, LLC
215	87105			5/8/2017	RFA	OSW	SE	SW	22	21S	63E	0	OM		5/8/2017	2000	CL	LAKE LAS VEGAS MASTER ASSOCIATION
215	87596T			1/22/2018	DEN	UG	NE	SE	13	19S	63E	0	OM		10/18/1988	0	CL	DRY LAKE WATER, LLC
215	87597T			1/22/2018	DEN	UG	NE	SE	13	19S	63E	0	OM		10/18/1988	0	CL	DRY LAKE WATER, LLC
215	89063T			7/23/2019	RFA	UG	NE	SE	13	19S	63E	0.75	MM		6/21/1988	527.275	CL	PACIFIC COAST BUILDING PRODUCTS, INC.

Nevada Division of Water Resources

Hydrographic Abstracts

Hydrographic Abstract Report

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('216') Run Date: 8/22/2019 8:57:08 AM

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216	13825			9/7/1951	CAN	UG			31	17S	64E	1.5	IRR		9/7/1951	0	CL	MOHLER, MRS. DAISY P.
216	14320			6/3/1952	CAN	UG		S2	06	18S	64E	4.5	IRR		6/3/1952		CL	MCLENNAN, G.W
216	18140		5115	7/24/1959	ABR	UG	SW	SW	21	17S	64E	0.1	DOM		7/24/1959	0	CL	TECHNICHROME
		CHANGED BY: 83563			PER	UG												
216	24015			7/24/1967	ABR	UG	NW	NW	07	18S	64E	0.5	MM		7/24/1967	0	CL	CHEMSTAR, INC.
		CHANGED BY: 20277			ABR	UG												
216	26277		8462	8/30/1971	ABR	UG	NW	NE	14	18S	63E	0.22	MM		7/24/1967	0	CL	CHEMICAL LIME COMPANY OF ARIZONA
		CHANGED BY: 85125T			EXP	UG												
		CHANGED BY: 84880			CER	UG												
216	32519			6/30/1977	DEN	UG	NW	SW	38	16S	63E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32520			6/30/1977	DEN	UG	NW	NW	38	16S	63E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32521			6/30/1977	DEN	UG	NW	SW	31	16S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32522			6/30/1977	DEN	UG	NW	NW	31	16S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32523			6/30/1977	DEN	UG	NW	NW	32	16S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32524			6/30/1977	DEN	UG	NW	SW	32	16S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32525			6/30/1977	DEN	UG	NW	NW	33	16S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32526			6/30/1977	DEN	UG	NW	SW	33	16S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32527			6/30/1977	DEN	UG	NW	NW	34	16S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32528			6/30/1977	DEN	UG	NW	SW	34	16S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK

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216	32529			6/30/1977	DEN	UG	NE	NE	09	17S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32530			6/30/1977	DEN	UG	SE	SE	09	17S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32531			6/30/1977	DEN	UG	NW	NW	08	17S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32532			6/30/1977	DEN	UG	NW	SW	08	17S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32533			6/30/1977	DEN	UG	NE	NE	07	17S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32534			6/30/1977	DEN	UG	NE	NW	07	17S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32535			6/30/1977	DEN	UG	NE	NE	18	17S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32536			6/30/1977	DEN	UG	NE	NE	17	17S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32537			6/30/1977	DEN	UG	NE	NW	20	17S	64E	5.4	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32538			6/30/1977	DEN	UG	NE	SW	17	17S	64E	2.7	IRR		6/30/1977	0	CL	COYOTE VALLEY WATER LAND & LIVESTK
216	32765			7/11/1977	CAN	UG	E2	E2	09	17S	63E	2.7	IRR		7/11/1977	0	CL	BOWMAN, DOLPH SR.
216	32766			7/11/1977	CAN	UG	NE	SE	32	17S	63E	2.7	IRR		7/11/1977	0	CL	SHAKES, GARY STEVEN
216	34097			10/13/1977	CAN	UG		SE	31	17S	64E	2.7	IRR		10/13/1977	0	CL	STENGER, JOSEPH WILLIAM
216	34399			10/25/1977	CAN	UG		NW	17	16S	63E	2.7	IRC		10/25/1977	0	CL	CANFIELD, DONNA LEE
216	37128			3/22/1979	CAN	UG	NE	NE	17	17S	64E	5.4	IRR		3/22/1979	0	CL	LEAVITT, JOHN
216	37129			3/22/1979	DEN	UG	NW	NW	31	16S	64E	5.4	IRD		3/22/1979	0	CL	LEAVITT, MISHIE
216	37200			3/26/1979	DEN	UG	NE	NE	31	16S	64E	5.4	IRD		3/26/1979	0	CL	HARDY, RICHARD
216	37206			3/26/1979	DEN	UG	NE	NE	17	17S	64E	5.4	IRR		3/26/1979	0	CL	LUZI, CHERI LYNN
216	37209			3/26/1979	DEN	UG	NW	NE	07	17S	64E	5.4	IRD		3/26/1979	0	CL	LEAVITT, LINDA K.
216	37211			3/26/1979	DEN	UG	NW	NW	07	17S	64E	5.4	IRD		3/26/1979	0	CL	LEAVITT, RICHARD G.
216	37216			3/26/1979	DEN	UG	NW	NW	17	17S	64E	5.4	IRD		3/26/1979	0	CL	JOSEPH, JEFF
216	37217			3/26/1979	DEN	UG	NW	NE	08	17S	64E	5.4	IRD		3/26/1979	0	CL	BUTLER, MARILYN
216	37218			3/26/1979	DEN	UG	NW	NW	18	17S	64E	5.4	IRD		3/26/1979	0	CL	BUTLER, TOM

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							POINT OF DIVERSION											
216	37255			3/27/1979	DEN	UG	NW	NW	33	16S	64E	5.4	IRD		3/27/1979	0	CL	LEAVITT, LOIS
216	37379			3/30/1979	DEN	UG	NE	NW	09	17S	64E	5.4	IRD		3/30/1979	0	CL	SLOAN, H.MILLARD
216	37383			3/30/1979	DEN	UG	NE	NE	32	16S	64E	5.4	IRD		3/30/1979	0	CL	LINFORD, ESTHER B.
216	37384			3/30/1979	DEN	UG	NW	NW	32	16S	64E	5.4	IRD		3/30/1979	0	CL	LINFORD, DON C.
216	43533			4/14/1981	CAN	UG	SE	SE	07	18S	64E	1	IND		1/28/1988	0	CL	U.S. STEEL CORPORATION
216	44173			7/20/1981	ABR	UG		TR38	21	17S	64E	0.15	OM		7/20/1981	0	CL	NEVADA POWER COMPANY
		CHANGED BY: 60890T			WDR	UG												
		CHANGED BY: 60023T			EXP	UG												
		CHANGED BY: 60022			ABR	UG												
216	44664			10/20/1981	ABR	UG		TR38	21	17S	64E	0.46	COM		10/20/1981	0	CL	KERR-MCGEE CHEMICAL CORPORATION
		CHANGED BY: 55674			ABR	UG												
		CHANGED BY: 55673T			EXP	UG												
216	49164			6/28/1985	CAN	UG	SE	NW	22	18S	63E	1	IRD		6/28/1985	460.06	CL	TRYTHALL, DEBRA L.
216	49165			6/28/1985	CAN	UG	NE	SW	22	18S	63E	1	IRD		6/28/1985	0	CL	HICKOK, PATRICIA A.
216	49166			6/28/1985	CAN	UG	SE	NW	27	18S	63E	1	IRD		6/28/1985	460.06	CL	NESSEN, BARBARA T.
216	49167			6/28/1985	CAN	UG	NE	SW	27	18S	63E	1	IRD		6/28/1985	972	CL	NESSEN, KENNETH
216	50316			10/28/1986	ABR	UG	NW	SE	34	18S	63E	0.35	IND		10/28/1986	0	CL	GEORGIA-PACIFIC CORPORATION
		CHANGED BY: 55275T			EXP	UG												
		CHANGED BY: 56855			CER	UG												
216	50663			3/6/1987	ABR	UG	SW	SW	04	18S	64E	1.34	MM		3/6/1987	0	CL	GREAT STAR CEMENT CORPORATION
		CHANGED BY: 66784			PER	UG												
216	52585			10/3/1988	ABR	UG	NE	NW	19	18S	64E	1	IND		10/3/1988	0	CL	CLARK SANITATION, INC.
		CHANGED BY: 53322			ABR	UG												

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216	53322			5/26/1989	ABR	UG	SW	NE	18	18S	64E	1	IND	Y	10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 59237			ABR	UG												
		CHANGED BY: 59216T			EXP	UG												
		CHANGED BY: 62494T			EXP	UG												
		CHANGED BY: 61750			WDR	UG												
		CHANGED BY: 63587			ABR	UG												
		CHANGED BY: 60623			ABR	UG												
		CHANGED BY: 62934T			EXP	UG												
		CHANGED BY: 63585			ABR	UG												
		CHANGED BY: 62935T			EXP	UG												
		CHANGED BY: 63586			ABR	UG												
		CHANGED BY: 67711			ABR	UG												
216	53360			6/8/1989	DEN	UG	SE	NE	08	18S	64E	3.13	MM		6/8/1989	0	CL	GREAT STAR CEMENT CORPORATION
216	54073			10/17/1989	PER	UG	SW	SW	32	17S	63E	5	MUN	Y	10/17/1989	150.21	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 71521T			EXP	UG												
		CHANGED BY: 72799T			EXP	UG												
		CHANGED BY: 68056T			WDR	UG												
		CHANGED BY: 68181T			EXP	UG												
		CHANGED BY: 67595T			WDR	UG												
		CHANGED BY: 67850			WDR	UG												
		CHANGED BY: 68784T			EXP	UG												
		CHANGED BY: 68837T			EXP	UG												
		CHANGED BY: 77642T			EXP	UG												

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		CHANGED BY: 77643T			EXP	UG												
		CHANGED BY: 72798			ABR	UG												
		CHANGED BY: 78954T			EXP	UG												
		CHANGED BY: 73149			ABR	UG												
		CHANGED BY: 73150			ABR	UG												
		CHANGED BY: 73151			ABR	UG												
		CHANGED BY: 86467T			EXP	UG												
		CHANGED BY: 83490			PER	UG												
		CHANGED BY: 68822			PER	UG												
216	54130			10/30/1989	DEN	UG	SE	NE	34	18S	63E	2.3	IND		10/30/1989	1665.13	CL	BONNEVILLE NEVADA CORPORATION
216	54232			12/14/1989	DEN	UG	NW	NW	16	18S	63E	0.3	COM		12/14/1989		CL	KERR-MCGEE CHEMICAL CORPORATION
216	54348			1/19/1990	DEN	UG	SW	SW	12	18S	63E	0.3	IND		1/19/1990	0	CL	ADAMS, JAMES W.
216	54349			1/19/1990	DEN	UG	SE	SE	11	18S	63E	0.15	IND		1/19/1990		CL	ADAMS, JAMES W.
216	54350			1/19/1990	DEN	UG	NW	SE	11	18S	63E	0.3	IND		1/19/1990		CL	ADAMS, JAMES W.
216	54351			1/19/1990	DEN	UG	SW	NE	11	18S	63E	0.23	IND		1/19/1990		CL	ADAMS, JAMES W.
216	54352			1/19/1990	DEN	UG	SE	NW	11	18S	63E	0.23	IND		1/19/1990		CL	ADAMS, JAMES W.
216	54483			2/26/1990	DEN	UG	NW	NW	16	18S	63E	1	COM		2/26/1990		CL	KERR-MCGEE CHEMICAL CORPORATION
216	54484			2/26/1990	DEN	UG	SW	NE	02	18S	63E	2	IND		2/26/1990	1000	CL	NEVADA POWER COMPANY
		CHANGED BY: 79865			WDR	UG												
216	54697			4/26/1990	DEN	UG	SE	NW	03	19S	63E	1	MM		4/26/1990	723.9841 99	CL	AZTEC GLASS SAND CORPORATION
216	55099			7/18/1990	DEN	UG	SE	SE	07	18S	64E	1	IND		7/19/1990	724	CL	CONSTRUCTION PRODUCTS INC.
216	55275T			9/17/1990	EXP	UG	NE	SE	34	18S	63E	0.35	IND		10/28/1986	168.0222 75	CL	GEORGIA-PACIFIC CORPORATION
216	55673T			1/24/1991	EXP	UG	NW	NW	10	18S	63E	0.46	COM		10/20/1981	308.02	CL	KERR-MCGEE CHEMICAL CORPORATION

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216	55874		16705	1/24/1991	ABR	UG	NW	NW	16	18S	63E	0.46	COM		10/20/1981	0	CL	KAPEX, LLC
		CHANGED BY: 61041			ABR	UG												
		CHANGED BY: 61367			CAN	UG												
		CHANGED BY: 63356T			EXP	UG												
		CHANGED BY: 63281			CER	UG												
		CHANGED BY: 63348			CER	UG												
		CHANGED BY: 77745			CER	UG												
216	56855		14449	10/22/1991	CER	UG	SE	NE	34	18S	63E	0.35	IND		10/28/1986	144.1462 33	CL	GEORGIA PACIFIC CORPORATION
216	57011			12/16/1991	DEN	UG	NW	NE	11	18S	63E	8.8	IND		12/16/1991	6370.936	CL	ADAMS, JAMES W
216	59216T			9/7/1993	EXP	UG	NW	NE	19	18S	64E	0.5	IND		10/3/1988	137	CL	CLARK SANITATION INC.
216	59237		15391	8/16/1993	ABR	UG	NW	NE	19	18S	64E	0.25	IND	Y	10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 60624			ABR	UG												
		CHANGED BY: 67712			ABR	UG												
216	60022			4/27/1994	ABR	UG	NW	SW	21	17S	64E	0.15	IND		7/20/1981	0	CL	NEVADA POWER COMPANY
		CHANGED BY: 67880T			EXP	UG												
		CHANGED BY: 64452T			EXP	UG												
		CHANGED BY: 63810T			WDR	UG												
		CHANGED BY: 67476T			EXP	UG												
		CHANGED BY: 74399			CER	UG												
216	60023T			4/27/1994	EXP	UG	NW	SW	21	17S	64E	0.15	IND		7/20/1981	74.56999 99	CL	NEVADA POWER COMPANY
216	60623			10/28/1994	ABR	UG	SE	SE	07	18S	64E	0.25	IND		10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 63589			ABR	UG												
216	60624			10/28/1994	ABR	UG	SE	SE	07	18S	64E	0.25	IND	Y	10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES

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		CHANGED BY: 63590			ABR	UG												
		CHANGED BY: 67713			ABR	UG												
216	60890T			2/1/1995	WDR	UG	SW	NW	38	17S	63E	0.15	IND		7/20/1981		CL	NEVADA POWER COMPANY
216	61041			3/15/1995	ABR	UG	SE	SE	07	18S	64E	0.29	IND		10/20/1981	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 63588			ABR	UG												
216	61367			7/3/1995	CAN	UG	NW	NE	03	19S	63E	0.40	COM		10/20/1981	4	CL	WESTERN GYPSUM, INC.
216	61750			12/18/1995	WDR	UG	NE	SW	19	18S	64E	0	IND		10/3/1988		CL	CLARK SANITATION, INC.
216	62404T			10/2/1996	EXP	UG	SE	SE	07	18S	64E	0.048	IND		10/3/1988	34.53	CL	SILVER STATE DISPOSAL SERVICE, INC.
216	62934T			3/24/1997	EXP	UG	SE	SW	19	18S	64E	0.001	IND		10/3/1988	0.122756	CL	ENVIRONMENTAL TECHNOLOGIES OF NV,INC
216	62935T			3/24/1997	EXP	UG	NE	NW	20	18S	64E	0.001	IND		10/3/1988	0.122756	CL	ENVIRONMENTAL TECHNOLOGIES OF NV,INC
216	62996			4/3/1997	DEN	UG	NE	NE	14	16S	63E	8.35	IND		4/3/1997	6045.15	CL	NEVADA POWER COMPANY
216	62998			4/3/1997	DEN	UG	SW	NE	11	16S	63E	8.35	IND		4/3/1997	6045.15	CL	NEVADA POWER COMPANY
216	63261		16751	7/21/1997	CER	UG	NE	NE	14	18S	63E	0.149	COM	Y	10/20/1981	100	CL	CHEMICAL LIME COMPANY OF ARIZONA
216	63348		15682	6/18/1997	CER	UG	NE	SW	13	18S	63E	0.006	COM		10/20/1981	4	CL	WESTERN MINING & MINERALS, INC.
216	63356T			8/26/1997	EXP	UG		N2	13	18S	63E	0.006	COM		10/20/1981	4.357838	CL	WESTERN GYPSUM, INC.
216	63585			11/25/1997	ABR	UG	NE	NW	20	18S	64E	0.001	IND	Y	10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECH., INC.
		CHANGED BY: 67714			ABR	UG												
216	63586			11/25/1997	ABR	UG	SE	SE	07	18S	64E	0.149	IND	Y	10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECH., INC.
		CHANGED BY: 67715			ABR	UG												
216	63587			11/25/1997	ABR	UG	NW	NE	19	18S	64E	0.1004	IND	Y	10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECH., INC.
		CHANGED BY: 67716			ABR	UG												
		CHANGED BY: 67717			ABR	UG												
216	63588			11/25/1997	ABR	UG	SE	SW	19	18S	64E	0.29	IND	Y	10/20/1981	0	CL	REPUBLIC ENVIRONMENTAL TECH., INC.

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		CHANGED BY: 67718			ABR	UG												
216	63589			11/25/1997	ABR	UG	NW	NE	19	18S	64E	0.25	IND	Y	10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECH., INC.
		CHANGED BY: 67719			ABR	UG												
216	63590			11/25/1997	ABR	UG	SE	SE	07	18S	64E	0.25	IND	Y	10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECH., INC.
		CHANGED BY: 67720			ABR	UG												
216	63610T			12/9/1997	WDR	UG	NW	SW	21	17S	64E	0.15	CON		7/20/1981	74	CL	NEVADA POWER COMPANY
216	64040			4/17/1998	DEN	UG	NW	NW	29	17S	64E	10	QM		4/17/1998	7239.7	CL	DRY LAKE WATER, L.L.C.
216	64045			4/17/1998	DEN	UG	NE	NE	32	17S	63E	10	QM		4/17/1998	7239.7	CL	DRY LAKE WATER, L.L.C.
216	64222			6/12/1998	DEN	UG	SE	SE	09	17S	64E	1.11	IND		6/12/1998	807	CL	NEVADA POWER COMPANY
216	64223			6/12/1998	DEN	UG	SW	SW	10	17S	64E	1.11	IND		6/12/1998	807	CL	NEVADA POWER COMPANY
216	64452T			9/17/1998	EXP	UG	NW	SW	10	17S	64E	0.15	IND		7/20/1981	74	CL	NEVADA POWER COMPANY
216	64880		16664	3/1/1999	CER	UG	SW	SE	23	18S	63E	0.22	MM	Y	7/24/1967	133.81	CL	CHEMICAL LIME COMPANY
216	65125T			5/18/1999	EXP	UG	SW	SE	23	18S	63E	0.22	MM		7/24/1967	150.3761	CL	CHEMICAL LIME COMPANY
216	65950			1/28/2000	WDR	UG	SE	NE	15	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
216	65951			1/28/2000	WDR	UG	NE	NE	15	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
216	65952			1/28/2000	WDR	UG	SW	SE	15	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
216	65953			1/28/2000	WDR	UG	SW	NW	23	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
216	66784			8/25/2000	PER	UG	NE	NE	27	18S	63E	1.34	QM	Y	3/6/1987	158.84	CL	DRY LAKE WATER, LLC
216	66785			8/25/2000	PER	UG	NE	NE	32	17S	63E	1.34	QM	Y	8/25/2000	48.84	CL	DRY LAKE WATER, LLC
		CHANGED BY: 72098			CER	UG												
		CHANGED BY: 74064			ABR	UG												
		CHANGED BY: 79948			PER	UG												
		CHANGED BY: 77389			PER	UG												

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216	67476T			5/3/2001	EXP	UG	NW	SW	21	17S	64E	0.05	IND		7/20/1981	24.85609	CL	NEVADA POWER COMPANY
216	67595T			5/21/2001	WDR	UG	NW	NW	16	18S	63E	1.136	PWR		10/17/1989	500	CL	LAS VEGAS VALLEY WATER DISTRICT
216	67650			6/7/2001	WDR	UG	NE	NE	15	18S	63E	1.59	MUN		10/17/1989	700	CL	LAS VEGAS VALLEY WATER DISTRICT
		CHANGED BY: 71607T			EXP	UG												
		CHANGED BY: 68541T			EXP	UG												
		CHANGED BY: 77605T			WDR	UG												
		CHANGED BY: 77604T			WDR	UG												
216	67711			6/28/2001	ABR	UG	SW	NE	18	18S	64E	0.0004	IND		10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 83707			CER	UG												
216	67712			6/28/2001	ABR	UG	SW	NE	18	18S	64E	0.25	IND		10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 82841T			WDR	UG												
		CHANGED BY: 83708			PER	UG												
216	67713			6/28/2001	ABR	UG	SE	SE	07	18S	64E	0	IND		10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 83709			PER	UG												
216	67714			6/28/2001	ABR	UG	NE	NW	20	18S	64E	0.0004	IND		10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 83710			CER	UG												
216	67715			6/28/2001	ABR	UG	SE	SE	07	18S	64E	0.149	IND		10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 83711			PER	UG												
216	67716			6/28/2001	ABR	UG	NW	NE	19	18S	64E	0.014	IND	Y	10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 81009T			EXP	UG												
		CHANGED BY: 83712			PER	UG												
216	67717			6/28/2001	ABR	UG	SW	NE	18	18S	64E	0.0869	IND		10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 83713			PER	UG												

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216	67718			6/28/2001	ABR	UG	SE	SW	19	18S	64E	0.29	IND		10/20/1981	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 83715			PER	UG												
		CHANGED BY: 83714			CER	UG												
216	67719			6/28/2001	ABR	UG	SW	NE	18	18S	64E	0.25	IND		10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 83716			PER	UG												
216	67720			6/28/2001	ABR	UG	SE	SE	07	18S	64E	0.25	IND		10/3/1988	0	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES
		CHANGED BY: 83717			CER	UG												
216	67880T			8/3/2001	EXP	UG	NW	SW	21	17S	64E	0.1	IND		7/20/1981	49.71818	CL	NEVADA POWER COMPANY
216	67894			8/8/2001	DEN	UG	NE	NE	32	17S	63E	10	QM		8/8/2001	7239.7	CL	DRY LAKE WATER, L.L.C.
216	68056T			10/3/2001	WDR	UG	NW	NW	18	18S	63E	1.136	MUN		10/17/1989	500	CL	LAS VEGAS VALLEY WATER DISTRICT
216	68161T			11/1/2001	EXP	UG	NE	NE	05	18S	63E	0.454	PWR		10/17/1989	200	CL	LAS VEGAS VALLEY WATER DISTRICT
216	68541T			3/6/2002	EXP	UG	NE	NE	15	18S	63E	1.367	MUN		10/17/1989	600	CL	LAS VEGAS VALLEY WATER DISTRICT
216	68784T			5/6/2002	EXP	UG	NE	SE	05	18S	63E	0.5	MUN		10/17/1989	220	CL	LAS VEGAS VALLEY WATER DISTRICT
216	68822			5/16/2002	PER	UG	NE	NE	05	18S	63E	1.591	MUN	Y	10/17/1989	350	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 79001			PER	UG												
		CHANGED BY: 86466T			EXP	UG												
		CHANGED BY: 88011T			EXP	UG												
216	68837T			5/24/2002	EXP	UG	NE	NE	05	18S	63E	1.136	MUN		10/17/1989	500	CL	LAS VEGAS VALLEY WATER DISTRICT
216	71521T			8/2/2004	EXP	UG	NE	SE	05	18S	63E	0.5	MUN		10/17/1989	220	CL	LAS VEGAS VALLEY WATER DISTRICT
216	71807T			10/22/2004	EXP	UG	NE	NE	15	18S	63E	1.367	MUN		10/17/1989	600	CL	LAS VEGAS VALLEY WATER DISTRICT
216	72098		19102	1/4/2005	CER	UG	SE	SW	13	18S	63E	0.1	QM	Y	8/25/2000	13.16	CL	DRY LAKE WATER, LLC
216	72798			5/18/2005	ABR	UG	NE	SE	05	18S	63E	0.795	MUN		10/17/1989	0	CL	LAS VEGAS VALLEY WATER DISTRICT
		CHANGED BY: 79002			PER	UG												

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216	72799T			5/18/2005	EXP	UG	NE	SE	05	18S	63E	0.795	MUN		10/17/1989	349.8	CL	LAS VEGAS VALLEY WATER DISTRICT
216	73149			8/12/2005	ABR	UG	NE	NE	15	18S	63E	0.53	MUN		10/17/1989	0	CL	LAS VEGAS VALLEY WATER DISTRICT
		CHANGED BY: 79003			PER	UG												
216	73150			8/12/2005	ABR	UG	NE	NE	15	18S	63E	0.53	MUN		10/17/1989	0	CL	LAS VEGAS VALLEY WATER DISTRICT
		CHANGED BY: 79004			PER	UG												
216	73151			8/12/2005	ABR	UG	NE	NE	15	18S	63E	0.53	MUN		10/17/1989	0	CL	LAS VEGAS VALLEY WATER DISTRICT
		CHANGED BY: 79005			PER	UG												
216	73732			1/20/2006	WDR	UG	SW	NE	04	18S	63E	1	MM		1/20/2006	0	CL	RINKER MATERIALS WEST, LLC.
216	74064			3/24/2006	ABR	UG	SW	NW	35	18S	63E	0.06	QM		8/25/2000	0	CL	DRY LAKE WATER, LLC
		CHANGED BY: 81344			PER	UG												
216	74399		17531	6/19/2006	CER	UG	NW	SW	21	17S	64E	0.15	IND	Y	7/20/1981	74.57	CL	NEVADA POWER COMPANY
216	74758			8/15/2006	DEN	UG	SW	NW	35	18S	63E	0.0028	COM		8/15/2006	2.02	CL	HARDY MANAGEMENT COMPANY, LLC
216	76632			1/16/2008	DEN	UG	NW	SW	13	18S	63E	0.00277	COM		1/16/2008	2	CL	INES ESQUIVEL
216	76862			3/27/2008	PER	EFF	SE	NE	34	18S	63E	0.385	STO		3/27/2008	278.73	CL	NEVADA COGENERATION ASSOCIATES #1
		CHANGED BY: 76862S01			CAN	EFF												
		CHANGED BY: 76862S02			WDR	STO												
		CHANGED BY: 76862S03			CAN	STO												
		CHANGED BY: 76862S04			DEN	EFF												
216	76862S01			8/19/2008	CAN	EFF	SE	NE	34	18S	63E	0.075	MM		3/27/2008	53.8	CL	RINKER MATERIALS WEST LLC
216	76862S02			4/13/2012	WDR	STO	SE	NE	34	18S	63E	0.0315	CON		3/27/2008	9.5	CL	STURGEON ELECTRIC COMPANY INC
216	76862S03			8/22/2012	CAN	STO	SE	NE	34	18S	63E	0.0315	OTH		3/27/2008	9.5	CL	LAS VEGAS PAVING CORP
216	76862S04			2/10/2016	DEN	EFF	SE	NE	34	18S	63E	0.165	COM		2/10/2016	112	CL	V.T. CONSTRUCTION, INC.
216	77389			9/15/2008	PER	UG	NW	SE	33	18S	63E	0.602	QM	Y	8/25/2000	80	CL	DRY LAKE WATER, LLC

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('216') Run Date: 8/22/2019 8:57:08 AM

Basin	App	Prev App / Change of App	Cert	Filing Date	Status	Source	Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
216	77604T			11/18/2008	WDR	UG	NE	NE	14	18S	63E	0.0568	MM		10/17/1989	25	CL	LAS VEGAS VALLEY WATER DISTRICT
216	77605T			11/18/2008	WDR	UG	SW	SE	23	18S	63E	0.0568	MM		10/17/1989	25	CL	LAS VEGAS VALLEY WATER DISTRICT
216	77642T			11/26/2008	EXP	UG	SW	SE	23	18S	63E	0.057	MM	Y	10/17/1989	25	CL	LAS VEGAS VALLEY WATER DISTRICT
216	77643T			11/26/2008	EXP	UG	NE	NE	14	18S	63E	0.57	MM	Y	10/17/1989	25	CL	LAS VEGAS VALLEY WATER DISTRICT
216	77745		10842	1/7/2009	CER	UG	NW	NW	16	18S	63E	0.015	COM		10/20/1981	10.02	CL	NORTH LAS VEGAS-CITY
216	78954T			10/13/2009	EXP	UG	NW	SW	21	17S	64E	0.342	MUN		10/17/1989	150	CL	LAS VEGAS VALLEY WATER DISTRICT
216	79001			11/2/2009	PER	UG	NE	NE	05	18S	63E	0.7955	MUN	Y	10/17/1989	350	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 86468T			EXP	UG												
216	79002			11/2/2009	PER	UG	NE	SE	05	18S	63E	0.705	MUN	Y	10/17/1989	349.8	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 85856T			EXP	UG												
		CHANGED BY: 86970T			EXP	UG												
216	79003			11/2/2009	PER	UG	NW	SW	21	17S	64E	0.53	MUN	Y	10/17/1989	233.33	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 85857T			EXP	UG												
		CHANGED BY: 86069T			EXP	UG												
216	79004			11/2/2009	PER	UG	NE	NE	15	18S	63E	0.53	MUN	Y	10/17/1989	233.33	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 85858T			EXP	UG												
		CHANGED BY: 86968T			EXP	UG												
216	79005			11/2/2009	PER	UG	NE	NE	15	18S	63E	0.53	MUN	Y	10/17/1989	233.33	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 85859T			EXP	UG												
		CHANGED BY: 86967T			EXP	UG												
216	79006			11/2/2009	PER	UG	NE	NE	05	18S	63E	1.2	MUN	Y	11/2/2009	0	CL	SOUTHERN NEVADA WATER AUTHORITY
216	79007			11/2/2009	PER	UG	NE	SE	05	18S	63E	0.5	MUN	Y	11/2/2009	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 85860T			EXP	UG												

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Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
		CHANGED BY: 86966T			EXP	UG												
216	79008			11/2/2009	PER	UG	NW	SW	21	17S	64E	1.5	MUN	Y	11/2/2009	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 85861T			EXP	UG												
		CHANGED BY: 86965T			EXP	UG												
216	79009			11/2/2009	PER	UG	NE	NE	15	18S	63E	0.15	MUN	Y	11/2/2009	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 85862T			EXP	UG												
		CHANGED BY: 86964T			EXP	UG												
216	79010			11/2/2009	PER	UG	NE	NE	15	18S	63E	1.8	MUN	Y	11/2/2009	0	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 85863T			EXP	UG												
		CHANGED BY: 86963T			EXP	UG												
216	79354			1/28/2010	DEN	UG	SW	SW	32	17S	63E	10	MUN		1/28/2010	0	CL	SOUTHERN NEVADA WATER AUTHORITY
216	79687			3/15/2010	DEN	UG	SE	SE	09	17S	64E	1.11	IND		3/15/2010	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
216	79688			3/15/2010	DEN	UG	NE	NE	14	16S	63E	0.35	IND		3/15/2010	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
216	79689			3/15/2010	DEN	UG	NW	SW	10	17S	64E	1.11	IND		3/15/2010	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
216	79691			3/15/2010	DEN	UG	SW	NE	11	16S	63E	0.35	IND		3/15/2010	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
216	79865			5/21/2010	WDR	UG	NW	SW	21	17S	64E	2	PWR		2/26/1990	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
216	79903			6/14/2010	DEN	UG	SW	NE	02	18S	63E	2	IND		6/14/2010	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
216	79948			6/21/2010	PER	UG	SE	SW	13	18S	63E	0.226	QM	Y	8/25/2000	30	CL	DRY LAKE WATER LLC
216	81009T			7/28/2011	EXP	UG	NW	NE	19	18S	64E	0.0055	CON	Y	10/3/1988	1.5	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
216	81344			11/28/2011	PER	UG	SE	SW	13	18S	63E	0.06	QM	Y	8/25/2000	8	CL	DRY LAKE WATER LLC
216	82841T			5/31/2013	WDR	UG	SW	NE	18	18S	64E	0.12	CON		10/3/1988	32	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
216	83490			1/31/2014	PER	UG	NW	NW	16	18S	63E	0.68	MUN	Y	10/17/1989	300	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 87169T			EXP	UG												

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							POINT OF DIVERSION											
216	83553			2/18/2014	PER	UG	SE	NE	03	19S	63E	0.07	IND		7/24/1959	3	CL	TECHNICHROME
216	83707		21125	4/11/2014	CER	UG	SW	NE	18	18S	64E	0.0004	IND	Y	10/3/1988	0.11	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
216	83708			4/11/2014	PER	UG	SW	NE	18	18S	64E	0.25	IND	Y	10/3/1988	68.5	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
		CHANGED BY: 88292			RFA	UG												
216	83709			4/11/2014	PER	UG	SE	SE	07	18S	64E	0.0004	IND	Y	10/3/1988	0.11	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
216	83710		21126	4/11/2014	CER	UG	NE	NW	20	18S	64E	0.0004	IND	Y	10/3/1988	0.11	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
216	83711			4/11/2014	PER	UG	NW	NE	19	18S	64E	0.1488	IND	Y	10/3/1988	40.78	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
		CHANGED BY: 88293			RFA	UG												
216	83712			4/11/2014	PER	UG	NW	NE	19	18S	64E	0.0135	IND	Y	10/3/1988	3.7	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
		CHANGED BY: 88294			RFA	UG												
216	83713			4/11/2014	PER	UG	NW	NE	19	18S	64E	0.0869	IND	Y	10/3/1988	23.8	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
		CHANGED BY: 88295			RFA	UG												
216	83714		21127	4/11/2014	CER	UG	SE	SW	19	18S	64E	0.235	IND	Y	10/20/1981	157	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
216	83715			4/11/2014	PER	UG	NW	NE	19	18S	64E	0.055	IND	Y	10/20/1981	37	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
		CHANGED BY: 88296			RFA	UG												
216	83716			4/11/2014	PER	UG	SW	NE	18	18S	64E	0.25	IND	Y	10/3/1988	68.5	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
		CHANGED BY: 88297			RFA	UG												
216	83717		21128	4/11/2014	CER	UG	SE	SE	07	18S	64E	0.2496	IND	Y	10/3/1988	68.39	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC
216	84041			7/1/2014	PER	UG	SE	SW	13	18S	63E	0.5	QM	Y	7/1/2014	40	CL	DRY LAKE WATER LLC
216	84042			7/1/2014	WDR	UG	SE	SW	13	18S	63E	0.5	QM		7/1/2014	40	CL	DRY LAKE WATER LLC
216	85852T			1/14/2016	EXP	UG	NE	NE	15	18S	63E	0.41	MUN		9/27/1985	290	CL	SOUTHERN NEVADA WATER AUTHORITY
216	85853T			1/14/2016	EXP	UG	NE	NE	15	18S	63E	1.91	MUN		9/27/1985	1380	CL	SOUTHERN NEVADA WATER AUTHORITY
216	85854T			1/14/2016	EXP	UG	NE	SE	05	18S	63E	1.47	MUN		9/27/1985	1060	CL	SOUTHERN NEVADA WATER AUTHORITY

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216	85855T			1/14/2016	EXP	UG	NW	SW	21	17S	64E	0.38	MUN		9/27/1985	270	CL	SOUTHERN NEVADA WATER AUTHORITY
216	85856T			1/14/2016	EXP	UG	NE	SE	05	18S	63E	0.795	MUN		10/17/1989	349.8	CL	SOUTHERN NEVADA WATER AUTHORITY
216	85857T			1/14/2016	EXP	UG	NW	SW	21	17S	64E	0.53	MUN		10/17/1989	233.33	CL	SOUTHERN NEVADA WATER AUTHORITY
216	85858T			1/14/2016	EXP	UG	NE	NE	15	18S	63E	0.53	MUN		10/17/1989	233.33	CL	SOUTHERN NEVADA WATER AUTHORITY
216	85859T			1/14/2016	EXP	UG	NE	NE	15	18S	63E	0.53	MUN		10/17/1989	233.33	CL	SOUTHERN NEVADA WATER AUTHORITY
216	85860T			1/14/2016	EXP	UG	NE	SE	05	18S	63E	0.5	MUN		11/2/2009	0	CL	SOUTHERN NEVADA WATER AUTHORITY
216	85861T			1/14/2016	EXP	UG	NW	SW	21	17S	64E	1.5	MUN		11/2/2009	0	CL	SOUTHERN NEVADA WATER AUTHORITY
216	85862T			1/14/2016	EXP	UG	NE	NE	15	18S	63E	0.15	MUN		11/2/2009	0	CL	SOUTHERN NEVADA WATER AUTHORITY
216	85863T			1/14/2016	EXP	UG	NE	NE	15	18S	63E	1.6	MUN		11/2/2009	0	CL	SOUTHERN NEVADA WATER AUTHORITY
216	86195T			5/6/2016	EXP	UG	NW	SW	33	17S	63E	1.53	CON	Y	9/27/1985	1000	CL	SOUTHERN NEVADA WATER AUTHORITY
216	86466T			9/23/2016	EXP	UG	NE	SE	08	18S	63E	0.795	MUN	Y	10/17/1989	0	CL	SNWA
216	86467T			9/23/2016	EXP	UG	NE	SE	08	18S	63E	0.344	MUN	Y	10/17/1989	150.21	CL	SNWA
216	86468T			9/23/2016	EXP	UG	NE	SE	08	18S	63E	0.12	MUN	Y	10/17/1989	80	CL	SNWA
216	86959T			2/27/2017	EXP	UG	NE	NE	15	18S	63E	1.91	MUN	Y	9/27/1985	1380	CL	SNWA
216	86960T			2/27/2017	EXP	UG	NE	SE	05	18S	63E	1.47	MUN	Y	9/27/1985	1060	CL	SNWA
216	86961T			2/27/2017	EXP	UG	NW	SW	21	17S	64E	0.38	MUN	Y	9/27/1985	0	CL	SNWA
216	86962T			2/27/2017	EXP	UG	NE	NE	15	18S	63E	0.41	MUN	Y	9/27/1985	290	CL	SNWA
216	86963T			2/27/2017	EXP	UG	NE	NE	15	18S	63E	1.6	MUN	Y	11/2/2009	0	CL	SNWA
216	86964T			2/27/2017	EXP	UG	NE	NE	15	18S	63E	0.15	MUN	Y	11/2/2009	0	CL	SNWA
216	86965T			2/27/2017	EXP	UG	NW	SW	21	17S	64E	1.5	MUN	Y	11/2/2009	0	CL	SNWA
216	86966T			2/27/2017	EXP	UG	NE	SE	05	18S	63E	0.5	MUN	Y	11/2/2009	0	CL	SNWA
216	86967T			2/27/2017	EXP	UG	NE	NE	15	18S	63E	0.53	MUN	Y	10/17/1989	233.33	CL	SNWA
216	86968T			2/27/2017	EXP	UG	NE	NE	15	18S	63E	0.53	MUN	Y	10/17/1989	233.33	CL	SNWA

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216	86969T			2/27/2017	EXP	UG	NW	SW	21	17S	64E	0.53	MUN	Y	10/17/1989	233.33	CL	SNWA
216	86970T			2/27/2017	EXP	UG	NE	SE	05	18S	63E	0.795	MUN	Y	10/17/1989	349.8	CL	SNWA
216	87102T			5/5/2017	EXP	UG	NW	SW	33	17S	63E	1.25	CON	Y	1/1/1900	900	CL	SNWA
216	87165T			8/16/2017	EXP	UG	NW	NE	02	18S	63E	0.007	COM		10/17/1989	5	CL	SNWA
216	87735			3/6/2018	RFP	UG	NE	NE	05	18S	63E	2.5	PWR		3/6/2018	1800	CL	NEVADA POWER COMPANY
216	87736			3/6/2018	RFP	UG	NE	NE	05	18S	63E	2.5	PWR		3/6/2018	1800	CL	NEVADA POWER COMPANY
216	87737			3/6/2018	WDR	UG	NE	NE	05	18S	63E	2.5	PWR		3/6/2018	1800	CL	NEVADA POWER COMPANY
216	87738			3/6/2018	RFP	UG	NE	NE	05	18S	63E	2.5	PWR		3/6/2018	1800	CL	NEVADA POWER COMPANY
216	88011T			5/25/2018	EXP	UG	NW	SW	33	17S	63E	0.795	CON		10/17/1989	0	CL	SNWA
216	88161			7/31/2018	RFP	UG	NE	NE	15	18S	63E	2.5	PWR		7/31/2018	0	CL	NEVADA POWER COMPANY
216	88292			9/11/2018	RFA	UG	SE	SE	07	18S	64E	0.25	IND		10/3/1988	68.5	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES, INC.
216	88293			9/11/2018	RFA	UG	SE	SE	07	18S	64E	0.1488	IND		10/3/1988	40.78	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES, INC.
216	88294			9/11/2018	RFA	UG	SE	SE	07	18S	64E	0.0135	IND		10/3/1988	3.7	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES, INC.
216	88295			9/11/2018	RFA	UG	SE	SE	07	18S	64E	0.0869	IND		10/3/1988	23.8	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES, INC.
216	88296			9/11/2018	RFA	UG	SE	SE	07	18S	64E	0.055	IND		10/20/1981	37	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES, INC.
216	88297			9/11/2018	RFA	UG	NE	NW	20	18S	64E	0.25	IND		10/3/1988	68.5	CL	REPUBLIC ENVIRONMENTAL TECHNOLOGIES, INC.
216	88873T			5/15/2019	PER	UG	NE	NE	27	18S	63E	0.119	OM		10/18/1988	86	CL	DRY LAKE WATER, LLC
216	88874T			5/15/2019	PER	UG	SE	SE	14	18S	63E	0.046	OM		10/18/1988	33.44	CL	DRY LAKE WATER, LLC
216	88875T			5/15/2019	PER	UG	NE	NW	10	18S	63E	0.75	OM		6/21/1988	542.98	CL	DRY LAKE WATER, LLC
216	88876T			5/15/2019	PER	UG	SE	SE	14	18S	63E	0.19	OM		10/18/1988	137.55	CL	DRY LAKE WATER, LLC
216	88877T			5/15/2019	PER	UG	SE	SE	14	18S	63E	2	OM		12/10/1990	592.06	CL	DRY LAKE WATER, LLC

Nevada Division of Water Resources

Hydrographic Abstracts

Hydrographic Abstract Report

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('217') — Run Date: 8/22/2019 9:00:40 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
217	18862			2/10/1958	CAN	UG	NE	SE	09	16S	63E	8	IRR		2/10/1956	0	CL	COLLET, RUDOLPH J.
217	32631			7/1/1977	DEN	UG	SE	SE	09	16S	63E	4	IRR		7/1/1977	0	CL	KNAPP, HERSCHEL J.
217	32632			7/1/1977	DEN	UG	SW	SW	03	16S	63E	4	IRR		7/1/1977	0	CL	KNAPP, BEECHER E.
217	32633			7/1/1977	DEN	UG	SE	SW	10	16S	63E	4	IRR		7/1/1977	0	CL	KNAPP, BARBARA A.
217	32634			7/1/1977	DEN	UG	NE	SE	04	16S	63E	4	IRR		7/1/1977	0	CL	CUDDY, WILLIAM T.
217	32635			7/1/1977	DEN	UG	SE	NE	16	16S	63E	4	IRR		7/1/1977	0	CL	SMITH, SABRINA R.
217	32636			7/1/1977	DEN	UG	SE	NE	21	16S	63E	4	IRR		7/1/1977	0	CL	VINCENT, CASSANDRA J. SMITH
217	32637			7/1/1977	DEN	UG	SE	SE	16	16S	63E	4	IRR		7/1/1977	0	CL	SMITH, LESLIE H.
217	32638			7/1/1977	DEN	UG	NE	NW	15	16S	63E	4	IRR		7/1/1977	0	CL	STEWART, SUZANNE SMITH
217	32639			7/1/1977	DEN	UG	SE	NW	21	16S	63E	4	IRR		7/1/1977	0	CL	STEWART, GRANT T.
217	32640			7/1/1977	DEN	UG	NE	NW	10	16S	63E	4	IRR		7/1/1977	0	CL	LOZZI, JOHN
217	33081			8/8/1977	DEN	UG	NE	NE	17	16S	63E	2.7	IRC		8/8/1977	0	CL	DIXON, RAOUL M.
217	33082			8/8/1977	DEN	UG	SE	SE	17	16S	63E	2.7	IRC		8/8/1977	0	CL	BLAKE, DONN I.
217	33093			8/8/1977	DEN	UG		NW	16	16S	63E	2.7	IRR		8/8/1977	0	CL	COBURN, KENNETH RAY
217	33094			8/8/1977	DEN	UG		NW	21	16S	63E	2.7	IRR		8/8/1977		CL	WILSON, JANINE M.
217	33095			8/8/1977	DEN	UG		SW	16	16S	63E	2.7	IRR		8/8/1977	0	CL	COBURN, CALIN KAY
217	33096			8/8/1977	DEN	UG		SW	09	16S	63E	2.7	IRR		8/8/1977	0	CL	DUNCAN, CLAYTON B.
217	33291			8/23/1977	DEN	UG		SW	21	16S	63E	2.7	IRR		8/23/1977	0	CL	BISEK, ALBERT ROBERT
217	33292			8/23/1977	CAN	UG		SW	20	16S	63E	2.7	IRR		8/23/1977	0	CL	SPECTER, FRANK

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Basin	App	Prev App / Change of App	Cert	Filing Date	Status	Source	Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
217	33313			8/23/1977	DEN	UG		SW	10	16S	63E	2.7	IRR		8/23/1977	0	CL	DIXON, HISAKO A.
		CHANGED BY: 38783			CAN	UG												
217	33352			8/25/1977	CAN	UG			08	16S	63E	2.7	IRR		8/25/1977	0	CL	PAGLIUSO, ERNEST P.
217	33353			8/25/1977	WDR	UG		SE	08	16S	63E	2.7	IRR		8/25/1977	0	CL	ABE, DAVID
217	33856			9/23/1977	CAN	UG		NW	09	16S	63E	2.7	IRR		9/23/1977	0	CL	SAKAMOTO, JIM
217	33928			10/3/1977	DEN	UG	SW	SW	04	16S	63E	2.7	IRR		10/3/1977	0	CL	BAKER, HAROLD J.
217	34027			10/6/1977	CAN	UG		SE	04	16S	63E	2.7	IRR		10/6/1977	0	CL	NEWELL, NINA R.
217	34028			10/6/1977	CAN	UG		NE	04	16S	63E	2.7	IRR		10/6/1977	0	CL	NEWELL, WM. A.
217	34029			10/6/1977	DEN	UG	SW	NW	04	16S	63E	2.7	IRR		10/6/1977	0	CL	BAKER, MAE L.
217	34170			10/14/1977	WDR	UG		NW	10	17S	63E	2.7	IRR		10/14/1977	100	CL	GRANTHAM, KELLEY D.
217	38653			7/24/1979	CAN	UG		SE	20	16S	63E	2.7	IRR		7/24/1979	0	CL	WILSON, JANINE
217	38758			8/8/1979	DEN	UG	SE	SE	08	16S	63E	2.7	IRC		8/8/1979	800	CL	NORTH VALLEY HOLDINGS, LLC
		CHANGED BY: 66316			DEN	UG												
217	38781			8/14/1979	DEN	UG	SE	SE	20	16S	63E	2.7	IRR		8/14/1979	0	CL	WILSON, JANINE M.
217	38783			8/14/1979	CAN	UG	SW	NE	20	16S	63E	2.7	IRR		8/23/1977		CL	DIXON, HISAKO A.
217	52837			12/28/1988	DEN	UG	NE	SE	29	16S	63E	6.4	IRR		12/28/1988	0	CL	LEAVITT, J. ROBERT C.
217	52846			1/5/1989	DEN	UG	SE	NE	29	16S	63E	6.4	IRR		1/5/1989	0	CL	LEAVITT, EARL M.
217	54074			10/17/1989	PER	UG	SW	SW	25	16S	62E	5	MUN	Y	10/17/1989	2200	CL	SOUTHERN NEVADA WATER AUTHORITY
217	62997			4/3/1997	DEN	UG	NW	SE	27	15S	63E	5.57	IND		4/3/1997	0	CL	NEVADA POWER COMPANY
217	62999			4/3/1997	DEN	UG	NW	SE	29	16S	63E	22.28	IND		4/3/1997	0	CL	NEVADA POWER COMPANY
217	64038			4/17/1998	DEN	UG	NW	NE	16	16S	63E	10	QM		4/17/1998	7239.7	CL	DRY LAKE WATER, L.L.C.
		CHANGED BY: 66162			DEN	UG												
217	66162			3/17/2000	DEN	UG	SW	SE	21	17S	63E	10	QM		4/17/1998	7239.7	CL	DRY LAKE WATER, L.L.C.

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('217') Run Date: 8/22/2019 9:00:40 AM

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		CHANGED BY: 67160			WDR	UG												
217	66316			4/26/2000	DEN	UG	SE	NE	21	16S	63E	2.7	IND		8/8/1979	0	CL	NICHOLS, CHRIS D. (C/O)
217	66871			10/13/2000	WDR	UG	SE	NE	21	16S	63E	3	QM		10/13/2000	0	CL	NORTH VALLEY HOLDINGS, LLC
217	67160			1/24/2001	WDR	UG	SW	SE	21	17S	63E	10	QM		4/17/1998		CL	DRY LAKE WATER, L.L.C.
217	67895			8/8/2001	DEN	UG	SW	SE	21	17S	63E	10	QM		8/8/2001	0	CL	DRY LAKE WATER, L.L.C.
217	68501			2/15/2002	DEN	UG	SW	SE	21	17S	63E	10	QM		2/15/2002	0	CL	DRY LAKE WATER, L.L.C.
217	79355			1/28/2010	DEN	UG	SW	SW	25	16S	62E	10	MUN		1/28/2010	0	CL	SOUTHERN NEVADA WATER AUTHORITY
217	79692			3/15/2010	DEN	UG	NW	SE	27	15S	63E	5.57	IND		3/15/2010	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
217	79693			3/15/2010	DEN	UG	NW	SE	29	16S	63E	22.28	IND		3/15/2010	0	CL	NEVADA POWER COMPANY DBA NV ENERGY

Nevada Division of Water Resources

Hydrographic Abstracts

Hydrographic Abstract Report

Selection Criteria: WHERE owner_type IN ('C','B') AND ms Basin IN ('218') Run Date: 8/22/2019 9:02:08 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
218	10034			10/8/1936	DEN	STR	SW	SW	04	15S	66E	50	PWR		10/8/1936	0	CL	LIVINGSTON, D.H.
218	10045			10/26/1936	WDR	UG	NW	NE	33	16S	65E	0.25	STK		10/26/1936	0	CL	BLM
218	11492			1/30/1946	WDR	UG	W2	NE	31	15S	66E	0.3	QM		1/30/1946	0	CL	GIBBONS, J.P.
218	11717			11/12/1946	WDR	SPR	SE	NE	02	15S	66E	0.1	DOM		11/12/1946		CL	CAPLES, VERNON S.
218	12803			1/25/1949	DEN	UG	SE	SE	06	15S	66E	5	IRR		1/25/1949		CL	HIDDEN VALLEY RANCH
		CHANGED BY: 66930			WDR	UG												
218	1504			11/4/1909	CAN	STR	SW	SE	04	15S	66E	60	COM		11/4/1909	0	CL	JUDD, THOMAS
218	1530			11/22/1909	CAN	UG				13S	66E	0	IRC		11/22/1909	0	CL	DUNAWAY, T.F.
218	19979			7/7/1961	CAN	STR	NW	NW	09	15S	66E	0.414	DEC		7/7/1961	0	CL	TANNER, EVAN O.
218	20160			11/17/1961	ABR	SPR	NE	SE	08	15S	66E	0.414	IRR		11/17/1961	0	CL	NEVADA POWER CO.
		CHANGED BY: 21901			WDR	SPR												
218	21901			3/26/1964	WDR	SPR	SE	SE	08	15S	66E	0.414	PWR		3/26/1964		CL	NEVADA POWER CO.
218	22603		7337	5/19/1965	ABR	STR	SE	SE	08	15S	66E	0.414	IND		5/19/1965	0	CL	NEVADA POWER CO.
		CHANGED BY: 29764			CER	STR												
218	25355			11/18/1969	ABR	UG	NE	SW	25	14S	65E	1	IRR		11/18/1969	0	CL	LYTLE, JOHN
		CHANGED BY: 26371			CER	UG												
218	26240			8/2/1971	WDR	UG	NE	SW	25	14S	65E	0.075	IRR		8/2/1971	0	CL	LYTLE, JOHN
218	26371		9404	10/20/1971	CER	UG	NE	SW	25	14S	65E	0.37	IRR		11/18/1969	90	CL	MOAPA VALLEY WATER COMPANY
218	28161			2/28/1974	CAN	UG	SE	NW	02	15S	66E	0.5	MM		2/28/1974	0	CL	CX PRODUCTS CORP.

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('218')

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218	28413			6/12/1974	CAN	SPR	NE	SW	11	15S	65E	0.1	COM		6/12/1974	0	CL	BELL, SYLVIA
218	28635			8/26/1974	DEN	UG	SW	SW	25	14S	65E	4	IRR		8/26/1974	0	CL	PERKINS, ROBERT
218	31086			2/10/1977	CAN	UG	NE	NW	36	14S	65E	2.5	IRR		2/10/1977	1000	CL	MOAPA BAND OF PAIUTE INDIANS
218	31087			2/10/1977	CAN	UG	NE	NW	36	14S	65E	2.5	IRR		2/10/1977	0	CL	MOAPA BAND OF PAIUTE INDIANS
218	33028			8/4/1977	CAN	UG		SE	24	14S	65E	2.7	IRR		8/4/1977	0	CL	ROTH, MARILYN
218	33159			8/15/1977	DEN	UG	SW	SE	01	15S	65E	2	IRR		8/15/1977	0	CL	PERKINS, CAROLYN L.
218	33101			8/15/1977	DEN	UG	SW	SE	02	15S	65E	2	IRR		8/15/1977	0	CL	PERKINS, JOHN G.
218	33891			9/30/1977	CAN	UG		NE	13	15S	65E	2.7	IRC		9/30/1977	0	CL	ZUNIGA, GREGORIO
218	33925			10/3/1977	CAN	UG	NW	SW	13	15S	65E	2.7	IRC		10/3/1977	100	CL	CORTEZ, SANDRA LEE
218	33926			10/3/1977	CAN	UG		NE	14	15S	65E	2.7	IRC		10/3/1977	0	CL	HUGHES, ERWIN LEE
218	33927			10/3/1977	CAN	UG		NW	13	15S	65E	2.7	IRC		10/3/1977	0	CL	ZUNIGA, GREGORIO P.
218	34045			10/7/1977	CAN	UG	NW	SE	33	15S	66E	2.7	IRC		10/7/1977	0	CL	CHAMBERLAND, JAMES W.
218	34046			10/7/1977	CAN	UG	SW	NE	33	15S	65E	2.7	IRC		10/7/1977	0	CL	LOUVIERE, MYRNA
218	34288			10/18/1977	CAN	UG		NW	14	15S	65E	2.7	IRR		10/18/1977	0	CL	LOPEZ, MARGARET
218	34289			10/18/1977	CAN	UG		SW	14	15S	65E	2.7	IRR		10/18/1977	0	CL	LOPEZ, DANIEL JOE
218	34290			10/18/1977	CAN	UG		SE	15	15S	65E	2.7	IRR		10/18/1977	0	CL	WELLER, JOANN
218	34543			11/1/1977	CAN	UG		NW	30	14S	66E	2.7	IRC		11/1/1977	0	CL	LEE, GARY D.
218	34544			11/1/1977	CAN	UG		SW	30	14S	66E	2.7	IRC		11/1/1977	0	CL	LEE, SANDRA L.
218	35380			5/4/1978	CAN	UG		SW	07	15S	66E	2.7	IRR		5/4/1978		CL	MADRID, DANIEL MATTHEW
218	35848			7/20/1978	CAN	UG	SW	NW	02	15S	66E	0.17	IRR		7/20/1978	0	CL	ZACHARIAS, EDWARD M.
218	3694			11/11/1915	CAN	STR	SE	SW	04	15S	66E	60	PWR		11/11/1915	0	CL	LIVINGSTON, D.H.
218	37430			3/30/1979	CAN	UG			01	14S	65E	1	IRR		3/30/1979	0	CL	JOHNSON, MR. FREEMAN
218	38011			4/24/1979	DEN	UG	NW	SE	33	15S	65E	2.7	IRC		4/24/1979	100	CL	CHAMBERLAND, JAMES W.

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218	38012			4/24/1979	DEN	UG	SW	NE	33	15S	65E	2.7	IRC		4/24/1979	100	CL	LOUVIERE, MYRHA
218	39368			10/17/1979	CAN	UG			01	15S	65E	1	IRR		10/17/1979	0	CL	JOHNSON, FREEMAN W.
218	44716			10/29/1981	CAN	UG	NW	SE	31	17S	65E	0.005	STK		10/29/1981	0	CL	BLM
218	44736			10/29/1981	CAN	UG	NE	NE	25	18S	64E	0.005	STK		10/29/1981	0.675156	CL	BLM
218	45256			1/21/1982	WDR	UG			01	15S	65E	1	IRR		1/21/1982		CL	JOHNSON, FREEMAN
218	50558			2/2/1987	PER	UG	NE	SW	05	15S	66E	0.04	ENV		2/2/1987	28.970416	CL	NEVADA POWER COMPANY
218	50559		13823	2/2/1987	CER	UG	SE	SW	05	15S	66E	0.5	IND	Y	2/2/1987	361.976755	CL	NEVADA POWER COMPANY
218	50560			2/2/1987	PER	UG	NE	SW	05	15S	66E	0.04	ENV		2/2/1987	28.970416	CL	NEVADA POWER COMPANY
218	53091			4/4/1989	ABR	UG	NW	SW	25	14S	65E	0.2	IRR		4/4/1989	0	CL	WHEELER, ELMER
		CHANGED BY: 66319T			EXP	UG												
		CHANGED BY: 66320			ABR	UG												
218	54075			10/17/1989	ABR	UG	NE	SW	04	16S	66E	5	MUN		10/17/1989	0	CL	MOAPA BAND OF PAIUTE INDIANS
		CHANGED BY: 70257			PER	UG												
		CHANGED BY: 70258			PER	UG												
		CHANGED BY: 70259			PER	UG												
218	54076			10/17/1989	DEN	UG	NW	NW	16	15S	64E	10	MUN		10/17/1989	7239.7	CL	MOAPA BAND OF PAIUTE INDIANS
218	54202			11/30/1989	DEN	UG	NE	SE	29	14S	66E	3	IND		11/30/1989	0	CL	OXFORD ENERGY COMPANY
218	54634			4/6/1990	DEN	UG	SE	NW	07	15S	66E	3.5	PWR		4/6/1990	0	CL	NEVADA POWER COMPANY
218	54698			4/26/1990	DEN	UG	SW	NW	12	16S	65E	1	MM		4/26/1990	0	CL	AZTEC GLASS SAND CORPORATION
218	57441E			4/16/1992	PER	UG	SW	NE	02	16S	64E	0.045	ENV		4/16/1992	32.591718	CL	NEVADA-DEPARTMENT OF TRANSPORTATION
218	6012			3/9/1920	CAN	OSW	SW	SW	09	16S	66E	0.016	STK	Y	3/9/1920	0	CL	BUFFINGTON, C.F.
218	6013			3/9/1920	CAN	OSW	NE	NW	11	16S	65E	0.016	STK	Y	3/9/1920	0	CL	BUFFINGTON, C.F.
218	64037			4/17/1998	DEN	UG	NE	NE	33	17S	65E	10	OM		4/17/1998	0	CL	DRY LAKE WATER, LLC

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218	65197			6/14/1999	DEN	UG	SE	NW	31	18S	65E	0.5	COM		6/14/1999	0	CL	MOAPA BAND OF PAIUTES
218	65722			12/15/1999	DEN	UG	NE	NW	27	16S	65E	1	MM		12/15/1999	0	CL	STALLION SAND AND GRAVEL, LLC.
218	65944			1/28/2000	DEN	UG	SE	SE	15	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
218	65945			1/28/2000	DEN	UG	NE	NE	22	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
218	65946			1/28/2000	DEN	UG	SE	NE	15	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
218	65947			1/28/2000	DEN	UG	SE	NE	15	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
218	65948			1/28/2000	DEN	UG	NE	NE	15	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
218	65949			1/28/2000	DEN	UG	SE	NE	15	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
218	65954			1/28/2000	DEN	UG	SE	SW	34	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
218	65955			1/28/2000	DEN	UG	SE	SW	34	16S	64E	6	PWR		1/28/2000	3500	CL	MOAPA BAND OF PAIUTES
218	66319T			5/2/2000	EXP	UG	NE	SE	10	17S	55E	0.2	MM		4/4/1989	25	CL	WHEELER, ELMER
218	66320			5/2/2000	ABR	UG	NE	SE	10	17S	65E	0.2	MM		4/4/1989	0	CL	E. WHEELER & P. WHEELER FAMILY TRUST
		CHANGED BY: 75198			PER	UG												
218	66473			6/19/2000	DEN	UG	NE	NE	15	16S	64E	6	PWR		6/19/2000	0	CL	MOAPA BAND OF PAIUTES
218	66474			6/19/2000	DEN	UG	SW	SE	15	16S	64E	6	PWR		6/19/2000	0	CL	MOAPA BAND OF PAIUTES
218	66475			6/19/2000	DEN	UG	SE	NE	15	16S	64E	6	PWR		6/19/2000	0	CL	MOAPA BAND OF PAIUTES
218	66476			6/19/2000	DEN	UG	SW	NW	23	16S	64E	1	COM		6/19/2000	0	CL	MOAPA BAND OF PAIUTES
218	66930			11/8/2000	WDR	UG	NE	NW	04	19S	64E	5	QM		1/25/1949		CL	HIDDEN VALLEY RANCH
218	67890			8/8/2001	DEN	UG	NE	NE	04	19S	64E	10	QM		8/8/2001	7239.7	CL	DRY LAKE WATER, L.L.C.
218	69700T			3/3/2003	EXP	STR	NE	SE	08	15S	66E	0.2	STO		12/17/1981	6.1378	CL	NEVADA POWER COMPANY
218	70257			7/23/2003	PER	UG	SE	NE	15	16S	64E	5	MUN	Y	10/17/1989	2500	CL	MOAPA BAND OF PAIUTE INDIANS
218	70258			7/23/2003	PER	UG	NE	NE	15	16S	64E	5	MUN	Y	10/17/1989	2500	CL	MOAPA BAND OF PAIUTE INDIANS
218	70259			7/23/2003	PER	UG	NE	NE	15	16S	64E	5	MUN	Y	10/17/1989	2500	CL	MOAPA BAND OF PAIUTE INDIANS

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218	7109			8/21/1924	CAN	STR	SE	NW	02	15S	66E	0	MM	Y	8/21/1924		CL	WHITE STAR PLASTER COMPANY
218	75196			12/18/2006	PER	UG	NE	SW	25	14S	65E	0.2	MUN		4/4/1989	25	CL	COYOTE SPRINGS INVESTMENT LLC
218	75247			1/10/2007	WDR	STR	NE	NW	08	15S	66E	0	DEC		1/1/1900	0	CL	SOUTHERN NEVADA WATER AUTHORITY
218	76643			1/18/2008	PER	UG	SW	NW	23	16S	64E	5	MUN	Y	1/18/2008	2500	CL	MOAPA BAND OF PAIUTE INDIANS
218	78758T			7/23/2009	WDR	STR	NW	NW	06	15S	66E	6	IRR		7/23/2009	400	CL	MUDDY VALLEY IRRIGATION COMPANY
218	79690			3/15/2010	DEN	UG	SE	NW	07	15S	66E	3.5	IND		3/15/2010	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
218	79949			6/22/2010	WDR	STR	SW	SE	36	14S	65E	6	IRR		6/22/2010	1400	CL	MUDDY VALLEY IRRIGATION COMPANY
218	8430			1/8/1928	CAN	STR	SW	SE	26	14S	65E	0	IRR	Y	1/8/1928	0	CL	MUDDY VALLEY IRRIGATION CO
218	85009			3/27/2015	CAN	STR		LT19	06	15S	66E	0.4	COM		3/27/2015	0	CL	MOAPA BAND OF PAIUTE INDIANS
218	85037			4/3/2015	DEN	SPR	SE	SE	09	15S	66E	0.003	WLD		4/3/2015	2.2	CL	MOAPA VALLEY WATER DISTRICT
218	85038			4/3/2015	DEN	SPR	NE	SE	09	15S	66E	0.022	WLD		4/3/2015	16.1	CL	MOAPA VALLEY WATER DISTRICT
218	85043			4/3/2015	DEN	SPR	NW	NW	11	15S	66E	0.01	WLD		4/3/2015	7.3	CL	MOAPA VALLEY WATER DISTRICT
218	85529T			10/15/2015	EXP	STR	SE	SE	06	15S	66E	0.5	IRR		10/15/2015	300	CL	MUDDY VALLEY IRRIGATION COMPANY
218	85530T			10/15/2015	EXP	STR	SE	SE	06	15S	66E	0.35	IRR		10/15/2015	300	CL	MUDDY VALLEY IRRIGATION COMPANY
218	86738			12/27/2016	RFP	UG	SE	NE	15	16S	64E	2.312	IND		1/1/1900	340	CL	MOAPA BAND OF PAIUTE INDIANS
218	86739			12/27/2016	RFP	UG	SE	NE	15	16S	64E	1.2	IND		1/1/1900	180	CL	MOAPA BAND OF PAIUTE INDIANS
218	87143T			5/26/2017	EXP	STR	SE	SE	06	15S	66E	0.5	IRR			300	CL	MUDDY VALLEY IRRIGATION COMPANY
218	87144T			5/26/2017	EXP	STR	SE	SE	08	15S	66E	0.35	IRR		1/1/1900	300	CL	MUDDY VALLEY IRRIGATION COMPANY
218	87932T			5/14/2018	EXP	STR	SE	SE	08	15S	66E	0.35	IRR		1/1/1900	300	CL	MUDDY VALLEY IRRIGATION DISTRICT
218	87933T			5/14/2018	EXP	STR	SE	SE	08	15S	66E	0.5	IRR		1/1/1900	300	CL	MUDDY VALLEY IRRIGATION DISTRICT
218	87998			5/21/2018	RFP	SPR	NE	SE	09	15S	66E	0.022	WLD		5/21/2018	16	CL	U S.-BUREAU OF LAND MANAGEMENT
218	87999			5/21/2018	RFP	SPR	SE	SE	09	15S	66E	0.003	WLD		5/21/2018	2	CL	U S.-BUREAU OF LAND MANAGEMENT
218	88000			5/21/2018	RFP	SPR	NW	NW	11	15S	66E	0.01	WLD		5/21/2018	7	CL	U S.-BUREAU OF LAND MANAGEMENT

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218	8818			1/23/1929	DEN	STR	SW	SE	28	14S	65E	0	IRR	Y	1/23/1929	10000	CL	MUDDY VALLEY IRRIGATION COMPANY
218	88719T			3/4/2019	PER	STR	SE	SE	06	15S	66E	0.35	IRR		3/1/1905	300	CL	MUDDY VALLEY IRRIGATION COMPANY
218	88720T			3/4/2019	PER	STR	SE	SE	06	15S	66E	0.5	IRR		3/1/1905	300	CL	MUDDY VALLEY IRRIGATION COMPANY
218	949			5/1/1908	DEN	STR	SW	SE	28	14S	65E	25	IRR	Y	5/1/1908	0	CL	WILLIAM C. SHARP, LT., IN CHARGE
218	9571			1/30/1932	CAN	STR		SE	34	14S	65E	0	MM		1/30/1932	0	CL	SALTER, THOS. J.

Nevada Division of Water Resources

Hydrographic Abstracts

Hydrographic Abstract Report

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('219') | Run Date: 8/22/2019 9:04:44 AM

Basin	App	Prev App / Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
219	11960		4481	8/13/1947	ABR	UG	NW	NW	15	14S	65E	3.5	IRR		8/13/1947	0	CL	LDS
		CHANGED BY: 25862			ABR	UG												
		CHANGED BY: 25863			ABR	UG												
		CHANGED BY: 50723			CER	UG												
219	11961		4555	8/13/1947	ABR	UG	SW	NE	15	14S	65E	2.85	IRR		8/13/1947	0	CL	LDS
		CHANGED BY: 25058			CAN	UG												
		CHANGED BY: 25864			ABR	UG												
		CHANGED BY: 25887			ABR	UG												
219	12244		4016	2/4/1948	ABR	UG	NW	NW	23	14S	65E	0.72	IRR		2/4/1948	0	CL	BEHMER, B R.
		CHANGED BY: 45418			WDR	UG												
		CHANGED BY: 38871			CER	UG												
		CHANGED BY: 29290			CER	UG												
219	12458			5/20/1948	CAN	UG	NW	NW	23	14S	65E	1	IRR		5/20/1948	200	CL	PERKINS, DALE B.
219	12459		4017	4/20/1948	ABR	UG	SW	NE	23	14S	65E	0.79	IRR		4/20/1948	0	CL	PERKINS, LAWRENCE W.
		CHANGED BY: 27681			WDR	UG												
		CHANGED BY: 43160			ABR	UG												
219	12570		3911	8/14/1948	ABR	UG	NW	NE	08	14S	65E	1.34	IRR		8/14/1948	0	CL	LEWIS, CLARENCE A.
		CHANGED BY: 21263			WDR	UG												
		CHANGED BY: 22634			ABR	UG												

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219	12670		3738	10/7/1948	ABR	UG	NE	NE	22	14S	65E	1	IRR		10/7/1948	0	CL	PERKINS, G.M.
		CHANGED BY: 50851			CER	UG												
		CHANGED BY: 50275			CER	UG												
219	12774		3942	12/20/1948	ABR	UG	SW	NE	08	14S	65E	1.5	IRR		12/20/1948	0	CL	LEWIS, CLARVID A.
		CHANGED BY: 21264			WDR	UG												
		CHANGED BY: 22633			CER	UG												
219	13074		4121	10/4/1949	ABR	UG	SW	SW	09	14S	65E	0.92	IRR		10/4/1949	0	CL	LDS
		CHANGED BY: 50724			CER	UG												
219	13881			10/24/1951	CAN	UG	NW	SE	08	14S	65E	1.5	IRR		10/24/1951		CL	LEWIS, CLARVID A.
219	13882			10/24/1951	CAN	UG	NW	SE	08	14S	65E	1.5	IRR		10/24/1951		CL	LEWIS, LILLIAN C.
219	14344		4123	6/19/1952	ABR	UG	NW	SE	08	14S	65E	1.5	IRR		6/19/1952	0	CL	LEWIS, CLARENCE A.
		CHANGED BY: 21261			WDR	UG												
		CHANGED BY: 22636			CER	UG												
219	14345		4306	6/19/1952	ABR	UG	NW	SE	08	14S	65E	1.5	IRR		6/19/1952	0	CL	LEWIS, CLARVID A.
		CHANGED BY: 21265			WDR	UG												
		CHANGED BY: 22632			CER	UG												
219	14982			4/15/1953	CAN	UG	NE	SW	11	14S	65E	3	IRR		4/15/1953		CL	MILLS, LESTER
219	15151			6/22/1953	DEN	UG	SW	SW	11	14S	65E	1.6	IRR		6/22/1953		CL	ADAMS, LOUIS
219	1655			4/2/1910	DEN	STR			15	14S	65E	8	IRR		4/2/1910	0	CL	FITZGERALD, THOMAS H
219	16583			6/30/1955	CAN	UG	SE	NW	11	14S	65E	0	IRD		6/30/1955		CL	MILLS, LESTER
219	16603			7/11/1955	WDR	SPR	NW	NW	22	14S	65E	0.01	COM		7/11/1955		CL	COBURN, L.R.
219	17678			10/1/1958	WDR	SPR				14S	65E	0	MUN		10/1/1958		CL	MUDDY VALLEY IRRIGATION CO
219	17754		5563	12/18/1958	ABR	UG	SE	NE	08	14S	65E	1.2	IRR		12/18/1958	0	CL	LEWIS, CLARVID A.

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		CHANGED BY: 21262			WDR	UG												
		CHANGED BY: 22635			CER	UG												
219	18437		5683	11/20/1959	CER	UG	SE	SE	09	14S	65E	1	IRR		11/20/1959	20.15	CL	COYOTE SPRINGS INVESTMENT LLC
		CHANGED BY: 50934			CER	UG												
219	20124			10/11/1961	WDR	UG	SW	NE	23	14S	65E	2	IND		10/11/1961	30	CL	LANGFORD, F.H.
219	21261			5/13/1963	WDR	UG	NW	SE	08	14S	65E	1.5	PWR		6/19/1952	0	CL	LEWIS, LOIS ALLEN
219	21262			5/13/1963	WDR	UG	SE	NE	08	14S	65E	1.2	PWR		12/16/1958		CL	LEWIS, CLARVID ARTHUR
219	21263			5/13/1963	WDR	UG	NW	NE	08	14S	65E	1.34	PWR		8/14/1948	0	CL	LEWIS, CLARVID ARTHUR
219	21264			5/13/1963	WDR	UG	SW	NE	08	14S	65E	1.5	PWR		12/20/1948	0	CL	LEWIS, LOIS ALLEN
219	21265			5/13/1963	WDR	UG	NW	SE	08	14S	65E	1.5	PWR		6/19/1952	0	CL	LEWIS, CLARVID ARTHUR
219	21466		6293	8/15/1963	CER	UG	SE	SE	08	14S	65E	1	IRR		8/15/1963	183.2	CL	CASA DE WARM SPRINGS LLC
219	2162			7/31/1911	DEN	SPR				14S	65E	0.5	IRR		7/31/1911	0	CL	BURTNER, JAMES H.
219	22559		9606	4/28/1965	ABR	UG	NW	NW	23	14S	65E	0.117	IRR		4/28/1965	0	CL	LDS
		CHANGED BY: 26313			ABR	UG												
		CHANGED BY: 50730			CER	UG												
		CHANGED BY: 25733			ABR	UG												
219	22632		7164	6/14/1965	CER	UG	NW	SE	08	14S	65E	1.5	IND	Y	6/19/1952	315	CL	NEVADA POWER COMPANY
219	22633		7165	6/14/1965	CER	UG	SW	NE	08	14S	65E	1.5	IND	Y	12/20/1948	297.5	CL	NEVADA POWER COMPANY
219	22634			6/14/1965	ABR	UG	NW	NE	08	14S	65E	1.34	IND		8/14/1948	0	CL	LEWIS, CLARENCE A.
		CHANGED BY: 24186			CER	UG												
219	22635		7166	6/14/1965	CER	UG	SE	NE	08	14S	65E	1.2	IND	Y	12/16/1958	25	CL	NEVADA POWER COMPANY
		CHANGED BY: 49842			WDR	UG												
219	22636		7167	6/14/1965	CER	UG	NW	SE	08	14S	65E	1.5	IND	Y	6/19/1952	260	CL	NEVADA POWER COMPANY

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219	22738		8331	8/25/1965	CER	UG	NE	NE	22	14S	65E	0.25	COM		8/25/1965	18.81	CL	DAVIS, DON J. & MARSHA L.
		CHANGED BY: 27216			CER	UG												
219	22739		10060	8/25/1965	CER	SPR	NW	SE	16	14S	65E	1	MUN			723.8000 65	CL	MOAPA VALLEY WATER DISTRICT
		CHANGED BY: 28659			CAN	STR												
219	22861			11/24/1965	CAN	UG	NE	SW	14	14S	65E	2	IRR		11/24/1965		CL	ABBOTT, S.E.
219	22948			2/2/1966	ABR	UG	NW	NE	08	14S	65E	2.945	IND		2/2/1966	0	CL	LEWIS, CLARENCE A.
		CHANGED BY: 24185			CER	UG												
219	22949		7168	2/2/1966	CER	UG	SE	NE	08	14S	65E	2.945	IND	Y	2/2/1966	433	CL	LEWIS, CLARENCE A. AND/OR CLARVID ARTHUR
		CHANGED BY: 49844			WDR	UG												
		CHANGED BY: 86738			RFP	UG												
219	22950		7169	2/2/1966	CER	UG	SW	NE	08	14S	65E	2.945	IND	Y	2/2/1966	433	CL	NEVADA POWER COMPANY
219	22951		7170	2/2/1966	CER	UG	NW	SE	08	14S	65E	2.945	IND	Y	2/2/1966	433	CL	NEVADA POWER COMPANY
219	22952		7171	2/2/1966	CER	UG	NW	SE	08	14S	65E	2.945	IND	Y	2/2/1966	433	CL	NEVADA POWER COMPANY
219	23600		7316	1/11/1967	CER	STR	SE	SE	15	14S	65E	7	IND		1/1/1905	2000	CL	MUDDY VALLEY IRRIGATION COMPANY
219	24185		7172	10/20/1967	CER	UG	NW	NE	08	14S	65E	2.945	IND	Y	2/2/1966	433	CL	NEVADA POWER COMPANY
219	24186		7173	10/20/1967	CER	UG	NW	NE	08	14S	65E	1.34	IND	Y	8/14/1948	310	CL	NEVADA POWER COMPANY
219	25058			5/7/1969	CAN	UG	SW	SW	09	14S	65E	2.85	IRR		8/13/1047	1000	CL	WEBB, R.W.
219	25173			7/28/1969	DEN	SPR	SW	SE	16	14S	65E	0.33	IRR		7/28/1969	100	CL	APCAR, FREDERIC
219	25174			7/28/1969	DEN	SPR	SW	SE	16	14S	65E	0.25	IRR		7/28/1969	75	CL	APCAR, FREDERIC
219	25310		7844	10/9/1969	CER	UG	SE	NE	08	14S	65E	1.2	IND	Y	10/9/1969	180	CL	MOAPA BAND OF PAIUTE INDIANS
		CHANGED BY: 49843			WDR	UG												
		CHANGED BY: 86739			RFP	UG												
219	25375			12/3/1969	DEN	SPR	NW	SE	16	14S	65E	4	MUN		12/3/1969		CL	OVERTON WATER DISTRICT

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219	25495			3/12/1970	CAN	UG	SW	NE	23	14S	65E	2.4	IRR		3/12/1970	600	CL	PERKINS, LAWRENCE W.
		CHANGED BY: 30091			DEN	UG												
219	25697		10660	7/7/1970	ABR	UG	NE	NE	22	14S	65E	1.23	IRR		7/7/1970	0	CL	PERKINS, G.M.
		CHANGED BY: 50272			CER	UG												
219	25698		10661	7/7/1970	ABR	UG	NE	NE	22	14S	65E	0.67	IRR		7/7/1970	0	CL	PERKINS, G.M.
		CHANGED BY: 29328			ABR	UG												
		CHANGED BY: 50273			CER	UG												
219	25699			7/7/1970	ABR	UG	SE	SW	14	14S	65E	2.5	IRR		7/7/1970	0	CL	ABBOTT, STOWELL E.
		CHANGED BY: 29297			ABR	UG												
		CHANGED BY: 29298			CER	UG												
219	25700			7/7/1970	ABR	UG	SE	SE	14	14S	65E	0	IRR		7/7/1970	0	CL	ABBOTT, STOWELL E.
		CHANGED BY: 28522			CAN	UG												
219	25701			7/7/1970	ABR	UG	SE	SE	14	14S	65E	2.5	IRR		7/7/1970	0	CL	ABBOTT, STOWELL E.
		CHANGED BY: 28523			CAN	UG												
219	25731			7/29/1970	WDR	UG	SE	SE	09	14S	65E	1.6	IRR		7/29/1970	375	CL	WEBB, R.W.
219	25732			7/29/1970	WDR	UG	NE	NE	16	14S	65E	3	IRR		7/29/1970		CL	WEBB, R.W.
219	25733			7/29/1970	ABR	UG	NW	NW	23	14S	65E	0.581	IRR		7/29/1970	0	CL	LDS
		CHANGED BY: 26315			ABR	UG												
		CHANGED BY: 26314			ABR	UG												
219	25734			7/29/1970	WDR	UG	NW	NW	23	14S	65E	1.7	IRR		7/29/1970		CL	WEBB, R.W.
219	25860			11/12/1970	ABR	SPR	SW	SW	09	14S	65E	0.829	IRR			0	CL	LDS
		CHANGED BY: 26316			CER	STR												
219	25861		10944	11/12/1970	CER	SPR			16	14S	65E	1.62	IRR		11/12/1970	0	CL	MOAPA VALLEY WATER DISTRICT-LEASEE

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		CHANGED BY: 26317			CER	SPR												
		CHANGED BY: 26318			CER	STR												
219	25862		10945	11/12/1970	ABR	UG	NW	NW	15	14S	65E	2.16	IRR		8/13/1947	0	CL	LDS
		CHANGED BY: 26319			ABR	UG												
		CHANGED BY: 50731			CER	UG												
219	25863			11/12/1970	ABR	UG	NW	NW	23	14S	65E	0.44	IRR		8/13/1947	0	CL	LDS
		CHANGED BY: 26320			ABR	UG												
219	25864		10946	11/12/1970	ABR	UG	NE	NE	16	14S	65E	2.51	IRR		8/13/1947	0	CL	LDS
		CHANGED BY: 50732			CER	UG												
219	25887		10947	12/10/1970	ABR	UG	NE	NE	16	14S	65E	0.2	IRR		8/13/1947	0	CL	LDS
		CHANGED BY: 50733			CER	UG												
219	26313		10948	9/15/1971	ABR	UG	SW	SW	09	14S	65E	0.302	IRR		4/26/1965	0	CL	LDS
		CHANGED BY: 50725			CER	UG												
219	26314		10949	9/15/1971	ABR	UG	SW	SW	09	14S	65E	0.302	IRR		7/29/1970	0	CL	LDS
		CHANGED BY: 50726			CER	UG												
219	26315		10950	9/15/1971	ABR	UG	NW	NW	23	14S	65E	0.271	IRR		7/29/1970	0	CL	LDS
		CHANGED BY: 50727			CER	UG												
219	26316		10951	9/15/1971	CER	STR	SE	SE	15	14S	65E	0.829	IRR			0	CL	MOAPA VALLEY WATER DISTRICT
219	26317		10952	9/15/1971	CER	SPR	NW	SE	16	14S	65E	0.057	IRR			18.02	CL	MOAPA VALLEY WATER DISTRICT
219	26318		10953	9/15/1971	CER	STR	SW	NW	16	14S	65E	0.536	IRR		11/12/1970	0	CL	MOAPA VALLEY WATER DISTRICT
219	26319		10954	9/15/1971	ABR	UG	SW	SW	09	14S	65E	0.58	IRR		8/13/1947	0	CL	LDS
		CHANGED BY: 50728			CER	UG												
219	26320		10955	9/15/1971	ABR	UG	SW	SW	09	14S	65E	0.44	IRR		8/13/1947	0	CL	LDS

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		CHANGED BY: 50729			CER	UG												
219	27216		12758	1/2/1973	CER	UG	NW	SE	16	14S	65E	0.25	COM		8/25/1965	1.381005	CL	UNITED STATES OF AMERICA
219	27648			7/23/1973	CAN	UG	NW	SW	09	14S	65E	0.1	COM		7/23/1973	72.39535 1	CL	J. FLECK REALTY
219	27661			7/27/1973	WDR	UG	SW	NE	23	14S	65E	0.79	IRR		4/20/1948	175.5	CL	PERKINS, LAWRENCE W.
219	27662			7/27/1973	ABR	UG	SW	NE	23	14S	65E	0.1	IRR		7/27/1973		CL	LEAVITT, J.D.
		CHANGED BY: 28789			WDR	UG												
		CHANGED BY: 29473			CAN	UG												
219	28522			7/15/1974	CAN	UG	SW	SE	14	14S	65E	0	IRR		7/7/1970	0	CL	ABBOTT, STOWELL E.
219	28523			7/15/1974	CAN	UG	NE	SW	14	14S	65E	2.5	IRR		7/7/1970	650	CL	ABBOTT, STOWELL E.
219	28659			9/10/1974	CAN	STR	NW	SE	18	14S	65E	1	MUN			723.6	CL	MOAPA VALLEY WATER CO.
219	28789			10/9/1974	WDR	UG	SW	NE	23	14S	65E	0.1	IRR		7/27/1973		CL	LEAVITT, J.D.
219	28791		13445	10/11/1974	CER	SPR	SE	NW	16	14S	65E	3	MUN		1/1/1905	2132.050 897	CL	MUDDY VALLEY IRRIGATION CO.
		CHANGED BY: 52351			CAN	STR												
219	29150			1/18/1975	CAN	UG	SW	NE	23	14S	65E	2.4	IRR		6/27/1975	800	CL	PERKINS, LAWRENCE W.
219	29295		9609	3/25/1975	CER	OSW	SE	SE	15	14S	65E	1.357	IND			811.3	CL	SOUTHERN NEVADA WATER AUTHORITY
219	29296		9691	3/25/1975	CER	UG	NW	NW	23	14S	65E	0.576	IND	Y	2/4/1948	300	CL	NEVADA POWER COMPANY
219	29297		9745	3/25/1975	ABR	UG	SE	SW	14	14S	65E	0.4455	IND		7/7/1970	0	CL	NEVADA POWER COMPANY
		CHANGED BY: 52587			ABR	UG												
219	29298		9750	3/25/1975	CER	UG	NW	NW	23	14S	65E	0.452	IND	Y	7/7/1970	327.5	CL	NEVADA POWER COMPANY
219	29328		10667	4/3/1975	ABR	UG	NE	NE	22	14S	65E	1	IRR		7/7/1970	0	CL	PERKINS, G.M.
		CHANGED BY: 50274			ABR	UG												
219	29473			6/27/1975	CAN	UG	SW	NE	23	14S	65E	0.1	IRR		7/27/1973		CL	LEAVITT, J.D.
219	29764		9661	11/13/1975	CER	STR	SE	SE	15	14S	65E	0.4143	IND		5/19/1965	247.6	CL	NEVADA POWER CO.

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		CHANGED BY: 69700T			EXP	STR												
219	30991			1/12/1977	DEN	UG	SE	SE	08	14S	65E	2.4	IRR		3/12/1970		CL	LEWIS, CLARVID ARTHUR
219	3340			4/9/1915	DEN	STR	SW	SW	07	14S	65E	0	IRR	Y	4/9/1915	0	CL	WOODRUFF, SIDNEY H.
219	33660			9/19/1977	DEN	UG	NW	NW	27	14S	65E	1.5	IRC		9/19/1977	1000	CL	PERKINS, G.M.
219	33661			9/19/1977	DEN	UG	NE	NE	27	14S	65E	1.5	IRC		9/19/1977	1000	CL	PERKINS, G.M.
219	33778			9/23/1977	CAN	UG		SW	03	14S	65E	2.7	IRR		9/23/1977	100	CL	WILLIAMS, RICHARD E.
219	33779			9/23/1977	CAN	UG		NW	14	14S	65E	2.7	IRR		9/23/1977	100	CL	KONYS, MARY
219	33780			9/23/1977	DEN	UG	SW	SE	22	14S	65E	2.7	IRR		9/23/1977	100	CL	GALUS, PAUL JOHN
219	33781			9/23/1977	DEN	UG	NW	NE	14	14S	65E	2.7	IRR		9/23/1977	100	CL	KONYS, JOANNA
219	33782			9/23/1977	DEN	UG	SE	SE	10	14S	65E	2.7	IRR		9/23/1977	100	CL	KONYS, STEPHEN J.
219	33783			9/23/1977	CAN	UG	NW	SW	10	14S	65E	2.7	IRR		9/23/1977	100	CL	BRADLEY, PHILIP A.
219	33795			9/26/1977	CAN	UG		NW	16	14S	65E	0	IRR		9/26/1977	0	CL	COPPER COUNTRY EXPLORATIONS INC.
219	33859			9/28/1977	CAN	UG		NW	12	14S	65E	2.7	IRR		9/28/1977	100	CL	UNGARO, BRENDA KAYE
219	33860			9/28/1977	CAN	UG		SW	12	14S	65E	2.7	IRR		9/28/1977	100	CL	GALE, WILLIAM
219	33862			9/28/1977	DEN	UG	SE	SE	17	14S	65E	2.7	IRR		9/28/1977	100	CL	CLEMENTS, JOAN M.
219	33863			9/28/1977	DEN	UG	SW	SE	11	14S	65E	2.7	IRR		9/28/1977	100	CL	CORTEZ, JOHNNY M. III
219	33864			9/28/1977	DEN	UG	SE	SW	11	14S	65E	2.7	IRR		9/28/1977	800	CL	GALUS, FRANCES C.
219	33890			9/30/1977	DEN	UG	SW	SE	03	14S	65E	0	IRR		9/30/1977	0	CL	BEELER, LYNDSEY D.
219	34013			10/5/1977	CAN	UG		NE	03	14S	65E	2.7	IRR		10/5/1977	750	CL	WHITNEY, RAYMOND C., SR.
219	34291			10/18/1977	CAN	UG		SE	07	14S	65E	2.7	IRC		10/18/1977		CL	LAMB, ROZELLA
219	36091			10/24/1978	DEN	UG	SE	NW	04	14S	65E	2.7	IRR		10/24/1978		CL	KATHY ANNE KOSTAL
219	36092			10/24/1978	DEN	UG	SW	NE	04	14S	65E	2.7	IRR		10/24/1978		CL	ARTHUR KOSTAL
219	37381			3/30/1979	DEN	UG	SE	SW	03	14S	65E	5.4	IRD		3/30/1979	0	CL	EARL, DIANE

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219	37382			3/30/1979	DEN	UG	SE	SW	02	14S	65E	5	IRD		3/30/1979	0	CL	EARL, GARY
219	37518			4/2/1979	CAN	UG	NW	SE	04	14S	65E	0	IRR		4/2/1979	0	CL	PEEK, KATHERINE J.
219	37519			4/2/1979	CAN	UG	NE	NW	09	14S	65E	0	IRR		4/2/1979	0	CL	PEEK, KATHERINE J.
219	37520			4/2/1979	CAN	UG	NE	NW	04	14S	65E	0	IRR		4/2/1979	0	CL	PEEK, FLOYD J.
219	37521			4/2/1979	CAN	UG	NW	NW	04	14S	65E	0	IRR		4/2/1979	0	CL	PEEK, FLOYD J.
219	38871		10166	6/28/1979	CER	UG	NW	NW	23	14S	65E	0.144	IRR		2/4/1948	75	CL	EGTEDAR, ASCAR
219	42100		10920	6/18/1980	CER	SPR	NE	NE	21	14S	65E	0.003	DOM		6/18/1980	2.025474	CL	UNITED STATES OF AMERICA
219	43160		10168	1/29/1981	ABR	UG	SW	NE	23	14S	65E	0.79	IRR		4/20/1948	0	CL	WHITMORE, DAN OR LATRICE
		CHANGED BY: 59254			ABR	UG												
		CHANGED BY: 59255			ABR	UG												
		CHANGED BY: 59257			CER	UG												
		CHANGED BY: 59256			CER	UG												
		CHANGED BY: 59253			CER	UG												
219	4471			6/16/1917	DEN	STR	NE	SW	15	14S	65E	7	IRR		6/16/1917	0	CL	BALDWIN, GEORGE C.
219	45418			3/4/1982	WDR	UG	NW	NW	23	14S	65E	0	IRR		2/4/1948	0	CL	EGTEDAR, ASCAR
219	46168			9/24/1982	WDR	UG	NW	SE	16	14S	65E	0.37	MUN		11/18/1969	0	CL	MOAPA VALLEY WATER COMPANY
219	46932			5/19/1983	PER	UG	NE	NE	35	13S	64E	2	MUN	Y	5/19/1983	1000.15451	CL	MOAPA VALLEY WATER DISTRICT
		CHANGED BY: 58062T			WDR	UG												
		CHANGED BY: 63496T			EXP	UG												
		CHANGED BY: 64724T			EXP	UG												
219	4754			12/3/1917	DEN	STR	NW	NE	16	14S	65E	1	IRR	Y		0	CL	MOAPA & SALT LAKE PRODUCE COMPANY
219	49825			4/14/1986	ABR	UG	NE	SE	06	14S	65E	2	MUN		4/14/1986	0	CL	MOAPA VALLEY WATER DISTRICT
		CHANGED BY: 52520			CER	UG												

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219	49842			4/21/1986	WDR	UG	SW	NE	06	14S	65E	1.2	IND		12/16/1958	24.91946 7969311	CL	NEVADA POWER COMPANY
219	49843			4/21/1986	WDR	UG	SW	NE	06	14S	65E	1.2	IND		10/9/1969	159.5628	CL	NEVADA POWER COMPANY
219	49844			4/21/1986	WDR	UG	SW	NE	08	14S	65E	2.945	IND		2/2/1966	431.8556 08	CL	NEVADA POWER COMPANY
219	50272		13507	10/13/1986	CER	UG	NE	NE	22	14S	65E	0.23	IND	Y	7/7/1970	09.51	CL	NEVADA POWER COMPANY
219	50273		13508	10/13/1986	CER	UG	NE	NE	22	14S	65E	0.67	IND	Y	7/7/1970	289.91	CL	NEVADA POWER COMPANY
219	50274		13509	10/13/1986	ABR	UG	NE	NE	22	14S	65E	1	IND		7/7/1970	0	CL	NEVADA POWER COMPANY
		CHANGED BY: 79069T			EXP	UG												
		CHANGED BY: 79068			CER	UG												
219	50275		13510	10/13/1986	CER	UG	NE	NE	22	14S	65E	0.52	IND	Y	10/7/1948	32.88	CL	NEVADA POWER COMPANY
219	50723		13381	3/24/1987	CER	UG	NW	NW	15	14S	65E	0.32	IND	Y	8/13/1947	88	CL	LDS
219	50724		13382	3/24/1987	CER	UG	SW	SW	09	14S	65E	0.92	IND	Y	10/4/1949	182.55	CL	LDS
219	50725		13383	3/24/1987	CER	UG	SW	SW	09	14S	65E	0.302	IND	Y	4/28/1965	65	CL	LDS
219	50726		13384	3/24/1987	CER	UG	SW	SW	09	14S	65E	0.302	IND	Y	4/28/1965	65	CL	LDS
219	50727		13385	3/24/1987	CER	UG	SW	SW	09	14S	65E	0.271	IND	Y	4/28/1965	60	CL	LDS
219	50728		13386	3/24/1987	CER	UG	SW	SW	09	14S	65E	0.58	IND	Y	8/13/1947	158	CL	LDS
219	50729		13387	3/24/1987	CER	UG	SW	SW	09	14S	65E	0.44	IND	Y	8/13/1947	120	CL	LDS
219	50730		13388	3/24/1987	CER	UG	SW	SW	09	14S	65E	0.117	IND	Y	4/28/1965	25	CL	LDS
219	50731		13389	3/24/1987	CER	UG	NW	NW	15	14S	65E	2.16	IND	Y	8/13/1947	588	CL	LDS
219	50732		13390	3/24/1987	CER	UG	NE	NE	16	14S	65E	2.33	IND	Y	8/13/1947	930	CL	LDS
219	50733		13391	3/24/1987	CER	UG	NE	NE	16	14S	65E	0.18	IND	Y	8/13/1947	70	CL	LDS
219	50734		13651	3/24/1987	CER	STR	SE	SE	15	14S	65E	3.5	IND		1/1/1905	1000	CL	NEVADA POWER COMPANY (LESSEE)
219	50851		14294	4/23/1987	CER	UG	NW	NW	23	14S	65E	0.48	IRR	Y	10/7/1948	30	CL	CLARK COUNTY
		CHANGED BY: 58428			WDR	UG												

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		CHANGED BY: 64840			CER	UG												
219	50934		13581	5/14/1987	CER	UG	NE	NE	22	14S	65E	0.733	IND	Y	11/20/1959	55.4	CL	NEVADA POWER COMPANY
219	52351			7/29/1988	CAN	STR	SW	NW	16	14S	65E	3	MUN			2171.400 195	CL	MUDDY VALLEY IRRIGATION COMPANY
219	52520		21072	9/19/1988	CER	UG	SE	NE	07	14S	65E	2	MUN	Y	4/14/1986	1447.937 709	CL	MOAPA VALLEY WATER DISTRICT
219	52587			10/4/1988	ABR	UG	NW	NW	23	14S	65E	0.0005	IND		7/7/1970	0	CL	NEVADA POWER COMPANY
		CHANGED BY: 72186			CAN	UG												
		CHANGED BY: 75404			ABR	UG												
219	55450			11/9/1990	PER	UG	SE	NE	07	14S	65E	3	MUN	Y	11/9/1990	2171.906 5635	CL	MOAPA VALLEY WATER DISTRICT
219	56059			3/25/1991	DEN	UG	NE	NE	35	13S	64E	3	IND		3/25/1991	0	CL	OXFORD ENERGY OF NEVADA INC.
219	56428			6/11/1991	WDR	UG	NW	NW	23	14S	65E	0.19	IRR		10/7/1948	19.98	CL	PERKINS, G.M.
219	56668		15097	8/15/1991	CER	SPR	SE	SE	18	14S	65E	3.5	WLD		8/15/1991	2533.960 041	CL	USFWS
219	58269			10/27/1992	PER	UG	SE	NE	07	14S	65E	5	MUN	Y	10/27/1992	1085.94	CL	MOAPA VALLEY WATER DISTRICT
		CHANGED BY: 66043			PER	UG												
219	58787			4/23/1993	WDR	UG	NE	SE	07	14S	65E	6	PWR		4/23/1993	0	CL	MOAPA VALLEY WATER DISTRICT
219	59062T			7/27/1993	WDR	UG	SE	NE	07	14S	65E	1	MUN		5/19/1983	0	CL	MOAPA VALLEY WATER DISTRICT
219	59253		15460	9/20/1993	CER	UG	SW	NE	23	14S	65E	0.1975	IRR		5/20/1948	43.675	CL	LEAVITT, UTE
219	59254			9/20/1993	ABR	UG	SW	NE	23	14S	65E	0.198	IRR		4/20/1948	0	CL	HENRY, SUZIE
		CHANGED BY: 63505			ABR	UG												
		CHANGED BY: 63504			CER	UG												
219	59255			9/20/1993	ABR	UG	SW	NE	23	14S	65E	0.198	IRR		4/20/1948	0	CL	ROBINSON, MARLEY
		CHANGED BY: 63535			ABR	UG												
219	59256		15104	9/20/1993	CER	UG	SW	NE	23	14S	65E	0.12998	IRR		5/20/1948	28.875	CL	WHITMORE, DAN
219	59257		15105	9/20/1993	CER	UG	SW	NE	23	14S	65E	0.06752	IRR		5/20/1948	15	CL	BRUNDY, LARRY

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219	59369			11/5/1993	DEN	UG	NE	NE	33	13SH	64E	10	MUN		11/5/1993	0	CL	MOAPA VALLEY WATER DISTRICT
219	61052			3/20/1995	WDR	UG	SE	SW	09	14S	65E	1620	COM		3/20/1995		CL	S AND R, INC.
219	61427			7/26/1995	PER	UG	SE	SW	09	14S	65E	0.007	COM		7/26/1995	1.350316	CL	S & R, INC.
219	6109			6/14/1920	DEN	STR	NW	NE	16	14S	65E	1	IRR	Y	6/14/1920	0	CL	MOAPA & SALT LAKE PRODUCE CO.
219	63496T			10/10/1997	EXP	UG	SE	NE	07	14S	65E	2	MUN		5/19/1983	1000.154 51	CL	MOAPA VALLEY WATER DISTRICT
219	63504		15771	10/14/1997	CER	UG	SW	NE	23	14S	65E	0.0675	IRR		5/20/1948	15	CL	KOLHOSS, KELLY
219	63505		15772	10/14/1997	ABR	UG	SW	NE	23	14S	65E	0.13	IRR		4/20/1948	0	CL	DAVIS, VENNA LEAVITT
		CHANGED BY: 71763			CAN	UG												
		CHANGED BY: 70520			ABR	UG												
		CHANGED BY: 82096			PER	UG												
		CHANGED BY: 71026			CER	UG												
		CHANGED BY: 77381			PER	UG												
219	63535		15773	10/28/1997	ABR	UG	SW	NE	23	14S	65E	0.1975	IRR		4/20/1948	0	CL	DAVIS, VENNA LEAVITT
		CHANGED BY: 71768			CAN	UG												
		CHANGED BY: 82097			PER	UG												
		CHANGED BY: 71344			CER	UG												
		CHANGED BY: 70519			ABR	UG												
		CHANGED BY: 77382			PER	UG												
219	6419		6795	3/9/1921	CER	STR	NW	NW	15	14S	65E	0.2	IRR			0	CL	MOAPA VALLEY WATER DISTRICT
219	64724T			12/29/1998	EXP	UG	SE	NE	07	14S	65E	2	MUN		5/19/1983	1000.154 51	CL	MOAPA VALLEY WATER DISTRICT
219	64840		16450	2/8/1999	CER	UG	NW	NW	23	14S	65E	0.192	IRR	Y	10/7/1948	19.8	CL	CLARK COUNTY
219	66043			2/3/2000	PER	UG	SE	NE	07	14S	65E	3.5	MUN	Y	10/27/1992	2533.9	CL	MOAPA VALLEY WATER DISTRICT
219	68079			10/9/2001	WDR	UG	NW	NW	06	14S	65E	15	PWR		10/9/2001	0	CL	SILVER STATE WATER CO., LLC

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219	70510			10/20/2003	ABR	UG	NE	NE	22	14S	65E	0.0958	IRR		4/20/1948	0	CL	DAVIS, VENNA LEAVITT
		CHANGED BY: 71223T			EXP	UG												
		CHANGED BY: 71766			CER	UG												
219	70520			10/20/2003	ABR	UG	NE	NE	22	14S	65E	0.0631	IRR		4/20/1948	0	CL	3335HILLSIDE, LLC
		CHANGED BY: 86209			PER	UG												
219	71026		16914	4/9/2004	CER	UG	SE	SE	09	14S	65E	0.018	IRR	Y	5/20/1948	3.993	CL	PARSON, BILLY & LINDA
219	71223T			5/14/2004	EXP	UG	NE	NE	22	14S	65E	0.0958	IRR		4/20/1948	21.29	CL	DAVIS, VENNA LEAVITT
219	71344		16915	8/18/2004	CER	UG	SE	SE	09	14S	65E	0.0273	IRR	Y	5/20/1948	6.067	CL	PARSON, BILLY & LINDA
219	71766		21130	10/14/2004	CER	UG	NE	NE	22	14S	65E	0.0958	IRR	Y	7/21/2011	21.289	CL	3335HILLSIDE, LLC
219	71768			10/14/2004	CAN	UG	NE	NE	22	14S	65E	0.019	IRR		4/20/1948	4.22	CL	DAVIS, VENNA LEAVITT
219	71769			10/14/2004	CAN	UG	NE	NE	22	14S	65E	0.013	IRR		4/20/1948	2.78	CL	DAVIS, VENNA LEAVITT
219	72189			2/2/2005	CAN	UG	SE	SW	14	14S	65E	0.4454	IND		7/7/1970	322.5	CL	NEVADA POWER COMPANY
219	73482			11/14/2005	ABR	STR	SW	SE	26	14S	65E	3.98	IRR		1/1/1905	0	CL	MUDDY VALLEY IRRIGATION COMPANY
		CHANGED BY: 85530T			EXP	STR												
		CHANGED BY: 87144T			EXP	STR												
		CHANGED BY: 88719T			PER	STR												
		CHANGED BY: 87932T			EXP	STR												
219	73483			11/14/2005	ABR	STR	SW	SE	26	14S	65E	7.948	IRR		1/1/1905	0	CL	MUDDY VALLEY IRRIGATION COMPANY
		CHANGED BY: 78756T			WDR	STR												
		CHANGED BY: 79949			WDR	STR												
		CHANGED BY: 85009			CAN	STR												
		CHANGED BY: 85529T			EXP	STR												
		CHANGED BY: 87143T			EXP	STR												

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		CHANGED BY: 67933T			EXP	STR												
		CHANGED BY: 88720T			PER	STR												
219	73695			1/12/2006	PER	STR	SW	SE	26	14S	65E	3.552	IRR		1/1/1905	0	CL	MUDDY VALLEY IRRIGATION COMPANY
219	75181E			12/6/2006	PER	UG	NW	NW	23	14S	65E	1.266	ENV	Y	12/6/2006	905.81	CL	NEVADA POWER COMPANY
219	75404			3/2/2007	ABR	UG	SE	SW	14	14S	65E	0.445	IND		7/7/1970	0	CL	NEVADA POWER COMPANY
		CHANGED BY: 79067			ABR	UG												
219	77381			9/12/2008	PER	UG	NE	SW	09	14S	65E	0.027	COM	Y	4/20/1948	8.069	CL	WILLIAM O'DONNELL
219	77382			9/12/2008	PER	UG	NE	SW	09	14S	65E	0.042	COM	Y	4/20/1948	9.221	CL	WILLIAM O'DONNELL
219	77575			11/6/2008	RFP	SPR	NE	NE	21	14S	65E	3	WLD		11/6/2008	0	CL	U.S.-FISH AND WILDLIFE SERVICE
219	77599			11/17/2008	RFP	SPR	NW	SE	16	14S	65E	3	WLD		11/17/2008	0	CL	U.S.-FISH AND WILDLIFE SERVICE
219	79067			12/2/2009	ABR	UG	SE	SW	14	14S	65E	0.445	IND		7/7/1970	0	CL	NEVADA POWER COMPANY
		CHANGED BY: 80167			WDR	UG												
		CHANGED BY: 85158			PER	UG												
219	79068		20183	12/2/2009	CER	UG	NE	NE	22	14S	65E	1	IND	Y	7/7/1970	432.7	CL	NEVADA POWER COMPANY
219	79068T			12/2/2009	EXP	UG	NE	NE	22	14S	65E	1	IND		7/7/1970	432.7	CL	NEVADA POWER COMPANY DBA
219	79629			2/22/2010	WDR	UG	NE	NE	33	13SH	64E	10	MUN		2/22/2010	7240	CL	MOAPA VALLEY WATER DISTRICT
219	80167			9/22/2010	WDR	UG	SE	NE	08	14S	65E	0.445	IND		7/7/1970	322.17	CL	NEVADA POWER COMPANY DBA NV ENERGY
219	80212			10/18/2010	WDR	UG	NW	SE	08	14S	65E	0.445	IND		7/7/1970	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
219	80213			10/18/2010	WDR	UG	NW	SE	08	14S	65E	0.445	IND		7/7/1970	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
219	80214			10/18/2010	WDR	UG	SW	NE	08	14S	65E	0.445	IND		7/7/1970	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
219	80215			10/18/2010	WDR	UG	NW	NE	08	14S	65E	0.445	IND		7/7/1970	0	CL	NEVADA POWER COMPANY DBA NV ENERGY
219	80843			5/9/2011	PER	UG	SE	NE	08	14S	65E	0.445	IND	Y	5/9/2011	322.17	CL	NEVADA POWER COMPANY
219	80844			5/9/2011	PER	UG	SW	NE	08	14S	65E	0.445	IND	Y	5/9/2011	322.17	CL	NEVADA POWER COMPANY

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219	80845			5/9/2011	PER	UG	NW	NE	08	14S	65E	0.445	IND	Y	5/9/2011	322.17	CL	NEVADA POWER COMPANY
219	80846			5/9/2011	PER	UG	NW	SE	08	14S	65E	0.445	IND	Y	5/9/2011	322.17	CL	NEVADA POWER COMPANY
219	80847			5/9/2011	WDR	UG	NW	SE	08	14S	65E	0.445	IND		5/9/2011	0	CL	NEVADA POWER COMPANY
210	82096			9/7/2012	PER	UG	NW	NE	26	14S	65E	0.009	QM	Y	4/20/1948	1.003	CL	CLOUD, MARY K
219	82097			9/7/2012	PER	UG	NW	NE	26	14S	65E	0.0135	QM	Y	4/20/1948	2.891	CL	CLOUD, MARY K
219	85040			4/3/2015	DEN	SPR	NW	SW	27	14S	65E	0.011	WLD		4/3/2015	8	CL	MOAPA VALLEY WATER DISTRICT
219	85156			5/8/2015	PER	UG	NW	SE	08	14S	65E	0.445	IND	Y	7/7/1970	322.17	CL	NEVADA POWER COMPANY
219	86209			5/13/2016	PER	UG	NE	NE	22	14S	65E	0.0631	COM	Y	4/20/1948	14.01	CL	333HILLSIDE LLC
219	86955T			2/24/2017	EXP	STR	SW	SW	09	14S	65E	0.06435	IRR		2/24/2017	0	CL	SNWA
219	86956T			2/24/2017	EXP	STR	NW	SE	15	14S	65E	0.0788	IRR		2/24/2017	0	CL	SNWA
219	86957T			2/24/2017	EXP	STR	SW	SW	09	14S	65E	0.043	IRR		2/24/2017	0	CL	SNWA
219	87996			5/21/2018	RFP	SPR	NW	SW	27	14S	65E	0.011	WLD		5/21/2018	8	CL	U.S.-BUREAU OF LAND MANAGEMENT
219	88008T			5/25/2018	EXP	STR	SW	SW	09	14S	65E	0.045	IRR		4/23/1919	0	CL	SNWA
219	88009T			5/25/2018	EXP	STR	NW	SE	15	14S	65E	0.055	IRR		4/23/1919	0	CL	SNWA
219	88010T			5/25/2018	EXP	STR	SW	SW	09	14S	65E	0.03	IRR		4/23/1919	0	CL	SNWA
219	89			4/26/1906	CAN	STR	NE	NE	16	14S	65E	0	IRR	Y	4/26/1906	0	CL	STOER, FRED J.
219	9461			5/22/1931	DEN	STR	NE	NE	21	14S	65E	0.029	IRR	Y	5/22/1931		CL	BEACH, CALVIN B.
219	9985			4/30/1936	CAN	OSW	NE	SE	03	14S	64E	30	STO	Y	4/30/1936	700	CL	MUDDY VALLEY IRRIGATION CO., INC.
219	V01619			4/23/1919	DEC	STR	NW	NE	16	14S	65E	0.143	IRR		4/23/1919	123.907	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 86956T			EXP	STR												
		CHANGED BY: 86955T			EXP	STR												
		CHANGED BY: 88008T			EXP	STR												
		CHANGED BY: 88009T			EXP	STR												

Selection Criteria: WHERE owner_type IN ('C','B') AND ms.Basin IN ('219')

Run Date: 8/22/2019 9:04:44 AM

Basin	App	Prev App Change of App	Cert	Filing Date	Status	Source	POINT OF DIVERSION Qtr-Qtr	Qtr	SEC	TWN	RNG	Div Rate (CFS)	Manner of Use	Sup?	Priority Date	Duty Bal	County	Owner of Record
219	V01625			6/23/1919	VST	SPR						0	DEC		6/23/1919	0	CL	ROBERT E. AND LYNN C. PLUMMER FAMILY TRUST U/A/D JUNE 9 AND 10, 1987
219	V01631			4/23/1919	PER	STR	NE	NE	16	14S	65E	0.043	IRR		4/23/1919	25.66	CL	SOUTHERN NEVADA WATER AUTHORITY
		CHANGED BY: 86957T			EXP	STR												
		CHANGED BY: 88010T			EXP	STR												

Nevada Division of Water Resources

Hydrographic Area Summary

Hydrographic Area No.	205	**Hydrographic Area Name**	LOWER MEADOW VALLEY WASH
Subarea Name			
Hydrographic Region No.	13	**Hydrographic Region Name**	COLORADO RIVER BASIN
Area (sq. mi.)	979		
Counties within the hydrographic area	Lincoln, Clark		
Nearest Communities to Hydrographic Area	Caliente, Moapa		
Designated (Y/N, Order No.)	Y, O-803	**For All or Portion of Basin**	All
Preferred Use	None	**For All or Portion of Basin**	All
State Engineer's Orders:		**For All or Portion of Basin**	All
State Engineer's Rulings:			
Pumpage Inventory Status	None	**Crop Inventory Status**	None
Water Level Measurement?	Y		

Yield Values

Perennial Yield (AFY)	25000
System Yield (AFY)	
Yield Reference(s)	USGS Recon. 27
Yield Remarks	Yield for basins 198 - 205 totals 25,000

Source of Committed Data: NDWR Database **Supplementally Adjusted?** Y

Manner of Use	Underground	Geothermal	Other Ground Water
Commercial	1,014.00	0.00	0.00
Construction	0.00	0.00	0.00
Domestic	0.00	0.00	0.00
Environmental	40.33	0.00	0.00
Industrial	6,904.87	0.00	0.00
Irrigation	6,631.70	0.00	0.00
Mining and Milling	6.40	0.00	0.00
Municipal	10,516.87	0.00	0.00
Power	0.00	0.00	0.00
Quasi-Municipal	4.48	0.00	0.00
Recreation	3.00	0.00	0.00
Stockwater	10.93	0.00	0.00
Storage	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00
Other	74.51	0.00	0.00
Totals	25,207.09	0.00	0.00

Related Reports

USGS Reconnaissance 27 **USGS Bulletin** 7

Other References

Comments

Nevada Division of Water Resources

Hydrographic Area Summary

Hydrographic Area No.	206	**Hydrographic Area Name**	KANE SPRINGS VALLEY
Subarea Name			
Hydrographic Region No.	13	**Hydrographic Region Name**	COLORADO RIVER BASIN
Area (sq. mi.)	234		
Counties within the hydrographic area	Lincoln		
Nearest Communities to Hydrographic Area	Caliente, Moapa		
Designated (Y/N, Order No.)	N	**For All or Portion of Basin**	All
Preferred Use	None	**For All or Portion of Basin**	All
State Engineer's Orders:		**For All or Portion of Basin**	All
State Engineer's Rulings:			
Pumpage Inventory Status	None	**Crop Inventory Status**	None
Water Level Measurement?	Y		

Yield Values

Perennial Yield (AFY)	1000
System Yield (AFY)	
Yield Reference(s)	State Engineer Ruling 5712
Yield Remarks	

Source of Committed Data: NDWR Database **Supplementally Adjusted?** Y

Manner of Use	Underground	Geothermal	Other Ground Water
Commercial	0.00	0.00	0.00
Construction	0.00	0.00	0.00
Domestic	0.00	0.00	0.00
Environmental	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00
Municipal	1,000.00	0.00	0.00
Power	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00
Recreation	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00
Storage	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00
Other	0.00	0.00	0.00
Totals	1,000.00	0.00	0.00

Related Reports

USGS Reconnaissance 25 **USGS Bulletin** 33

Other References

Comments

Nevada Division of Water Resources

Hydrographic Area Summary

Hydrographic Area No.	210	Hydrographic Area Name	COYOTE SPRING VALLEY
Subarea Name			
Hydrographic Region No.	13	Hydrographic Region Name	COLORADO RIVER BASIN
Area (sq. mi.)	657		
Counties within the hydrographic area	Lincoln, Clark		
Nearest Communities to Hydrographic Area	Moapa, Alamo		
Designated (Y/N, Order No.)	Y, O-905	For All or Portion of Basin	All
Preferred Use	O-905 Preferred Uses Only MUN, IND, DOM, PWR	For All or Portion of Basin	All
State Engineer's Orders:		For All or Portion of Basin	All
State Engineer's Rulings:			
Pumpage Inventory Status	Ongoing	Crop Inventory Status	None
Water Level Measurement?	Y		
Yield Values			
Perennial Yield (AFY)	1900 - 18000		
System Yield (AFY)			
Yield Reference(s)	State Engineer Ruling 4542		
Yield Remarks	See State Engineer Ruling 6254 and 6255		
Source of Committed Data:	NDWR Database	Supplementally Adjusted?	Y

Manner of Use	Underground	Geothermal	Other Ground Water
Commercial	343.00	0.00	0.00
Construction	0.00	0.00	0.00
Domestic	0.00	0.00	0.00
Environmental	0.00	0.00	0.00
Industrial	2,500.00	0.00	0.00
Irrigation	0.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00
Municipal	13,600.00	0.00	0.00
Power	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00
Recreation	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00
Storage	0.00	0.00	0.00
Wildlife	460.00	0.00	0.00
Other	0.00	0.00	0.00
Totals	16,903.00	0.00	0.00

Related Reports

USGS Reconnaissance 25 USGS Bulletin 18, 33

Other References

Comments A Part of this Basin is in Desert National Wildlife Range.

Nevada Division of Water Resources

Hydrographic Area Summary

Hydrographic Area No.	215	**Hydrographic Area Name**	BLACK MOUNTAINS AREA
Subarea Name			
Hydrographic Region No.	13	**Hydrographic Region Name**	COLORADO RIVER BASIN
Area (sq. mi.)	630		
Counties within the hydrographic area	Clark		
Nearest Communities to Hydrographic Area	Boulder City, Overton		
Designated (Y/N, Order No.)	Y, O-1018	**For All or Portion of Basin**	All
Preferred Use	O-1018 Preferred Uses Only MUN, IND, COM, PWR	**For All or Portion of Basin**	All
State Engineer's Orders:		**For All or Portion of Basin**	All
State Engineer's Rulings:			
Pumpage Inventory Status	ongoing	**Crop Inventory Status**	None
Water Level Measurement?	Y		
Yield Values			
Perennial Yield (AFY)	1300		
System Yield (AFY)	7000		
Yield Reference(s)	USGS Open File Report 78-768		
Yield Remarks	See State Engineer Ruling 6260		
Source of Committed Data:	NDWR Database	**Supplementally Adjusted?**	Y

Manner of Use	Underground	Geothermal	Other Ground Water
Commercial	1.35	0.00	0.00
Construction	0.00	0.00	0.00
Domestic	0.00	0.00	0.00
Environmental	0.00	0.00	0.00
Industrial	1,665.00	0.00	0.00
Irrigation	0.00	0.00	0.00
Mining and Milling	527.28	0.00	0.00
Municipal	0.00	0.00	0.00
Power	0.00	0.00	0.00
Quasi-Municipal	3,602.93	0.00	0.00
Recreation	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00
Storage	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00
Other	0.00	0.00	0.00
Totals	5,796.56	0.00	0.00

Related Reports

USGS Reconnaissance 50 **USGS Bulletin** None

Other References

Comments Basin is Shared in Common with Arizona.

Nevada Division of Water Resources

Hydrographic Area Summary

Hydrographic Area No.	216	**Hydrographic Area Name**	GARNET VALLEY
Subarea Name			
Hydrographic Region No.	13	**Hydrographic Region Name**	COLORADO RIVER BASIN
Area (sq. mi.)	156		
Counties within the hydrographic area	Clark		
Nearest Communities to Hydrographic Area	North Las Vegas, Moapa		
Designated (Y/N, Order No.)	Y, O-1025	**For All or Portion of Basin**	All
Preferred Use	O-1025 Preferred Uses Only MUN, OM, IND, COM, MM,	**For All or Portion of Basin**	All
State Engineer's Orders:		**For All or Portion of Basin**	All
State Engineer's Rulings:			
Pumpage Inventory Status	Ongoing	**Crop Inventory Status**	None
Water Level Measurement?	Y		

Yield Values

Perennial Yield (AFY)	400
System Yield (AFY)	
Yield Reference(s)	USGS Recon. 50
Yield Remarks	See State Engineer Ruling 6256

Source of Committed Data: NDWR Database **Supplementally Adjusted?** Y

Manner of Use	Underground	Geothermal	Other Ground Water
Commercial	14.02	0.00	0.00
Construction	0.00	0.00	0.00
Domestic	0.00	0.00	0.00
Environmental	0.00	0.00	0.00
Industrial	615.15	0.00	0.00
Irrigation	0.00	0.00	0.00
Mining and Milling	283.81	0.00	0.00
Municipal	2,274.57	0.00	0.00
Power	0.00	0.00	0.00
Quasi-Municipal	1,570.03	0.00	0.00
Recreation	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00
Storage	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00
Other	0.00	0.00	0.00
Totals	4,757.58	0.00	0.00

Related Reports

USGS Reconnaissance 50 **USGS Bulletin** 189

Other References

Comments Part of this Basin is in Desert National Wildlife Range

Nevada Division of Water Resources

Hydrographic Area Summary

Hydrographic Area No.	217	Hydrographic Area Name	HIDDEN VALLEY (NORTH)
Subarea Name			
Hydrographic Region No.	13	Hydrographic Region Name	COLORADO RIVER BASIN
Area (sq. mi.)	80		
Counties within the hydrographic area	Clark		
Nearest Communities to Hydrographic Area	North Las Vegas, Moapa		
Designated (Y/N, Order No.)	Y, O-1024	For All or Portion of Basin	All
Preferred Use	O-1024 Preferred Uses Only MUN, QM, IND, COM, MM,	For All or Portion of Basin	All
State Engineer's Orders:		For All or Portion of Basin	All
State Engineer's Rulings:			
Pumpage Inventory Status	None	Crop Inventory Status	None
Water Level Measurement?	Y		

Yield Values

Perennial Yield (AFY)	200
System Yield (AFY)	
Yield Reference(s)	USGS Recon. 50
Yield Remarks	See State Engineer Ruling 6257

Source of Committed Data: NDWR Database　Supplementally Adjusted? Y

Manner of Use	Underground	Geothermal	Other Ground Water
Commercial	0.00	0.00	0.00
Construction	0.00	0.00	0.00
Domestic	0.00	0.00	0.00
Environmental	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00
Municipal	2,274.57	0.00	0.00
Power	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00
Recreation	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00
Storage	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00
Other	0.00	0.00	0.00
Totals	2,274.57	0.00	0.00

Related Reports

USGS Reconnaissance 50　USGS Bulletin 18

Other References

Comments　Part of the Basin is in Desert National Wildlife Range

Nevada Division of Water Resources

Hydrographic Area Summary

Hydrographic Area No.	218	Hydrographic Area Name	CALIFORNIA WASH
Subarea Name			
Hydrographic Region No.	13	Hydrographic Region Name	COLORADO RIVER BASIN
Area (sq. mi.)	318		
Counties within the hydrographic area	Clark		
Nearest Communities to Hydrographic Area	Moapa		
Designated (Y/N, Order No.)	Y, O-1026	For All or Portion of Basin	All
Preferred Use	O-1026 Preferred Uses Only MUN, QM, IND, COM, MM,	For All or Portion of Basin	All
State Engineer's Orders:		For All or Portion of Basin	All
State Engineer's Rulings:			
Pumpage Inventory Status	None	Crop Inventory Status	None
Water Level Measurement?	Y		

Yield Values

Perennial Yield (AFY)	2200
System Yield (AFY)	40000
Yield Reference(s)	USGS Open File Report 78-768
Yield Remarks	See State Engineer Ruling 6258

Source of Committed Data: NDWR Database Supplementally Adjusted? Y

Manner of Use	Underground	Geothermal	Other Ground Water
Commercial	0.00	0.00	0.00
Construction	0.00	0.00	0.00
Domestic	0.00	0.00	0.00
Environmental	90.53	0.00	0.00
Industrial	6,904.87	0.00	0.00
Irrigation	90.00	0.00	0.00
Mining and Milling	0.00	0.00	0.00
Municipal	2,525.00	0.00	0.00
Power	0.00	0.00	0.00
Quasi-Municipal	0.00	0.00	0.00
Recreation	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00
Storage	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00
Other	0.00	0.00	0.00
Totals	9,610.40	0.00	0.00

Related Reports

USGS Reconnaissance 50 USGS Bulletin None

Other References

Comments

Nevada Division of Water Resources

Hydrographic Area Summary

Hydrographic Area No.	219	**Hydrographic Area Name**	MUDDY RIVER SPRINGS AREA (UPPER MOAPA)
Subarea Name			
Hydrographic Region No.	13	**Hydrographic Region Name**	COLORADO RIVER BASIN
Area (sq. mi.)	91		
Counties within the hydrographic area	Clark, Lincoln		
Nearest Communities to Hydrographic Area	Moapa, Overton		
Designated (Y/N, Order No.)	Y, O-1023	**For All or Portion of Basin**	All
Preferred Use	O-1023 Preferred Uses Only MUN, QM, IND, COM, MM.	**For All or Portion of Basin**	All
State Engineer's Orders:		**For All or Portion of Basin**	All
State Engineer's Rulings:			
Pumpage Inventory Status	None	**Crop Inventory Status**	None
Water Level Measurement?	Y		
Yield Values			
Perennial Yield (AFY)	100 - 36000		
System Yield (AFY)			
Yield Reference(s)	USGS Recon. 25		
Yield Remarks	See State Engineer Ruling 6259		
Source of Committed Data:	NDWR Database	**Supplementally Adjusted?**	Y

Manner of Use	Underground	Geothermal	Other Ground Water
Commercial	36.83	0.00	0.00
Construction	0.00	0.00	0.00
Domestic	0.00	0.00	0.00
Environmental	0.00	0.00	0.00
Industrial	9,234.42	0.00	0.00
Irrigation	476.26	0.00	0.00
Mining and Milling	0.00	0.00	0.00
Municipal	6,791.91	0.00	0.00
Power	0.00	0.00	0.00
Quasi-Municipal	4.79	0.00	0.00
Recreation	0.00	0.00	0.00
Stockwater	0.00	0.00	0.00
Storage	0.00	0.00	0.00
Wildlife	0.00	0.00	0.00
Other	0.00	0.00	0.00
Totals	16,544.21	0.00	0.00

Related Reports

USGS Reconnaissance 25 **USGS Bulletin** 33

Other References

Comments

Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
01/09/2013	969.112	1873.288	Transducer	
01/08/2013	969.077	1873.323	Transducer	
01/07/2013	969.063	1873.337	Transducer	
01/06/2013	969.067	1873.333	Transducer	
01/05/2013	969.058	1873.342	Transducer	
01/04/2013	969.027	1873.373	Transducer	
01/03/2013	969.001	1873.399	Transducer	
01/02/2013	968.979	1873.421	Transducer	
01/01/2013	968.954	1873.446	Transducer	
12/31/2012	968.909	1873.491	Transducer	
12/30/2012	968.89	1873.51	Transducer	
12/29/2012	968.882	1873.518	Transducer	
12/28/2012	968.855	1873.545	Transducer	
12/27/2012	968.829	1873.571	Transducer	
12/26/2012	968.826	1873.574	Transducer	
12/25/2012	968.819	1873.581	Transducer	
12/24/2012	968.781	1873.619	Transducer	
12/23/2012	968.772	1873.628	Transducer	
12/22/2012	968.76	1873.64	Transducer	
12/21/2012	968.743	1873.657	Transducer	
12/20/2012	968.716	1873.684	Transducer	
12/19/2012	968.664	1873.736	Transducer	
12/18/2012	968.639	1873.761	Transducer	
12/17/2012	968.636	1873.764	Transducer	
12/16/2012	968.604	1873.796	Transducer	
12/15/2012	968.579	1873.821	Transducer	
12/14/2012	968.58	1873.82	Transducer	
12/13/2012	968.588	1873.812	Transducer	
12/12/2012	968.594	1873.806	Transducer	
12/11/2012	968.593	1873.807	Transducer	
12/11/2012	968.82	1873.58	Electric Tape	Downloaded transducer data,
12/10/2012	968.599	1873.801	Transducer	"
12/09/2012	968.582	1873.818	Transducer	"
12/08/2012	968.586	1873.814	Transducer	"
12/07/2012	968.594	1873.806	Transducer	"
12/06/2012	968.604	1873.796	Transducer	"
12/05/2012	968.617	1873.783	Transducer	"
12/04/2012	968.617	1873.783	Transducer	"
12/03/2012	968.604	1873.796	Transducer	"
12/02/2012	968.612	1873.788	Transducer	"
12/01/2012	968.616	1873.784	Transducer	"
11/30/2012	968.622	1873.778	Transducer	"
11/29/2012	968.624	1873.776	Transducer	"
11/28/2012	968.629	1873.771	Transducer	"
11/27/2012	968.621	1873.779	Transducer	"
11/26/2012	968.614	1873.786	Transducer	"
11/25/2012	968.627	1873.773	Transducer	"
11/24/2012	968.649	1873.751	Transducer	"

Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
11/23/2012	968.653	1873.747	Transducer	"
11/22/2012	968.636	1873.764	Transducer	"
11/21/2012	968.637	1873.763	Transducer	"
11/20/2012	968.642	1873.758	Transducer	"
11/19/2012	968.627	1873.773	Transducer	"
11/18/2012	968.614	1873.786	Transducer	"
11/17/2012	968.619	1873.781	Transducer	"
11/16/2012	968.625	1873.775	Transducer	"
11/15/2012	968.625	1873.775	Transducer	"
11/14/2012	968.624	1873.776	Transducer	"
11/13/2012	968.622	1873.778	Transducer	"
11/12/2012	968.614	1873.786	Transducer	"
11/11/2012	968.585	1873.815	Transducer	"
11/10/2012	968.558	1873.842	Transducer	"
11/09/2012	968.574	1873.826	Transducer	"
11/08/2012	968.612	1873.788	Transducer	"
11/08/2012	968.61	1873.79	Electric Tape	downloaded xd data,
11/07/2012	968.645	1873.755	Transducer	"
11/06/2012	968.654	1873.746	Transducer	"
11/05/2012	968.66	1873.74	Transducer	"
11/04/2012	968.652	1873.748	Transducer	"
11/03/2012	968.635	1873.765	Transducer	"
11/02/2012	968.638	1873.762	Transducer	"
11/01/2012	968.643	1873.757	Transducer	"
10/31/2012	968.65	1873.75	Transducer	"
10/30/2012	968.656	1873.744	Transducer	"
10/29/2012	968.646	1873.754	Transducer	"
10/28/2012	968.645	1873.755	Transducer	"
10/27/2012	968.644	1873.756	Transducer	"
10/26/2012	968.646	1873.754	Transducer	"
10/25/2012	968.625	1873.775	Transducer	"
10/24/2012	968.611	1873.789	Transducer	"
10/23/2012	968.618	1873.782	Transducer	"
10/22/2012	968.64	1873.76	Transducer	"
10/21/2012	968.647	1873.753	Transducer	"
10/20/2012	968.67	1873.73	Transducer	"
10/19/2012	968.69	1873.71	Transducer	"
10/18/2012	968.684	1873.716	Transducer	"
10/17/2012	968.683	1873.717	Transducer	"
10/16/2012	968.697	1873.703	Transducer	"
10/15/2012	968.714	1873.686	Transducer	"
10/14/2012	968.732	1873.668	Transducer	"
10/13/2012	968.73	1873.67	Transducer	"
10/12/2012	968.761	1873.639	Transducer	"
10/11/2012	968.792	1873.608	Transducer	"
10/11/2012	968.8	1873.6	Electric Tape	Downloaded transducer data,
10/10/2012	968.792	1873.608	Transducer	"
10/09/2012	968.79	1873.61	Transducer	"

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Measure Date	Depth To Water	Water Surface Elevaon	Method	Comments
10/08/2012	968.787	1873.613	Transducer	"
10/07/2012	968.784	1873.616	Transducer	"
10/06/2012	968.781	1873.619	Transducer	"
10/05/2012	968.78	1873.62	Transducer	"
10/04/2012	968.781	1873.619	Transducer	"
10/03/2012	968.781	1873.619	Transducer	"
10/02/2012	968.786	1873.614	Transducer	"
10/01/2012	968.798	1873.602	Transducer	"
09/30/2012	968.799	1873.601	Transducer	"
09/29/2012	968.79	1873.61	Transducer	"
09/28/2012	968.807	1873.593	Transducer	"
09/27/2012	968.817	1873.583	Transducer	"
09/26/2012	968.818	1873.582	Transducer	"
09/25/2012	968.821	1873.579	Transducer	"
09/24/2012	968.798	1873.602	Transducer	"
09/23/2012	968.799	1873.601	Transducer	"
09/22/2012	968.837	1873.563	Transducer	"
09/21/2012	968.856	1873.544	Transducer	"
09/20/2012	968.841	1873.559	Transducer	"
09/19/2012	968.822	1873.578	Transducer	"
09/18/2012	968.849	1873.551	Transducer	"
09/17/2012	968.84	1873.56	Transducer	"
09/16/2012	968.781	1873.619	Transducer	"
09/15/2012	968.845	1873.555	Transducer	"
09/14/2012	968.839	1873.561	Transducer	"
09/13/2012	968.86	1873.54	Electric Tape	Visited site to replace transducer and cable; Started new test,
09/13/2012	968.841	1873.559	Transducer	"
09/12/2012	968.8	1873.6	Electric Tape	Unable to connect to transducer,
09/12/2012	968.859	1873.541	Transducer	"
09/11/2012	968.851	1873.549	Transducer	"
09/10/2012	968.842	1873.558	Transducer	"
09/09/2012	968.833	1873.567	Transducer	"
09/08/2012	968.824	1873.576	Transducer	"
09/07/2012	968.815	1873.585	Transducer	"
09/06/2012	968.806	1873.594	Transducer	"
09/05/2012	968.797	1873.603	Transducer	"
09/04/2012	968.788	1873.612	Transducer	"
09/03/2012	968.779	1873.621	Transducer	"
09/02/2012	968.77	1873.63	Transducer	"
09/01/2012	968.761	1873.639	Transducer	"
08/31/2012	968.752	1873.648	Transducer	"
08/30/2012	968.743	1873.657	Transducer	"
08/29/2012	968.734	1873.666	Transducer	"
08/28/2012	968.725	1873.675	Transducer	"
08/27/2012	968.716	1873.684	Transducer	"
08/26/2012	968.707	1873.693	Transducer	"

Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
08/25/2012	968.699	1873.701	Transducer	"
08/24/2012	968.69	1873.71	Transducer	"
08/23/2012	968.681	1873.719	Transducer	"
08/22/2012	968.672	1873.728	Transducer	"
08/21/2012	968.663	1873.737	Transducer	"
08/20/2012	968.654	1873.746	Transducer	"
08/19/2012	968.645	1873.755	Transducer	"
08/18/2012	968.636	1873.764	Transducer	"
08/17/2012	968.627	1873.773	Transducer	"
08/16/2012	968.618	1873.782	Transducer	"
08/15/2012	968.61	1873.79	Electric Tape	DOWNLOADED TRANSDUCER DATA,
08/15/2012	968.601	1873.799	Transducer	"
08/14/2012	968.596	1873.804	Transducer	
08/13/2012	968.605	1873.795	Transducer	
08/12/2012	968.624	1873.776	Transducer	
08/11/2012	968.66	1873.74	Transducer	
08/10/2012	968.676	1873.724	Transducer	
08/09/2012	968.602	1873.798	Transducer	
08/08/2012	968.604	1873.796	Transducer	
08/07/2012	968.628	1873.772	Transducer	
08/06/2012	968.671	1873.729	Transducer	
08/05/2012	968.727	1873.673	Transducer	
08/04/2012	968.73	1873.67	Transducer	
08/03/2012	968.716	1873.684	Transducer	
08/02/2012	968.706	1873.694	Transducer	
08/01/2012	968.717	1873.683	Transducer	
07/31/2012	968.773	1873.627	Transducer	
07/30/2012	968.821	1873.579	Transducer	
07/29/2012	968.767	1873.633	Transducer	
07/28/2012	968.776	1873.624	Transducer	
07/27/2012	968.797	1873.603	Transducer	
07/26/2012	968.804	1873.596	Transducer	
07/25/2012	968.809	1873.591	Transducer	
07/24/2012	968.784	1873.616	Transducer	
07/23/2012	968.7	1873.7	Transducer	
07/22/2012	968.653	1873.747	Transducer	
07/21/2012	968.658	1873.742	Transducer	
07/20/2012	968.669	1873.731	Transducer	
07/19/2012	968.71	1873.69	Electric Tape	Downloaded transducer data,
07/19/2012	968.677	1873.723	Transducer	
07/18/2012	968.649	1873.751	Transducer	
07/17/2012	968.63	1873.77	Transducer	
07/16/2012	968.573	1873.827	Transducer	
07/15/2012	968.5	1873.9	Transducer	
07/14/2012	968.301	1874.099	Transducer	
07/13/2012	968.09	1874.31	Transducer	
07/12/2012	968.069	1874.331	Transducer	

Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
07/11/2012	968.054	1874.346	Transducer	
07/10/2012	968.03	1874.37	Transducer	
07/09/2012	968.002	1874.398	Transducer	
07/08/2012	968.001	1874.399	Transducer	
07/07/2012	968.014	1874.386	Transducer	
07/06/2012	968.035	1874.365	Transducer	
07/05/2012	968.054	1874.346	Transducer	
07/04/2012	968.081	1874.319	Transducer	
07/03/2012	968.137	1874.263	Transducer	
07/02/2012	968.195	1874.205	Transducer	
07/01/2012	968.256	1874.144	Transducer	
06/30/2012	968.32	1874.08	Transducer	
06/29/2012	968.377	1874.023	Transducer	
06/28/2012	968.418	1873.982	Transducer	
06/27/2012	968.475	1873.925	Transducer	
06/26/2012	968.54	1873.86	Electric Tape	DOWNLOADED TRANSDUCER DATA,
06/26/2012	968.534	1873.866	Transducer	
06/25/2012	968.529	1873.871	Transducer	
06/24/2012	968.518	1873.882	Transducer	
06/23/2012	968.529	1873.871	Transducer	
06/22/2012	968.534	1873.866	Transducer	
06/21/2012	968.535	1873.865	Transducer	
06/20/2012	968.552	1873.848	Transducer	
06/19/2012	968.665	1873.735	Transducer	
06/18/2012	968.687	1873.713	Transducer	
06/17/2012	968.69	1873.71	Transducer	
06/16/2012	968.671	1873.729	Transducer	
06/15/2012	968.67	1873.73	Transducer	
06/14/2012	968.671	1873.729	Transducer	
06/13/2012	968.682	1873.718	Transducer	
06/12/2012	968.696	1873.704	Transducer	
06/11/2012	968.686	1873.714	Transducer	
06/10/2012	968.662	1873.738	Transducer	
06/09/2012	968.683	1873.717	Transducer	
06/08/2012	968.695	1873.705	Transducer	
06/07/2012	968.692	1873.708	Transducer	
06/06/2012	968.678	1873.722	Transducer	
06/05/2012	968.668	1873.732	Transducer	
06/04/2012	968.668	1873.732	Transducer	
06/03/2012	968.667	1873.733	Transducer	
06/02/2012	968.67	1873.73	Transducer	
06/01/2012	968.678	1873.722	Transducer	
05/31/2012	968.68	1873.72	Transducer	
05/30/2012	968.672	1873.728	Transducer	
05/29/2012	968.664	1873.736	Transducer	
05/28/2012	968.646	1873.754	Transducer	
05/27/2012	968.615	1873.785	Transducer	

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Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
05/26/2012	968.589	1873.811	Transducer	
05/25/2012	968.59	1873.81	Transducer	
05/24/2012	968.61	1873.79	Transducer	
05/23/2012	968.62	1873.78	Transducer	
05/23/2012		0.000		DOWNLOADED TRANSDUCER DATA, PHYSICAL WATER LEVEL MEASUREMENT OF 969.06 SUSPECT BASED ON FOLLOW-UP EXAMINATION OF EQUIPMENT USED, XDCR IN WELL OR NEARBY, AND WATER LEVEL TRENDS,
05/22/2012	968.634	1873.766	Transducer	
05/21/2012	968.65	1873.75	Transducer	
05/20/2012	968.636	1873.764	Transducer	
05/19/2012	968.61	1873.79	Transducer	
05/18/2012	968.635	1873.765	Transducer	
05/17/2012	968.636	1873.764	Transducer	
05/16/2012	968.63	1873.77	Transducer	
05/15/2012	968.638	1873.762	Transducer	
05/14/2012	968.647	1873.753	Transducer	
05/13/2012	968.635	1873.765	Transducer	
05/12/2012	968.611	1873.789	Transducer	
05/11/2012	968.599	1873.801	Transducer	
05/10/2012	968.604	1873.796	Transducer	
05/09/2012	968.611	1873.789	Transducer	
05/08/2012	968.609	1873.791	Transducer	
05/07/2012	968.613	1873.787	Transducer	
05/06/2012	968.605	1873.795	Transducer	
05/05/2012	968.584	1873.816	Transducer	
05/04/2012	968.572	1873.828	Transducer	
05/03/2012	968.571	1873.829	Transducer	
05/02/2012	968.572	1873.828	Transducer	
05/01/2012	968.581	1873.819	Transducer	
04/30/2012	968.592	1873.808	Transducer	
04/29/2012	968.592	1873.808	Transducer	
04/28/2012	968.595	1873.805	Transducer	
04/27/2012	968.589	1873.811	Transducer	
04/26/2012	968.584	1873.816	Transducer	
04/25/2012	968.597	1873.803	Transducer	
04/24/2012	968.39	1874.01	Electric Tape	Downloaded transducer data,
04/24/2012	968.603	1873.797	Transducer	
04/23/2012	968.608	1873.792	Transducer	
04/22/2012	968.613	1873.787	Transducer	
04/21/2012	968.615	1873.785	Transducer	
04/20/2012	968.609	1873.791	Transducer	
04/19/2012	968.596	1873.804	Transducer	
04/18/2012	968.599	1873.801	Transducer	
04/17/2012	968.604	1873.796	Transducer	
04/16/2012	968.593	1873.807	Transducer	

Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
04/15/2012	968.57	1873.83	Transducer	
04/14/2012	968.562	1873.838	Transducer	
04/13/2012	968.58	1873.82	Transducer	
04/12/2012	968.588	1873.812	Transducer	
04/11/2012	968.589	1873.811	Transducer	
04/10/2012	968.605	1873.795	Transducer	
04/09/2012	968.615	1873.785	Transducer	
04/08/2012	968.618	1873.782	Transducer	
04/07/2012	968.602	1873.798	Transducer	
04/06/2012	968.578	1873.822	Transducer	
04/05/2012	968.567	1873.833	Transducer	
04/04/2012	968.582	1873.818	Transducer	
04/03/2012	968.591	1873.809	Transducer	
04/02/2012	968.577	1873.823	Transducer	
04/01/2012	968.563	1873.837	Transducer	
03/31/2012	968.575	1873.825	Transducer	
03/30/2012	968.582	1873.818	Transducer	
03/29/2012	968.579	1873.821	Transducer	
03/28/2012	968.575	1873.825	Transducer	
03/27/2012	968.579	1873.821	Transducer	
03/26/2012	968.564	1873.836	Transducer	
03/25/2012	968.569	1873.831	Transducer	
03/24/2012	968.573	1873.827	Transducer	
03/23/2012	968.572	1873.828	Transducer	
03/22/2012	968.578	1873.822	Transducer	
03/21/2012	968.6	1873.8	Electric Tape	Downloaded transducer data,
03/21/2012	968.582	1873.818	Transducer	
02/23/2012	968.34	1874.06	Electric Tape	Visited site to replace failed transducer,
02/22/2012	968.58	1873.82	Electric Tape	Unable to connect to transducer,
02/15/2012	968.554	1873.846	Transducer	
02/14/2012	968.511	1873.889	Transducer	
02/13/2012	968.503	1873.897	Transducer	
02/12/2012	968.503	1873.897	Transducer	
02/11/2012	968.522	1873.878	Transducer	
02/10/2012	968.515	1873.885	Transducer	
02/09/2012	968.497	1873.903	Transducer	
02/08/2012	968.494	1873.906	Transducer	
02/07/2012	968.486	1873.914	Transducer	
02/06/2012	968.478	1873.922	Transducer	
02/05/2012	968.474	1873.926	Transducer	
02/04/2012	968.475	1873.925	Transducer	
02/03/2012	968.441	1873.959	Transducer	
02/02/2012	968.382	1874.018	Transducer	
02/01/2012	968.219	1874.181	Transducer	
01/31/2012	968.398	1874.002	Transducer	
01/30/2012	968.386	1874.014	Transducer	
01/29/2012	968.354	1874.046	Transducer	

Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
01/28/2012	968.304	1874.096	Transducer	
01/27/2012	968.273	1874.127	Transducer	
01/26/2012	968.265	1874.135	Transducer	
01/25/2012	968.251	1874.149	Transducer	
01/24/2012	968.253	1874.147	Transducer	
01/23/2012	968.26	1874.14	Transducer	
01/22/2012	968.252	1874.148	Transducer	
01/21/2012	968.246	1874.154	Transducer	
01/20/2012	968.314	1874.086	Transducer	
01/19/2012	968.38	1874.02	Electric Tape	Downloaded transducer data,
01/19/2012	968.384	1874.016	Transducer	
01/18/2012	968.396	1874.004	Transducer	
01/17/2012	968.383	1874.017	Transducer	
01/16/2012	968.387	1874.013	Transducer	
01/15/2012	968.406	1873.994	Transducer	
01/14/2012	968.439	1873.961	Transducer	
01/13/2012	968.43	1873.97	Transducer	
01/12/2012	968.433	1873.967	Transducer	
01/11/2012	968.437	1873.963	Transducer	
01/10/2012	968.443	1873.957	Transducer	
01/09/2012	968.446	1873.954	Transducer	
01/08/2012	968.429	1873.971	Transducer	
01/07/2012	968.419	1873.981	Transducer	
01/06/2012	968.444	1873.956	Transducer	
01/05/2012	968.468	1873.932	Transducer	
01/04/2012	968.468	1873.932	Transducer	
01/03/2012	968.466	1873.934	Transducer	
01/02/2012	968.464	1873.936	Transducer	
01/01/2012	968.445	1873.955	Transducer	
12/31/2011	968.435	1873.965	Transducer	
12/30/2011	968.45	1873.95	Transducer	
12/29/2011	968.467	1873.933	Transducer	
12/28/2011	968.471	1873.929	Transducer	
12/27/2011	968.47	1873.93	Transducer	
12/26/2011	968.472	1873.928	Transducer	
12/25/2011	968.479	1873.921	Transducer	
12/24/2011	968.469	1873.931	Transducer	
12/23/2011	968.451	1873.949	Transducer	
12/22/2011	968.42	1873.98	Transducer	
12/21/2011	968.39	1874.01	Electric Tape	DOWNLOADED TRANSDUCER DATA,
12/21/2011	968.395	1874.005	Transducer	
12/20/2011	968.404	1873.996	Transducer	
12/19/2011	968.418	1873.982	Transducer	
12/18/2011	968.433	1873.967	Transducer	
12/17/2011	968.438	1873.962	Transducer	
12/16/2011	968.424	1873.976	Transducer	
12/15/2011	968.411	1873.989	Transducer	

Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
12/14/2011	968.394	1874.006	Transducer	
12/13/2011	968.401	1873.999	Transducer	
12/12/2011	968.425	1873.975	Transducer	
12/11/2011	968.453	1873.947	Transducer	
12/10/2011	968.47	1873.93	Transducer	
12/09/2011	968.465	1873.935	Transducer	
12/08/2011	968.469	1873.931	Transducer	
12/07/2011	968.481	1873.919	Transducer	
12/06/2011	968.477	1873.923	Transducer	
12/05/2011	968.451	1873.949	Transducer	
12/04/2011	968.44	1873.96	Transducer	
12/03/2011	968.42	1873.98	Transducer	
12/02/2011	968.418	1873.982	Transducer	
12/01/2011	968.427	1873.973	Transducer	
11/30/2011	968.437	1873.963	Transducer	
11/29/2011	968.498	1873.902	Transducer	
11/28/2011	968.506	1873.894	Transducer	
11/27/2011	968.51	1873.89	Transducer	
11/26/2011	968.489	1873.911	Transducer	
11/25/2011	968.455	1873.945	Transducer	
11/24/2011	968.455	1873.945	Transducer	
11/23/2011	968.47	1873.93	Transducer	
11/22/2011	968.61	1873.79	Electric Tape	Downloaded transducer data,
11/22/2011	968.474	1873.926	Transducer	
11/21/2011	968.436	1873.964	Transducer	
11/20/2011	968.426	1873.974	Transducer	
11/19/2011	968.431	1873.969	Transducer	
11/18/2011	968.434	1873.966	Transducer	
11/17/2011	968.466	1873.934	Transducer	
11/16/2011	968.442	1873.958	Transducer	
11/15/2011	968.42	1873.98	Transducer	
11/14/2011	968.422	1873.978	Transducer	
11/13/2011	968.427	1873.973	Transducer	
11/12/2011	968.437	1873.963	Transducer	
11/11/2011	968.452	1873.948	Transducer	
11/10/2011	968.456	1873.944	Transducer	
11/09/2011	968.435	1873.965	Transducer	
11/08/2011	968.4	1874.0	Transducer	
11/07/2011	968.366	1874.034	Transducer	
11/06/2011	968.355	1874.045	Transducer	
11/05/2011	968.356	1874.044	Transducer	
11/04/2011	968.325	1874.075	Transducer	
11/03/2011	968.411	1873.989	Transducer	
11/02/2011	968.403	1873.997	Transducer	
11/01/2011	968.37	1874.03	Transducer	
10/31/2011	968.376	1874.024	Transducer	
10/30/2011	968.368	1874.032	Transducer	
10/29/2011	968.362	1874.038	Transducer	

Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
10/28/2011	968.358	1874.042	Transducer	
10/27/2011	968.34	1874.06	Transducer	
10/26/2011	968.314	1874.086	Transducer	
10/25/2011	968.316	1874.084	Transducer	
10/24/2011	968.323	1874.077	Transducer	
10/23/2011	968.329	1874.071	Transducer	
10/22/2011	968.323	1874.077	Transducer	
10/21/2011	968.305	1874.095	Transducer	
10/20/2011	968.299	1874.101	Transducer	
10/19/2011	968.27	1874.13	Electric Tape	Downloaded transducer data,
10/19/2011	968.304	1874.096	Transducer	
10/18/2011	968.315	1874.085	Transducer	
10/17/2011	968.286	1874.114	Transducer	
10/16/2011	968.27	1874.13	Transducer	
10/15/2011	968.259	1874.141	Transducer	
10/14/2011	968.249	1874.151	Transducer	
10/13/2011	968.249	1874.151	Transducer	
10/12/2011	968.226	1874.174	Transducer	
10/11/2011	968.206	1874.194	Transducer	
10/10/2011	968.197	1874.203	Transducer	
10/09/2011	968.197	1874.203	Transducer	
10/08/2011	968.18	1874.22	Transducer	
10/07/2011	968.15	1874.25	Transducer	
10/06/2011	968.143	1874.257	Transducer	
10/05/2011	968.151	1874.249	Transducer	
10/04/2011	968.157	1874.243	Transducer	
10/03/2011	968.157	1874.243	Transducer	
10/02/2011	968.155	1874.245	Transducer	
10/01/2011	968.145	1874.255	Transducer	
09/30/2011	968.132	1874.268	Transducer	
09/29/2011	968.125	1874.275	Transducer	
09/28/2011	968.126	1874.274	Transducer	
09/27/2011	968.113	1874.287	Transducer	
09/26/2011	968.144	1874.256	Transducer	
09/25/2011	968.145	1874.255	Transducer	
09/24/2011	968.154	1874.246	Transducer	
09/23/2011	968.32	1874.08	Electric Tape	Pulled transducer from well and replaced leveltroll. Started new test.,
09/23/2011	968.197	1874.203	Transducer	
09/22/2011		0.000	Transducer	
09/21/2011		0.000	Transducer	
09/20/2011	968.19	1874.21	Electric Tape	Unable to connect to transducer,
09/20/2011		0.000	Transducer	
09/19/2011		0.000	Transducer	
09/18/2011		0.000	Transducer	
09/17/2011		0.000	Transducer	
09/16/2011		0.000	Transducer	

Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
09/15/2011		0.000	Transducer	
09/14/2011		0.000	Transducer	
09/13/2011		0.000	Transducer	
09/12/2011		0.000	Transducer	
09/11/2011		0.000	Transducer	
09/10/2011		0.000	Transducer	
09/09/2011		0.000	Transducer	
09/08/2011		0.000	Transducer	Transducer failed
09/07/2011	968.056	1874.344	Transducer	
09/06/2011	968.041	1874.359	Transducer	
09/05/2011	968.024	1874.376	Transducer	
09/04/2011	968.027	1874.373	Transducer	
09/03/2011	968.032	1874.368	Transducer	
09/02/2011	968.019	1874.381	Transducer	
09/01/2011	968.014	1874.386	Transducer	
08/31/2011	968.013	1874.387	Transducer	
08/30/2011	968.016	1874.384	Transducer	
08/29/2011	968.016	1874.384	Transducer	
08/28/2011	968.016	1874.384	Transducer	
08/27/2011	968.013	1874.387	Transducer	
08/26/2011	968.004	1874.396	Transducer	
08/25/2011	967.998	1874.402	Transducer	
08/24/2011	968.05	1874.35	Electric Tape	Downloaded transducer data,
08/24/2011	968.014	1874.386	Transducer	
08/23/2011	968.03	1874.37	Transducer	
08/22/2011	968.027	1874.373	Transducer	
08/21/2011	968.016	1874.384	Transducer	
08/20/2011	968.012	1874.388	Transducer	
08/19/2011	968.012	1874.388	Transducer	
08/18/2011	968.018	1874.382	Transducer	
08/17/2011	968.011	1874.389	Transducer	
08/16/2011	968.004	1874.396	Transducer	
08/15/2011	968.004	1874.396	Transducer	
08/14/2011	968.013	1874.387	Transducer	
08/13/2011	967.998	1874.402	Transducer	
08/12/2011	967.998	1874.402	Transducer	
08/11/2011	968	1874.4	Transducer	
08/10/2011	968	1874.4	Transducer	
08/09/2011	968.002	1874.398	Transducer	
08/08/2011	968.002	1874.398	Transducer	
08/07/2011	968.002	1874.398	Transducer	
08/06/2011	968.004	1874.396	Transducer	
08/05/2011	968.005	1874.395	Transducer	
08/04/2011	968.01	1874.39	Transducer	
08/03/2011	968.018	1874.382	Transducer	
08/02/2011	968.026	1874.374	Transducer	
08/01/2011	968.027	1874.373	Transducer	
07/31/2011	968.012	1874.388	Transducer	

Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
07/30/2011	968.008	1874.392	Transducer	
07/29/2011	968.002	1874.398	Transducer	
07/28/2011	968.003	1874.397	Transducer	
07/27/2011	968.007	1874.393	Transducer	
07/26/2011	968.01	1874.39	Transducer	
07/25/2011	968.022	1874.378	Transducer	
07/24/2011	968.013	1874.387	Transducer	
07/23/2011	967.997	1874.403	Transducer	
07/22/2011	967.999	1874.401	Transducer	
07/21/2011	968	1874.4	Electric Tape	Downloaded transducer data,
07/21/2011	968.004	1874.396	Transducer	
07/20/2011	968.009	1874.391	Transducer	
07/19/2011	968.015	1874.385	Transducer	
07/18/2011	968.003	1874.397	Transducer	
07/17/2011	968.018	1874.382	Transducer	
07/16/2011	968.027	1874.373	Transducer	
07/15/2011	968.026	1874.374	Transducer	
07/14/2011	968.028	1874.372	Transducer	
07/13/2011	968.029	1874.371	Transducer	
07/12/2011	968.03	1874.37	Transducer	
07/11/2011	968.029	1874.371	Transducer	
07/10/2011	968.03	1874.37	Transducer	
07/09/2011	968.034	1874.366	Transducer	
07/08/2011	968.042	1874.358	Transducer	
07/07/2011	968.05	1874.35	Transducer	
07/06/2011	968.048	1874.352	Transducer	
07/05/2011	968.048	1874.352	Transducer	
07/04/2011	968.032	1874.368	Transducer	
07/03/2011	968.023	1874.377	Transducer	
07/02/2011	968.027	1874.373	Transducer	
07/01/2011	968.033	1874.367	Transducer	
06/30/2011	968.019	1874.381	Transducer	
06/29/2011	968.019	1874.381	Transducer	
06/28/2011	968.02	1874.38	Transducer	
06/27/2011	968.031	1874.369	Transducer	
06/26/2011	968.038	1874.362	Transducer	
06/25/2011	968.041	1874.359	Transducer	
06/24/2011	968.045	1874.355	Transducer	
06/23/2011	968.05	1874.35	Transducer	
06/22/2011	968.06	1874.34	Electric Tape	Downloaded transducer data,
06/22/2011	968.064	1874.336	Transducer	
06/21/2011	968.07	1874.33	Transducer	
06/20/2011	968.05	1874.35	Transducer	
06/19/2011	968.04	1874.36	Transducer	
06/18/2011	968.05	1874.35	Transducer	
06/17/2011	968.05	1874.35	Transducer	
06/16/2011	968.06	1874.34	Transducer	
06/15/2011	968.08	1874.32	Transducer	

Measure Date	Depth To Water	Water Surface Elevation	Method	Comments
06/14/2011	968.08	1874.32	Transducer	
06/13/2011	968.07	1874.33	Transducer	
06/12/2011	968.07	1874.33	Transducer	
06/11/2011	968.07	1874.33	Transducer	
06/10/2011	968.08	1874.32	Transducer	
06/09/2011	968.1	1874.3	Transducer	
06/08/2011	968.1	1874.3	Transducer	
06/07/2011	968.1	1874.3	Transducer	
06/06/2011	968.1	1874.3	Transducer	
06/05/2011	968.1	1874.3	Transducer	
06/04/2011	968.09	1874.31	Transducer	
06/03/2011	968.1	1874.3	Transducer	
06/02/2011	968.08	1874.32	Transducer	
06/01/2011	968.08	1874.32	Transducer	
05/31/2011	968.08	1874.32	Transducer	
05/30/2011	968.06	1874.34	Transducer	
05/29/2011	968.04	1874.36	Transducer	
05/28/2011	968.05	1874.35	Transducer	
05/27/2011	968.08	1874.32	Transducer	
05/26/2011	968.08	1874.32	Transducer	
05/25/2011	968.09	1874.31	Transducer	
05/24/2011	968.06	1874.34	Electric Tape	Downloaded transducer data,
05/24/2011	968.08	1874.32	Transducer	
05/23/2011	968.1	1874.3	Transducer	
05/22/2011	968.09	1874.31	Transducer	
05/21/2011	968.1	1874.3	Transducer	
05/20/2011	968.07	1874.33	Transducer	
05/19/2011	968.06	1874.34	Transducer	
05/18/2011	968.05	1874.35	Transducer	
05/17/2011	968.06	1874.34	Transducer	
05/16/2011	968.07	1874.33	Transducer	
05/15/2011	968.06	1874.34	Transducer	
05/14/2011	968.06	1874.34	Transducer	
05/13/2011	968.06	1874.34	Transducer	
05/12/2011	968.05	1874.35	Transducer	
05/11/2011	968.02	1874.38	Transducer	
05/10/2011	968.03	1874.37	Transducer	
05/09/2011	968.05	1874.35	Transducer	
05/08/2011	968.06	1874.34	Transducer	
05/07/2011	968.08	1874.32	Transducer	
05/06/2011	968.09	1874.31	Transducer	
05/05/2011	968.1	1874.3	Transducer	
05/04/2011	968.08	1874.32	Transducer	
05/03/2011	968.08	1874.32	Transducer	
05/02/2011	968.07	1874.33	Transducer	
05/01/2011	968.05	1874.35	Transducer	
04/30/2011	968.02	1874.38	Transducer	
04/29/2011	967.99	1874.41	Transducer	

Measure Date	Depth To Water	Water Surface Elevaon	Method	Comments
04/28/2011	968	1874.4	Transducer	
04/27/2011	967.99	1874.41	Transducer	
04/26/2011	967.95	1874.45	Transducer	
04/25/2011	967.96	1874.44	Transducer	
04/24/2011	967.95	1874.45	Transducer	
04/23/2011	967.95	1874.45	Transducer	
04/22/2011	967.98	1874.42	Transducer	
04/21/2011	968.01	1874.39	Transducer	
04/20/2011	968	1874.4	Transducer	
04/19/2011	968.06	1874.34	Electric Tape	Downloaded transducer data,
04/19/2011	968.03	1874.37	Transducer	
04/18/2011	968.04	1874.36	Transducer	
04/17/2011	968.01	1874.39	Transducer	
04/16/2011	967.99	1874.41	Transducer	
04/15/2011	967.98	1874.42	Transducer	
04/14/2011	967.92	1874.48	Transducer	
04/13/2011	967.88	1874.52	Transducer	
04/12/2011	967.84	1874.56	Transducer	
04/11/2011	967.83	1874.57	Transducer	
04/10/2011	967.77	1874.63	Transducer	
04/09/2011	967.75	1874.65	Transducer	
04/08/2011	967.76	1874.64	Transducer	
04/07/2011	967.72	1874.68	Transducer	
04/06/2011	967.72	1874.68	Transducer	
04/05/2011	967.7	1874.7	Transducer	
04/04/2011	967.67	1874.73	Transducer	
04/03/2011	967.65	1874.75	Transducer	
04/02/2011	967.639	1874.761	Transducer	
04/01/2011	967.618	1874.782	Transducer	
03/31/2011	967.605	1874.795	Transducer	
03/30/2011	967.56	1874.84	Transducer	
03/29/2011	967.506	1874.894	Transducer	
03/28/2011	967.49	1874.91	Transducer	
03/27/2011	967.562	1874.838	Transducer	
03/26/2011	967.618	1874.782	Transducer	
03/25/2011	967.581	1874.819	Transducer	
03/24/2011	967.544	1874.856	Transducer	
03/23/2011	967.557	1874.843	Transducer	
03/22/2011	967.538	1874.862	Transducer	
03/21/2011	967.742	1874.658	Transducer	
03/20/2011	967.721	1874.679	Transducer	
03/19/2011	967.692	1874.708	Transducer	
03/18/2011	967.719	1874.681	Transducer	
03/17/2011	967.823	1874.577	Transducer	
03/16/2011	967.97	1874.43	Electric Tape	
03/16/2011	967.94	1874.46	Transducer	
03/15/2011	967.816	1874.584	Transducer	
03/14/2011	967.847	1874.553	Transducer	

Measure Date	Depth To Water	Water Surface Elevaon	Method	Comments
03/13/2011	967.764	1874.636	Transducer	
03/12/2011	968.132	1874.268	Transducer	
03/11/2011	967.985	1874.415	Transducer	
03/10/2011	968.171	1874.229	Transducer	
03/09/2011	968.31	1874.09	Electric Tape	Installed transducer. Cable SN 232202 (1015 ft. Rugged vented cable) Level troll 700 SN 159182,
03/09/2011	968.238	1874.162	Transducer	
02/16/2011	967.79	1874.61	Electric Tape	Transducer pulled from well for replacement,
02/10/2011		0.000		Visited site to pull XD from well; Leveltroll and cable had moisture in it; sending both back to Insitu.,
01/20/2011	968.25	1874.15	Electric Tape	
12/13/2010	967.84	1874.56	Electric Tape	TRANSDUCER DATA DOWNLOADED SUCCESSFULLY. TRANSDUCER DEPTH IS NOT ACCURATE.,
12/12/2010	967.853	1874.547	Transducer	
12/11/2010	967.83	1874.57	Transducer	
12/10/2010	967.828	1874.572	Transducer	
12/09/2010	967.837	1874.563	Transducer	
12/08/2010	967.846	1874.554	Transducer	
12/07/2010	967.844	1874.556	Transducer	
12/06/2010	967.825	1874.575	Transducer	
12/05/2010	967.808	1874.592	Transducer	
12/04/2010	967.805	1874.595	Transducer	
12/03/2010	967.816	1874.584	Transducer	
12/02/2010	967.821	1874.579	Transducer	
12/01/2010	967.825	1874.575	Transducer	
11/30/2010	967.81	1874.59	Transducer	
11/29/2010	967.771	1874.629	Transducer	
11/28/2010	967.741	1874.659	Transducer	
11/27/2010	967.768	1874.632	Transducer	
11/26/2010	967.793	1874.607	Transducer	
11/25/2010	967.77	1874.63	Transducer	
11/24/2010	967.739	1874.661	Transducer	
11/23/2010	967.754	1874.646	Transducer	
11/22/2010	967.74	1874.66	Transducer	
11/21/2010	967.733	1874.667	Transducer	
11/20/2010	967.762	1874.638	Transducer	
11/19/2010	967.79	1874.61	Transducer	
11/18/2010	967.82	1874.58	Transducer	
11/17/2010	967.808	1874.592	Transducer	
11/16/2010	967.79	1874.61	Electric Tape	Downloaded transducer data,
11/16/2010	967.798	1874.602	Transducer	
11/15/2010	967.815	1874.585	Transducer	
11/14/2010	967.834	1874.566	Transducer	
11/13/2010	967.866	1874.534	Transducer	

Water Year	Annual Flow (cfs)	afy	"+ 6 taf ET
1914	47.2	34163	
1915	47.6	34453	
1917	46.7	33801	
1918	47	34018	
1945	45.7	33077	
1946	46.9	33946	
1947	47.7	34525	
1948	46.3	33512	
1949	47	34018	
1950	46.2	33439	
1951	46.9	33946	
1952	46.6	33729	
1953	46	33295	
1954	46	33295	
1955	47.2	34163	
1956	45.8	33150	
1957	47.7	34525	
1958	49.6	35900	
1959	48.9	35394	
1960	47.8	34597	
1961	46.3	33512	
1962	44.5	32209	
1963	44.7	32354	
1964	44.9	32498	
1965	43.4	31413	
1966	41.8	30255	
1967	46	33295	
1968	40.6	29386	
1969	42.7	30906	
1970	40.9	29603	
1971	38.1	27577	
1972	43.5	31485	
1973	45.5	32933	
1974	40.5	29314	
1975	39.9	28879	
1976	41.2	29820	
1977	37.5	27142	
1978	36.2	26201	
1979	39.2	28373	
1980	39.8	28807	
1981	37.9	27432	
1982	37.8	27359	
1983	39.4	28518	
1984	39.4	28518	
1985	38.2	27649	33649

NSE Ex. No. 211_USGS 09416000_Muddy R nr Moapa_all data_1914-2013
annual flows 1914-2012

1986	36.6	26491	32491
1987	37.6	27215	33215
1988	39.7	28735	34735
1989	33.7	24392	30392
1990	36.6	26491	32491
1991	36.1	26129	32129
1992	36.4	26346	32346
1993	39.6	28662	34662
1994	39.4	28518	34518
1995	35.6	25767	31767
1996	33.5	24247	30247
1997	32.5	23523	29523
1998	34.9	25260	31260
1999	34.8	25188	31188
2000	34.5	24971	30971
2001	32.2	23306	29306
2002	31.4	22727	28727
2003	31.7	22944	28944
2004	30.4	22003	28003
2005	33.2	24030	30030
2006	33.2	24030	30030
2007	33.2	24030	30030
2008	35.4	25622	31622
2009	35	25333	31333
2010	35.7	25839	31839
2011	37.3	26998	32998
2012	37.6	27215	33215

USGS	9416000	60	1	1914	47.2
USGS	9416000	60	1	1915	47.6
USGS	9416000	60	1	1917	46.7
USGS	9416000	60	1	1918	47
USGS	9416000	60	1	1945	45.7
USGS	9416000	60	1	1946	46.9
USGS	9416000	60	1	1947	47.7
USGS	9416000	60	1	1948	46.3
USGS	9416000	60	1	1949	47
USGS	9416000	60	1	1950	46.2
USGS	9416000	60	1	1951	46.9
USGS	9416000	60	1	1952	46.6
USGS	9416000	60	1	1953	46
USGS	9416000	60	1	1954	46
USGS	9416000	60	1	1955	47.2
USGS	9416000	60	1	1956	45.8

---------------------------------- WARNING ----------------------------------
The data you have obtained from this automated U.S. Geological Survey database
have not received Director's approval and as such are provisional and subject to
revision. The data are released on the condition that neither the USGS nor the
United States Government may be held liable for any damages resulting from its use.
Additional info: http://waterdata.usgs.gov/nv/nwis/help/?provisional
#
File-format description: http://waterdata.usgs.gov/nwis/?tab_delimited_format_info
Automated-retrieval info: http://waterdata.usgs.gov/nwis/?automated_retrieval_info
#
Contact: gs-w_support_nwisweb@usgs.gov
retrieved: 2013-01-31 15:45:47 EST (vaww01)
#
Data for the following 1 site(s) are contained in this file
USGS 09416000 MUDDY RV NR MOAPA, NV

#
Data provided for site 09416000
DD parameter statistic Description
01 00060 00003 Discharge, cubic feet per second (Mean)
#
Data-value qualification codes included in this output:
A Approved for publication -- Processing and review completed.
P Provisional data subject to revision.
e Value has been estimated.
#

agency_cd	site_no	datetime	01_00060_00003	01_00060_00003_cd
5s	15s	20d	14n	10s
USGS	9416000	10/1/1944	46	A
USGS	9416000	10/2/1944	46	A
USGS	9416000	10/3/1944	46	A
USGS	9416000	10/4/1944	46	A
USGS	9416000	10/5/1944	46	A
USGS	9416000	10/6/1944	46	A
USGS	9416000	10/7/1944	46	A
USGS	9416000	10/8/1944	46	A
USGS	9416000	10/9/1944	46	A
USGS	9416000	10/10/1944	46	A
USGS	9416000	10/11/1944	46	A
USGS	9416000	10/12/1944	46	A
USGS	9416000	10/13/1944	46	A
USGS	9416000	10/14/1944	46	A
USGS	9416000	10/15/1944	46	A
USGS	9416000	10/16/1944	46	A
USGS	9416000	10/17/1944	46	A
USGS	9416000	10/18/1944	46	A
USGS	9416000	10/19/1944	46	A

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Steven D. Grierson
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DYLAN V. FREHNER, ESQ.
Nevada State Bar No. 9020
LINCOLN COUNTY DISTRICT ATTORNEY
181 North Main Street, Suite 205
P.O. Box 60
Pioche, Nevada 89043
Telephone: (775) 962-8073
Email: dfrehner@lincolncountynv.gov

WAYNE O. KLOMP, ESQ.
Nevada State Bar No. 10109
GREAT BASIN LAW
1783 Trek Trail
Reno, Nevada 89521
Telephone: (775) 770-0386
Email: wayne@greatbasinlawyer.com

KAREN A. PETERSON, ESQ.
Nevada State Bar No. 366
ALLISON MacKENZIE, LTD.
402 North Division Street
Carson City, Nevada 89703
Telephone: (775) 687-0202
Email: kpeterson@allisonmackenzie.com

Attorneys for Petitioners, LINCOLN COUNTY WATER DISTRICT and VIDLER WATER COMPANY, INC.

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

DISTRICT COURT

CLARK COUNTY, NEVADA

LAS VEGAS VALLEY WATER DISTRICT, and SOUTHERN NEVADA WATER AUTHORITY, et al.,

Petitioners,

vs.

ADAM SULLIVAN, P.E., Acting Nevada State Engineer, et al.,

Respondent.
_______________________________/

Case No. A-20-816761-C

Dept. No. 1

Consolidated with Cases:
A-20-817765-P
A-20-818015-P
A-20-817977-P
A-20-818069-P
A-20-817840-P
A-20-817876-P
A-21-833572-J

LINCOLN COUNTY WATER DISTRICT AND VIDLER WATER COMPANY, INC.'S MASTER RECORD ON APPEAL CITED IN OPENING, ANSWERING AND REPLY BRIEFS
(VOLUME 2 OF 3)

///

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

Petitioners, LINCOLN COUNTY WATER DISTRICT ("LINCOLN") and VIDLER WATER COMPANY, INC. ("VIDLER"), by and through their counsel, DYLAN V. FREHNER, LINCOLN COUNTY DISTRICT ATTORNEY, WAYNE O. KLOMP of GREAT BASIN LAW, and KAREN A. PETERSON of ALLISON MacKENZIE, LTD., submit their Master Record on Appeal cited in their Opening, Answering and Reply Briefs in support of their Petition for Judicial Review.

The attached documents constitute excerpts from the Record on Appeal cited in LINCOLN/VIDLER's Opening, Answering and Reply Briefs in support of their Petition for Judicial Review.

DESCRIPTION	SE ROA NO.
Volume 1	2 – 4945
Volume 2	8058 – 36591
Volume 3	36689 – 54520

AFFIRMATION

The undersigned does hereby affirm that the foregoing **DOES NOT** contain the social security number of any person.

DATED this 11th day of January, 2022.

LINCOLN COUNTY DISTRICT ATTORNEY
181 North Main Street, Suite 205
P.O. Box 60
Pioche, Nevada 89043
Telephone: (775) 962-8073

/s/ Dylan V. Frehner
DYLAN V. FREHNER #9020
Email: dfrehner@lincolncountynv.gov

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GREAT BASIN LAW
1783 Trek Trail
Reno, Nevada 89521
Telephone: (775) 770-0386

/s/ Wayne O. Klomp
WAYNE O. KLOMP #10109
Email: wayne@greatbasinlawyer.com

Attorneys for ***Lincoln County Water District***

ALLISON MacKENZIE, LTD.
402 North Division Street
Carson City, Nevada 89703
Telephone: (775) 687-0202

/s/ Karen A. Peterson
KAREN A. PETERSON #366
Email: kpeterson@allisonmackenzie.com

Attorneys for ***Vidler Water Company, Inc.***

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

CERTIFICATE OF SERVICE

Pursuant to NRCP 5(b), I hereby certify that I am an employee of ALLISON MacKENZIE, LTD., Attorneys at Law, and that on this date, I caused a true and correct copy of the foregoing document to be served on all parties to this action by electronic service to the participates in this case who are registered with the Eighth Judicial District Court's Odyssey eFileNV File & Service system to this matter.

I hereby certify that I caused a true and correct copy of the foregoing document to be served via FedEx as follow:

Clark County District Court
Attn: Hon. Bita Yeager – District. Ct. Dept. 1
Court Administration – 2nd Floor
200 Lewis Avenue
Las Vegas, NV 89101

DATED this 11th day of January, 2022.

/s/ Nancy Fontenot
NANCY FONTENOT

4871-7479-1433, v. 1

	Pumpage (gal)					
Month-Year	CSI-1	CSI-2	CSI-3	CSI-4	CSV-RW2	MX-5
Jan-00						
Feb-00						
Mar-00						
Apr-00						
May-00						
Jun-00						
Jul-00						
Aug-00						
Sep-00						
Oct-00						
Nov-00						
Dec-00						
Jan-01						
Feb-01						
Mar-01						
Apr-01						
May-01						
Jun-01						
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Nov-01						
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Jan-02						
Feb-02						
Mar-02						
Apr-02						
May-02						
Jun-02						
Jul-02						
Aug-02						
Sep-02						
Oct-02						
Nov-02						
Dec-02						
Jan-03						
Feb-03						
Mar-03						
Apr-03						
May-03						
Jun-03						
Jul-03						
Aug-03						
Sep-03						

Month-Year	Coyote Spring Valley Jan-Dec total (af)	NV COGEN EBP-2	NV COGEN EGV-3	NV COGEN EBM-4
Jan-00	0	0	18,867,000	18,092,000
Feb-00		13,472,000	19,182,000	3,649,000
Mar-00		620,000	22,590,000	21,034,000
Apr-00		2,314,000	17,487,000	23,479,000
May-00		0	26,640,000	24,147,000
Jun-00		208,000	26,819,000	24,606,000
Jul-00		5,373,000	20,049,000	37,604,000
Aug-00		0	26,739,000	24,710,000
Sep-00		0	25,993,000	23,760,000
Oct-00		0	24,261,000	21,286,000
Nov-00		0	20,072,000	19,278,000
Dec-00		0	21,048,000	18,278,000
Jan-01	0	0	20,817,000	17,731,000
Feb-01		0	19,471,000	18,058,000
Mar-01		1,000	17,352,000	18,358,000
Apr-01		0	16,992,000	23,236,000
May-01		0	23,511,000	25,056,000
Jun-01		261,000	24,044,000	25,306,000
Jul-01		36,000	24,674,000	27,184,000
Aug-01		0	22,665,000	30,011,000
Sep-01		0	16,786,000	24,226,000
Oct-01		0	17,442,000	22,423,000
Nov-01		881,000	15,492,000	20,754,000
Dec-01		0	19,692,000	25,123,000
Jan-02	0	0	19,753,000	20,873,000
Feb-02		126,000	17,760,000	19,803,000
Mar-02		3,484,000	11,710,000	20,130,000
Apr-02		4,704,000	15,466,000	26,184,000
May-02		0	26,366,000	30,162,000
Jun-02		5,204,000	29,563,000	19,048,000
Jul-02		126,000	25,261,000	31,719,000
Aug-02		0	21,250,000	30,069,000
Sep-02		4,299,000	24,749,000	19,099,000
Oct-02		1,000	25,656,000	27,764,000
Nov-02		0	22,440,000	21,417,000
Dec-02		5,213,000	23,847,000	15,111,000
Jan-03	0	8,157,000	26,065,000	8,786,000
Feb-03		10,869,000	26,304,000	0
Mar-03		1,624,000	23,856,000	18,686,000
Apr-03		353,000	25,927,000	24,489,000
May-03		2,880,000	21,190,000	25,427,000
Jun-03		22,730,000	14,571,000	11,773,000
Jul-03		3,519,000	24,948,000	24,796,000
Aug-03		15,759,000	19,782,000	12,266,000
Sep-03		25,515,000	28,084,000	0

Month-Year	Black Mtns Jan-Dec total (af)	CHEM LIME OLD	CHEM LIME NEW	DRY LAKE GV-2
Jan-00	1,693			
Feb-00				
Mar-00				
Apr-00				
May-00				
Jun-00				
Jul-00				
Aug-00				
Sep-00				
Oct-00				
Nov-00				
Dec-00				
Jan-01	1,588	2,380,000	2,640,000	
Feb-01		2,920,000	2,110,000	
Mar-01		2,380,000	1,680,000	
Apr-01		3,240,000	3,600,000	
May-01		3,020,000	4,450,000	
Jun-01		3,240,000	3,140,000	
Jul-01		2,810,000	4,210,000	
Aug-01		2,730,000	4,190,000	
Sep-01		2,700,000	4,090,000	
Oct-01		3,043,950	4,754,370	
Nov-01		2,448,500	3,614,980	
Dec-01		2,475,720	3,442,320	
Jan-02	1,744	2,711,560	3,753,560	
Feb-02		2,902,400	4,008,350	
Mar-02		3,148,140	4,350,420	
Apr-02		1,825,000	4,868,000	
May-02		3,645,000	4,957,000	
Jun-02		2,586,000	4,562,000	
Jul-02		2,697,640	4,190,420	
Aug-02		3,584,110	4,443,210	
Sep-02		3,474,540	4,101,500	
Oct-02		3,665,690	3,632,350	
Nov-02		3,505,510	2,410,200	
Dec-02		1,808,800	2,025,990	
Jan-03	1,709	2,141,000	3,390,000	
Feb-03		2,486,000	2,863,000	
Mar-03		2,807,560	3,558,500	
Apr-03		3,174,000	4,174,000	
May-03		3,125,000	4,126,000	
Jun-03		3,219,000	4,123,000	
Jul-03		3,172,000	4,035,000	
Aug-03		3,172,000	4,035,000	
Sep-03		2,247,000	2,833,000	

Month-Year	REPUBLIC WELL #1	REPUBLIC WELL #2	REPUBLIC WELL #5
Jan-00			
Feb-00			
Mar-00		14,236,400	3,293,600
Apr-00			
May-00			
Jun-00		10,828,700	13,096,800
Jul-00			
Aug-00			
Sep-00		4,532,800	33,001,400
Oct-00			
Nov-00			
Dec-00		220,400	33,671,600
Jan-01			
Feb-01			
Mar-01		664,300	6,722,400
Apr-01			
May-01			
Jun-01		4,072,300	21,540,600
Jul-01			
Aug-01			
Sep-01		8,461,000	22,747,300
Oct-01			
Nov-01			
Dec-01		9,300,050	7,477,700
Jan-02			
Feb-02			
Mar-02		13,728,150	5,156,200
Apr-02			
May-02			
Jun-02		9,646,600	13,869,800
Jul-02			
Aug-02			
Sep-02		9,384,000	12,763,000
Oct-02			
Nov-02			
Dec-02		444,600	7,821,100
Jan-03			
Feb-03			
Mar-03		14,100,400	8,841,400
Apr-03			
May-03			
Jun-03		12,616,300	21,805,500
Jul-03			
Aug-03			
Sep-03		17,557,200	15,610,300

Month-Year	REPUBLIC WELL #6	GV-MIRANT1	GV-DUKE-WS1	GV-DUKE-WS2	GV-PW-WS1
Jan-00					
Feb-00					
Mar-00	11,687,700				
Apr-00					
May-00					
Jun-00	17,732,600				
Jul-00					
Aug-00					
Sep-00	8,244,700				
Oct-00					
Nov-00					
Dec-00	2,589,200				
Jan-01					
Feb-01					
Mar-01	16,553,400				
Apr-01					
May-01					
Jun-01	14,610,000				
Jul-01					
Aug-01					
Sep-01	16,222,700				
Oct-01					
Nov-01					
Dec-01	11,376,100				
Jan-02			827,400	0	0
Feb-02			2,965,669	0	0
Mar-02	4,610,900		2,096,688	0	0
Apr-02			3,234,061	0	0
May-02		3,645,623	4,467,939	3,312,100	0
Jun-02	7,700,300	3,254,451	5,784,610	0	0
Jul-02		5,962,152	3,498,065	0	0
Aug-02		2,724,774	3,803,782	0	4,505,425
Sep-02	16,895,700	2,567,000	6,374,024	0	10,401,855
Oct-02		1,110,000	2,894,745	0	6,560,000
Nov-02		2,675,000	575,668	0	2,111,000
Dec-02	13,745,200	3,000,000	461,386	0	1,050,000
Jan-03		5,307,000	0	0	1,200,000
Feb-03		1,792,000	0	0	194,000
Mar-03	4,962,700	3,942,000	0	0	1,788,983
Apr-03		3,998,000	0	0	1,289,912
May-03		4,134,000	0	0	1,696,524
Jun-03	12,005,900	3,760,000	0	0	2,506,268
Jul-03		5,786,000	0	0	2,079,648
Aug-03		5,116,000	0	0	658,995
Sep-03	15,790,700	3,802,000	0	0	1,491,374

Month-Year	GV-RW1	Garnet Valley Jan-Dec total (af)	PAIUTES TH-1	PAIUTES ECP-1	PAIUTES ECP-2
Jan-00		470			
Feb-00					
Mar-00					
Apr-00					
May-00					
Jun-00					
Jul-00					
Aug-00					
Sep-00					
Oct-00					
Nov-00					
Dec-00					
Jan-01	0	708			
Feb-01	0				
Mar-01	0				
Apr-01	0				
May-01	0				
Jun-01	0				
Jul-01	0				
Aug-01	5,676,600				
Sep-01	4,830,600				
Oct-01	2,902,900				
Nov-01	1,671,300				
Dec-01	698,200				
Jan-02		885			
Feb-02					
Mar-02					
Apr-02					
May-02					
Jun-02					
Jul-02					
Aug-02					
Sep-02					
Oct-02					
Nov-02					
Dec-02					
Jan-03		855			
Feb-03					
Mar-03					
Apr-03					
May-03					
Jun-03					
Jul-03					
Aug-03					
Sep-03					

Month-Year	PAIUTES-ECP-3	CA Wash Jan-Dec total (af)	MX-6	ARROW CANYON 1
Jan-00		0	0	51,210,000
Feb-00			0	39,570,000
Mar-00			0	55,860,000
Apr-00			430,000	81,410,000
May-00			0	101,400,000
Jun-00			5,140,000	107,110,000
Jul-00			10,170,000	120,360,000
Aug-00			12,100,000	102,690,000
Sep-00			12,950,000	85,050,000
Oct-00			1,340,000	70,280,000
Nov-00			360,000	53,260,000
Dec-00			0	36,740,000
Jan-01		0	400,000	39,410,000
Feb-01			0	35,070,000
Mar-01			0	55,630,000
Apr-01			0	65,980,000
May-01			12,930,000	62,240,000
Jun-01			23,760,000	101,440,000
Jul-01			22,040,000	100,270,000
Aug-01			21,380,000	106,060,000
Sep-01			20,310,000	75,950,000
Oct-01			0	76,350,000
Nov-01			0	54,530,000
Dec-01			20,000	20,150,000
Jan-02		0	0	870,000
Feb-02			0	19,500,000
Mar-02			0	62,270,000
Apr-02			0	52,570,000
May-02			4,690,000	87,650,000
Jun-02			22,880,000	73,470,000
Jul-02			20,880,000	101,420,000
Aug-02			23,930,000	111,550,000
Sep-02			18,570,000	65,070,000
Oct-02			9,640,000	63,650,000
Nov-02			40,000	52,800,000
Dec-02			20,000	46,830,000
Jan-03		0	0	43,810,000
Feb-03			8,000	51,220,000
Mar-03			40,000	47,380,000
Apr-03			13,870,000	53,340,000
May-03			20,175,000	72,035,000
Jun-03			19,400,000	94,840,000
Jul-03			20,150,000	103,420,000
Aug-03			20,230,000	90,190,000
Sep-03			19,270,000	76,660,000

Month-Year	ARROW CANYON 2	Muddy River (carbonate) Jan-Dec total (af)	LDS EAST	LDS WEST
Jan-00		2,908	1,487,000	23,814,000
Feb-00			20,474,000	18,939,000
Mar-00			44,674,000	0
Apr-00			23,870,000	0
May-00			13,422,000	0
Jun-00			44,165,000	24,241,000
Jul-00			40,545,000	45,737,000
Aug-00			37,717,000	54,665,000
Sep-00			40,257,000	55,748,000
Oct-00			31,773,000	46,762,000
Nov-00			42,104,000	49,875,000
Dec-00			23,266,000	34,046,000
Jan-01		2,743	9,580,000	44,300,000
Feb-01			0	27,410,000
Mar-01			0	0
Apr-01			2,650,000	10,560,000
May-01			23,830,000	36,670,000
Jun-01			34,530,000	38,970,000
Jul-01			26,360,000	42,720,000
Aug-01			33,400,000	27,480,000
Sep-01			42,290,000	0
Oct-01			24,708,000	0
Nov-01			0	0
Dec-01			3,000	0
Jan-02		2,573	5,596,000	0
Feb-02			0	0
Mar-02			0	0
Apr-02			36,439,000	0
May-02			22,434,000	41,660,000
Jun-02			5,236,000	32,694,000
Jul-02			24,903,000	42,674,000
Aug-02			14,964,000	45,388,000
Sep-02			0	45,863,000
Oct-02			6,073,000	35,900,000
Nov-02			9,325,000	2,759,000
Dec-02			0	0
Jan-03		2,816	0	0
Feb-03			0	0
Mar-03			0	0
Apr-03			11,098,000	0
May-03			18,773,000	14,309,000
Jun-03			40,963,000	32,565,000
Jul-03			43,015,000	37,735,000
Aug-03			32,695,000	36,096,000
Sep-03			16,728,000	27,874,000

Month-Year	LDS CENTRAL	PERKINS PRODUCTION	BEHMER	LEWIS 1	LEWIS 2
Jan-00	21,805,000	14,822,000	881,000	1,000	0
Feb-00	41,722,000	19,612,000	0	0	0
Mar-00	45,562,000	10,762,000	0	0	0
Apr-00	29,835,000	13,231,000	6,191,000	0	0
May-00	12,653,000	14,482,000	23,487,000	29,171,000	31,771,000
Jun-00	36,049,000	26,091,000	26,281,000	25,284,000	28,347,000
Jul-00	38,110,000	14,456,000	12,474,000	12,227,332	23,300,000
Aug-00	19,635,000	14,240,000	19,904,000	21,810,000	19,739,000
Sep-00	33,023,000	0	10,180,000	13,420,000	1,000
Oct-00	17,346,000	5,025,000	24,735,000	0	0
Nov-00	4,749,000	9,320,000	29,919,000	0	0
Dec-00	14,556,000	11,434,000	26,029,000	0	0
Jan-01	12,800,000	13,480,000	31,290,000	0	0
Feb-01	40,990,000	19,130,000	20,260,000	0	0
Mar-01	32,840,000	20,490,000	30,520,000	2,600,000	0
Apr-01	4,000,000	4,400,000	20,560,000	0	0
May-01	26,320,000	0	32,840,000	0	0
Jun-01	19,730,000	0	29,740,000	7,150,000	0
Jul-01	41,900,000	7,400,000	21,660,000	2,070,000	0
Aug-01	49,040,000	11,520,000	4,860,000	12,240,000	3,620,000
Sep-01	52,550,000	25,070,000	15,930,000	11,570,000	2,560,000
Oct-01	16,892,000	20,109,000	20,011,000	0	0
Nov-01	7,800,000	18,760,000	14,310,000	0	0
Dec-01	5,193,000	19,171,000	24,288,000	0	0
Jan-02	5,230,000	20,571,000	30,847,000	0	0
Feb-02	18,698,000	17,429,000	21,831,000	0	0
Mar-02	13,001,000	21,224,000	14,527,000	0	0
Apr-02	26,281,000	22,411,000	22,638,000	0	0
May-02	43,087,000	17,793,000	7,892,000	27,257,000	1,000,000
Jun-02	31,953,000	14,938,000	16,337,000	19,955,000	0
Jul-02	41,666,000	16,343,000	24,674,000	26,867,000	28,466,000
Aug-02	45,881,000	2,548,000	26,343,000	21,800,000	29,631,000
Sep-02	43,166,000	9,656,000	27,921,000	25,389,000	18,658,000
Oct-02	14,136,000	17,902,000	24,649,000	1,826,000	758,000
Nov-02	13,005,000	20,028,000	21,968,000	0	0
Dec-02	253,000	55,461,000	27,526,000	0	0
Jan-03	0	38,119,000	20,287,000	0	0
Feb-03	0	22,150,000	23,188,000	0	0
Mar-03	5,116,000	33,704,000	16,347,000	0	0
Apr-03	13,086,000	18,288,000	137,000	0	0
May-03	20,092,000	11,926,000	13,584,000	21,671,000	16,555,000
Jun-03	36,065,000	18,109,000	21,871,000	12,348,000	20,630,000
Jul-03	51,015,000	19,231,000	24,260,000	22,171,000	18,451,000
Aug-03	37,388,000	153,000	16,995,000	16,943,000	10,832,000
Sep-03	43,021,000	18,499,000	19,576,000	20,124,000	1,720,000

Month-Year	LEWIS 3	LEWIS 4	LEWIS 5	Muddy River (alluvial) Jan-Dec total (af)	RG1-3 Muddy River
Jan-00	0	0	0	5,966	
Feb-00	0	1,000	1,000		
Mar-00	53,000	0	0		
Apr-00	3,000	0	324,000		
May-00	5,288,000	0	38,259,000		
Jun-00	37,521,000	0	25,201,000		
Jul-00	29,582,000	12,790,000	27,302,000		
Aug-00	36,992,000	27,920,000	19,176,000		
Sep-00	40,309,000	37,017,000	26,647,000		
Oct-00	2,751,000	2,291,000	2,296,000		
Nov-00	0	1,084,000	0		
Dec-00	0	0	0		
Jan-01	0	0	0	4,867	
Feb-01	0	0	0		
Mar-01	3,130,000	2,140,000	2,910,000		
Apr-01	5,200,000	4,460,000	2,470,000		
May-01	21,410,000	20,430,000	27,880,000		
Jun-01	12,460,000	28,660,000	29,740,000		
Jul-01	39,310,000	18,860,000	18,010,000		
Aug-01	22,540,000	14,410,000	16,940,000		
Sep-01	36,750,000	22,220,000	32,100,000		
Oct-01	226,000	174,000	234,000		
Nov-01	0	0	0		
Dec-01	0	0	0		
Jan-02	0	1,000	0	5,735	0
Feb-02	0	0	0		0
Mar-02	0	0	0		0
Apr-02	0	0	0		
May-02	18,052,000	23,133,000	41,101,000		
Jun-02	37,080,000	26,818,000	12,518,000		
Jul-02	7,000	40,494,000	0		0
Aug-02	140,686,000	25,837,000	0		0
Sep-02	40,307,000	25,182,400	0		0
Oct-02	2,240,000	61,857,000	5,000		0
Nov-02	0	0	0		0
Dec-02	0	0	0		0
Jan-03	0	0	0	5,017	0
Feb-03	0	0	0		0
Mar-03	0	0	0		0
Apr-03	0	11,508,700	0		0
May-03	26,680,000	11,924,100	15,836,000		0
Jun-03	25,320,000	14,982,400	27,342,000		0
Jul-03	32,441,000	12,247,600	27,917,000		0
Aug-03	27,916,000	16,186,800	14,889,000		0
Sep-03	24,423,000	18,645,600	21,033,000		0

Month-Year	RG4 Muddy River
Jan-00	
Feb-00	
Mar-00	
Apr-00	
May-00	
Jun-00	
Jul-00	
Aug-00	
Sep-00	
Oct-00	
Nov-00	
Dec-00	
Jan-01	
Feb-01	
Mar-01	
Apr-01	
May-01	
Jun-01	
Jul-01	
Aug-01	
Sep-01	
Oct-01	
Nov-01	
Dec-01	
Jan-02	0
Feb-02	0
Mar-02	0
Apr-02	0
May-02	
Jun-02	
Jul-02	0
Aug-02	0
Sep-02	0
Oct-02	0
Nov-02	0
Dec-02	0
Jan-03	0
Feb-03	0
Mar-03	0
Apr-03	0
May-03	0
Jun-03	0
Jul-03	0
Aug-03	0
Sep-03	0

	Pumpage (gal)					
Month-Year	CSI-1	CSI-2	CSI-3	CSI-4	CSV-RW2	MX-5
Oct-03						
Nov-03						
Dec-03						
Jan-04						
Feb-04						
Mar-04						
Apr-04						
May-04						
Jun-04						
Jul-04						
Aug-04						
Sep-04						
Oct-04						
Nov-04						
Dec-04						
Jan-05	0	0				
Feb-05	0	0				
Mar-05	0	0				
Apr-05	0	0				
May-05	12,558,000	0				
Jun-05	6,041,000	0				
Jul-05	10,850,000	0				
Aug-05	10,562,000	504,000				
Sep-05	8,871,000	11,328,000				
Oct-05	7,902,000	2,019,000				
Nov-05	7,503,000	0				
Dec-05	6,095,000	0				
Jan-06	6,963,000	0	0	0		
Feb-06	9,356,000	0	0	0		
Mar-06	9,896,000	0	0	0		
Apr-06	18,070,000	0	0	0		
May-06	23,895,000	0	0	0		
Jun-06	35,570,000	0	0	0		
Jul-06	32,447,000	10,890,000	0	0		
Aug-06	24,969,000	37,648,000	0	0		
Sep-06	32,609,000	29,760,000	10,164,000	0		
Oct-06	20,239,000	30,917,000	0	0		
Nov-06	10,739,000	28,683,000	0	0		
Dec-06	10,585,000	32,688,000	0	0		
Jan-07	10,741,000	15,256,000	0	0		
Feb-07	10,904,000	23,213,000	0	0		
Mar-07	14,867,000	32,248,000	0	0		
Apr-07	21,250,000	34,823,000	0	0		
May-07	20,999,000	57,875,000	0	0		
Jun-07	28,506,000	50,119,000	5,362,000	0		

Month-Year	Coyote Spring Valley Jan-Dec total (af)	NV COGEN EBP-2	NV COGEN EGV-3	NV COGEN EBM-4
Oct-03		28,110,000	0	19,680,000
Nov-03		25,409,000	0	15,845,000
Dec-03		21,916,000	2,550,000	15,059,000
Jan-04	0	13,081,000	8,820,000	19,306,000
Feb-04		0	21,792,000	18,091,000
Mar-04		0	26,263,000	21,497,000
Apr-04		2,719,000	19,768,000	17,359,000
May-04		24,960,000	23,004,000	0
Jun-04		3,346,000	25,390,000	26,026,000
Jul-04		794,000	28,316,000	29,934,000
Aug-04		11,601,000	23,079,000	21,937,000
Sep-04		0	21,420,000	24,995,000
Oct-04		0	23,172,000	23,347,000
Nov-04		0	22,298,000	17,161,000
Dec-04		0	22,178,000	15,677,000
Jan-05	259	0	22,351,000	20,423,000
Feb-05		0	21,045,000	19,226,000
Mar-05		39,000	24,327,000	21,134,000
Apr-05		333,000	26,510,000	19,651,000
May-05		16,000	26,336,000	22,697,000
Jun-05		31,000	22,174,000	22,232,000
Jul-05		9,000	23,900,000	24,253,000
Aug-05		6,000	28,056,000	23,488,000
Sep-05		0	27,217,000	22,876,000
Oct-05		22,000	25,554,000	19,345,000
Nov-05		27,000	15,379,000	17,865,000
Dec-05		0	20,865,000	17,018,000
Jan-06	1,277	878,000	20,302,000	18,241,000
Feb-06		20,000	19,510,000	17,861,000
Mar-06		19,000	19,461,000	20,903,000
Apr-06		0	21,997,000	20,464,000
May-06		37,000	23,769,000	23,449,000
Jun-06		21,000	23,726,000	23,806,000
Jul-06		21,000	21,864,000	25,214,000
Aug-06		18,000	23,433,000	24,552,000
Sep-06		5,142,000	15,101,000	21,135,000
Oct-06		14,934,000	7,632,000	18,374,000
Nov-06		12,853,000	17,122,000	17,342,000
Dec-06		18,000	15,841,000	16,175,000
Jan-07	2,781	0	20,076,000	16,508,000
Feb-07		9,000	19,462,000	17,523,000
Mar-07		7,000	22,928,000	19,234,000
Apr-07		8,000	17,765,000	19,391,000
May-07		0	29,115,000	22,128,000
Jun-07		12,000	28,536,000	25,181,000

Month-Year	Black Mtns Jan-Dec total (af)	CHEM LIME OLD	CHEM LIME NEW	DRY LAKE GV-2
Oct-03		3,385,230	4,276,370	
Nov-03		2,131,430	2,720,170	
Dec-03		2,057,423	3,139,229	
Jan-04	1,710	2,336,218	3,002,031	
Feb-04		2,983,570	2,324,200	
Mar-04		3,655,250	4,813,730	
Apr-04		3,412,820	4,316,700	
May-04		3,288,840	4,149,170	
Jun-04		3,084,300	3,770,990	
Jul-04		3,879,150	4,691,000	
Aug-04		3,494,000	4,302,000	
Sep-04		2,509,000	3,986,000	
Oct-04		3,301,670	3,374,000	
Nov-04		3,494,000	749,000	
Dec-04		3,168,000	1,859,000	
Jan-05	1,640	1,902,560	2,653,310	
Feb-05		2,933,340	1,512,220	
Mar-05		3,295,870	1,764,900	
Apr-05		833,440	911,970	
May-05		2,997,030	3,829,110	
Jun-05		4,170,590	3,910,300	
Jul-05		3,055,960	3,326,080	
Aug-05		3,776,930	4,222,930	
Sep-05		3,157,690	3,065,180	
Oct-05		3,598,760	3,707,740	
Nov-05		3,148,030	3,154,920	
Dec-05		3,300,910	3,357,410	
Jan-06	1,569	3,595,660	3,515,090	
Feb-06		3,340,910	3,304,640	
Mar-06		3,500,000	3,573,620	
Apr-06		3,284,220	3,310,300	
May-06		3,966,020	3,849,920	
Jun-06		3,615,270	3,211,750	
Jul-06		3,397,550	3,507,700	
Aug-06		3,592,960	3,518,150	
Sep-06		3,463,920	3,206,020	
Oct-06		3,589,320	3,256,620	
Nov-06		3,638,260	2,845,320	
Dec-06		3,630,780	2,107,190	
Jan-07	1,585	4,220,720	3,300,168	
Feb-07		3,686,740	2,627,321	
Mar-07		3,594,040	2,653,880	
Apr-07		3,649,940	3,227,910	
May-07		2,240,340	5,490,900	
Jun-07		3,641,800	5,719,810	

Month-Year	REPUBLIC WELL #1	REPUBLIC WELL #2	REPUBLIC WELL #5
Oct-03			
Nov-03			
Dec-03		8,617,700	9,569,100
Jan-04			
Feb-04			
Mar-04		11,610,600	7,525,800
Apr-04			
May-04			
Jun-04		11,783,600	10,987,500
Jul-04			
Aug-04			
Sep-04		11,408,200	17,625,300
Oct-04			
Nov-04			
Dec-04		9,864,100	7,909,500
Jan-05			
Feb-05			
Mar-05		1,419,400	3,260,300
Apr-05			
May-05			
Jun-05		2,347,500	25,696,600
Jul-05			
Aug-05			
Sep-05		100	26,854,000
Oct-05			
Nov-05			
Dec-05		4,556,200	15,116,800
Jan-06			
Feb-06			
Mar-06		7,430,100	13,029,300
Apr-06			
May-06			
Jun-06		8,642,900	24,518,600
Jul-06			
Aug-06			
Sep-06			
Oct-06			
Nov-06			
Dec-06			
Jan-07			
Feb-07			
Mar-07		293,300	11,591,400
Apr-07			
May-07			
Jun-07		11,680,400	9,675,900

Month-Year	REPUBLIC WELL #6	GV-MIRANT1	GV-DUKE-WS1	GV-DUKE-WS2	GV-PW-WS1
Oct-03		2,602,000	0	0	720,699
Nov-03		291,000	0	0	1,088,041
Dec-03	4,303,700	129,000	0	0	1,007,292
Jan-04		521,000			7,117,841
Feb-04		889,000			7,133,305
Mar-04	2,101,399	571,000			4,862,573
Apr-04		1,040,000	0	0	1,801,254
May-04		1,415,000	0	0	1,224,177
Jun-04	11,807,200	2,205,000	0	0	4,209,943
Jul-04		2,093,000			5,199,958
Aug-04		2,173,000			6,607,075
Sep-04	13,382,400	1,327,000			3,043,062
Oct-04		1,141,400	0	0	1,742,400
Nov-04		713,000	67,365	0	1,337,626
Dec-04	6,019,200	323,000	214,395	0	2,053,676
Jan-05		164,000	530,200	0	2,837,485
Feb-05		1,245,000	683,950	0	603,860
Mar-05	12,328,100	960,000	1,002,000	0	2,991,125
Apr-05		683,000	1,481,000	0	685,820
May-05		938,000	1,674,000	0	1,937,189
Jun-05	12,165,700	1,611,000	2,344,000	0	4,780,123
Jul-05		4,000,000	1,143,000	0	7,243,742
Aug-05		2,968,000	3,738,000	1,800,000	5,823,532
Sep-05	16,432,600	2,330,000	6,584,000	0	5,759,801
Oct-05		1,100,000	320,000	3,680,000	4,163,039
Nov-05		757,000	415,000	4,767,000	3,265,705
Dec-05	5,594,300	773,000	7,951,000	9,929,000	2,973,298
Jan-06		309,000	6,273,000	2,712,000	2,552,430
Feb-06		717,000	5,403,000	3,374,000	3,071,045
Mar-06	10,216,600	234,000	3,535,000	379,000	2,669,079
Apr-06		1,155,000	3,288,000	422,000	2,798,375
May-06		2,527,000	4,088,000	3,562,000	6,250,404
Jun-06	16,186,400	2,670,000	1,627,000	8,877,000	6,194,504
Jul-06		3,170,000	2,405,000	12,501,000	6,911,928
Aug-06		3,070,000	2,527,000	10,955,000	6,229,011
Sep-06		2,730,000	3,009,000	7,255,000	4,926,932
Oct-06		1,370,000	1,858,023	2,667,308	3,963,807
Nov-06		790,000	987,761	80,037	2,185,200
Dec-06		1,360,000	739,106	143,457	3,685,598
Jan-07		1,190,000	2,580,000	0	3,720,000
Feb-07		990,000	730,000	0	2,810,000
Mar-07	6,935,100	750,000	3,110,000	1,930,000	2,650,000
Apr-07		1,080,000	4,810,000	2,870,000	3,870,000
May-07		1,920,000	7,780,000	6,870,000	5,590,000
Jun-07	20,068,200	2,730,000	9,650,000	11,000,000	5,670,000

Month-Year	GV-RW1	Garnet Valley Jan-Dec total (af)	PAIUTES TH-1	PAIUTES ECP-1	PAIUTES ECP-2
Oct-03					
Nov-03					
Dec-03					
Jan-04		807			
Feb-04					
Mar-04					
Apr-04					
May-04					
Jun-04					
Jul-04					
Aug-04					
Sep-04					
Oct-04					
Nov-04					
Dec-04					
Jan-05	10	940			
Feb-05	8,300				
Mar-05	0				
Apr-05	7,190				
May-05	0				
Jun-05	14,940				
Jul-05	24,730				
Aug-05	19,420				
Sep-05	44,150				
Oct-05	96,970				
Nov-05	71,650				
Dec-05	68,470				
Jan-06	0	1,027			
Feb-06	0				
Mar-06	0				
Apr-06	3,065,500				
May-06	0				
Jun-06	257,700				
Jul-06	207,500				
Aug-06	0				
Sep-06	1,592,200				
Oct-06	1,216,500				
Nov-06	1,216,500				
Dec-06	4,885,000				
Jan-07		1,115			
Feb-07					
Mar-07					
Apr-07					
May-07					
Jun-07					

Month-Year	PAIUTES-ECP-3	CA Wash Jan-Dec total (af)	MX-6	ARROW CANYON 1
Oct-03			0	80,420,000
Nov-03			0	50,230,000
Dec-03			20,000	40,750,000
Jan-04		0	50,000	44,540,000
Feb-04			0	35,080,000
Mar-04			0	57,170,000
Apr-04			0	67,260,000
May-04			620,000	91,448,000
Jun-04			9,290,000	106,360,000
Jul-04			19,840,000	102,520,000
Aug-04			20,030,000	90,690,000
Sep-04			19,310,000	76,600,000
Oct-04			260,000	68,370,000
Nov-04			20,000	40,530,000
Dec-04				
Jan-05		0	0	34,600,000
Feb-05			0	28,640,000
Mar-05			0	45,060,000
Apr-05			0	67,960,000
May-05			6,050,000	66,670,000
Jun-05			19,270,000	68,040,000
Jul-05			19,970,000	59,890,000
Aug-05			19,650,000	86,370,000
Sep-05			19,240,000	91,850,000
Oct-05			3,200,000	84,150,000
Nov-05			0	37,960,000
Dec-05			0	8,120,000
Jan-06		0	7,000	0
Feb-06			2,000	4,900,000
Mar-06			0	300,000
Apr-06			17,840,000	1,630,000
May-06			19,780,000	86,820,000
Jun-06			19,330,000	97,520,000
Jul-06			18,420,000	103,540,000
Aug-06			18,940,000	105,100,000
Sep-06			19,020,000	81,090,000
Oct-06			2,110,000	68,990,000
Nov-06			0	51,440,000
Dec-06			0	40,720,000
Jan-07		0	0	3,540,000
Feb-07			0	0
Mar-07			0	0
Apr-07			2,000	1,000
May-07			400,000	0
Jun-07			18,720,000	71,650,000

Month-Year	ARROW CANYON 2	Muddy River (carbonate) Jan-Dec total (af)	LDS EAST	LDS WEST
Oct-03			23,031,000	0
Nov-03			10,012,000	5,189,000
Dec-03			17,342,000	18,586,000
Jan-04		2,609	19,120,000	30,374,000
Feb-04			5,261,000	18,803,000
Mar-04			0	9,782,000
Apr-04			1,066,000	294,000
May-04			5,784,000	0
Jun-04			39,003,500	18,995,000
Jul-04			44,082,000	7,300,000
Aug-04			38,636,000	17,378,000
Sep-04			29,637,000	41,858,000
Oct-04			1,395,000	20,738,000
Nov-04				
Dec-04				
Jan-05	0	2,557	0	10,421,000
Feb-05	0		1,000	10,360,000
Mar-05	0		0	8,687,000
Apr-05	0		0	7,761,000
May-05	10,020,000		14,186,000	12,372,000
Jun-05	14,220,000		25,438,000	29,185,000
Jul-05	21,990,000		25,803,000	28,759,000
Aug-05	1,610,000		19,770,000	40,889,000
Sep-05	10,000		13,643,000	39,085,000
Oct-05	0		18,777,000	47,457,000
Nov-05	18,570,000		17,073,000	35,443,000
Dec-05	2,000		6,237,000	33,444,000
Jan-06	1,000	2,325	13,583,000	22,930,000
Feb-06	13,000		0	33,816,000
Mar-06	4,000		5,167,000	40,635,000
Apr-06	100,000		0	18,288,000
May-06	40,000		9,710,000	28,017,000
Jun-06	300		27,728,000	51,244,000
Jul-06	0		17,246,000	19,935,000
Aug-06	300		11,144,000	42,536,000
Sep-06	0		16,567,000	39,933,000
Oct-06	0		19,347,000	44,333,000
Nov-06	50,000		3,973,000	50,949,000
Dec-06	0		3,508,000	36,070,000
Jan-07	36,730,000	2,079	1,807,000	49,188,000
Feb-07	470,000			17,636,000
Mar-07	4,940,000		3,000	8,779,000
Apr-07	17,330,000			2,976,000
May-07	37,170,000		10,903,000	47,681,000
Jun-07	6,670,000		35,445,000	42,178,000

Month-Year	LDS CENTRAL	PERKINS PRODUCTION	BEHMER	LEWIS 1	LEWIS 2
Oct-03	49,511,000	20,499,000	23,481,000	0	0
Nov-03	38,957,000	11,449,000	16,559,000	0	0
Dec-03	23,114,000	16,702,000	13,021,000	0	0
Jan-04	5,025,000	18,747,000	13,726,000	0	0
Feb-04	9,304,000	8,244,000	15,163,000	0	0
Mar-04	16,743,000	15,574,000	16,733,000	0	0
Apr-04	8,428,000	4,411,000	18,153,000	10,489,000	10,086,000
May-04	16,315,000	16,370,000	22,433,000	23,595,000	23,808,000
Jun-04	45,121,000	19,219,000	22,280,000	17,043,000	17,001,000
Jul-04	53,998,000	25,276,000	10,958,000	19,615,000	22,898,000
Aug-04	48,455,000	25,810,000	17,955,000	8,465,000	15,456,000
Sep-04	32,326,000	21,491,000	28,178,000	19,148,000	12,091,000
Oct-04	1,826,000	15,771,000	15,522,000	2,172,000	1,574,000
Nov-04					
Dec-04					
Jan-05	0	18,758,000	14,942,000	10,273,000	2,311,000
Feb-05	7,766,000	17,597,000	26,214,000	1,289,000	815,000
Mar-05	10,603,000	18,978,000	11,474,000	0	0
Apr-05	3,819,000	14,866,000	18,611,000	0	0
May-05	15,171,000	10,350,000	20,577,000	21,421,000	24,474,000
Jun-05	45,331,000	19,696,000	21,432,000	14,116,000	25,443,000
Jul-05	47,078,000	29,960,000	15,939,000	2,807,000	20,463,000
Aug-05	29,349,000	17,680,000	14,100,000	4,764,000	3,631,000
Sep-05	28,939,000	24,394,000	21,058,000	31,173,000	19,736,000
Oct-05	25,667,000	18,114,000	17,343,000	5,202,000	1,937,000
Nov-05	18,487,000	22,836,000	17,591,000	0	0
Dec-05	19,805,000	25,526,000	14,847,000	1,619,000	1,567,000
Jan-06	25,473,000	18,758,000	2,000	0	0
Feb-06	21,542,000	14,148,000	34,000	0	0
Mar-06	31,836,000	25,083,000	12,976,000	0	0
Apr-06	8,017,000	13,900,000	12,977,000	0	0
May-06	11,044,000	13,307,000	8,824,000	22,809,000	18,361,000
Jun-06	46,696,000	29,518,000	1,344,000	16,385,000	11,717,000
Jul-06	20,493,000	30,665,000	1,005,000	12,653,000	9,797,000
Aug-06	32,656,000	25,083,000	1,027,000	20,021,000	28,050,000
Sep-06	15,136,000	25,083,000	18,237,000	6,389,000	6,290,000
Oct-06	13,546,000	13,900,000	13,863,000	8,477,000	1,000
Nov-06	35,222,000	13,307,000	65,667,000	0	0
Dec-06	25,810,000	29,518,000	30,403,000	0	0
Jan-07	4,237,000	23,893,000	15,188,000	592,000	823,000
Feb-07	6,819,000	14,150,000	34,000		
Mar-07	4,887,000	21,503,000	9,085,000	1,000	1,000
Apr-07	22,000	7,049,000	11,555,000		2,000
May-07	17,947,000	22,814,000	17,266,000	2,710,000	9,143,000
Jun-07	37,839,000	20,510,000	11,237,000	16,889,000	17,333,000

Month-Year	LEWIS 3	LEWIS 4	LEWIS 5	Muddy River (alluvial) Jan-Dec total (af)	RG1-3 Muddy River
Oct-03	0	2,581,200	0		
Nov-03	0	0	0		
Dec-03	0	0	0		
Jan-04	0	3,084,000	0	4,450	0
Feb-04	0	201,700	0		0
Mar-04	0	0	0		0
Apr-04	13,396,000	6,220,300	3,743,000		0
May-04	13,396,000	22,024,200	0		0
Jun-04	31,134,000	22,771,900	0		0
Jul-04	34,162,000	21,900,700	16,442,000		0
Aug-04	28,288,000	19,070,400	23,167,000		0
Sep-04	668,000	11,764,900	33,905,000		0
Oct-04	0	0	2,152,000		0
Nov-04					
Dec-04					
Jan-05	0	6,186,900	11,335,000	5,227	0
Feb-05	0	2,945,600	3,018,000		0
Mar-05	0	0	0		0
Apr-05	0	0	0		0
May-05	10,627,000	23,769,500	24,805,000		0
Jun-05	9,589,000	10,566,400	31,472,000		0
Jul-05	28,429,000	20,601,000	16,273,000		0
Aug-05	20,635,000	35,452,600	20,069,000		0
Sep-05	17,455,000	30,706,600	18,132,000		0
Oct-05	13,404,000	200	3,324,000		0
Nov-05	0	0	0		0
Dec-05	1,650,000	26,100	1,000		0
Jan-06	0	0	0	5,721	104,814,000
Feb-06	0	0	0		48,504,000
Mar-06	0	0	0		77,664,000
Apr-06	0	700	0		84,519,000
May-06	26,653,000	16,200,300	36,201,000		44,541,000
Jun-06	32,367,000	32,367,000	36,252,000		56,724,000
Jul-06	16,132,000	20,601,000	18,527,000		26,659,000
Aug-06	31,244,000	25,528,600	28,760,000		38,773,000
Sep-06	24,846,000	22,807,100	28,349,000		39,225,000
Oct-06	13,856,000	13,856,000	13,448,500		19,277,000
Nov-06	0	2,900	0		0
Dec-06	0	2,522,800	1,000		0
Jan-07	806,000	627,600	668,000	4,741	89,097,000
Feb-07		3,935,900			48,504,000
Mar-07	1,000		6,000		77,664,000
Apr-07	4,000	100			101,912,000
May-07	26,206,000	1,295,100	918,600		25,688,000
Jun-07	2,993,300	32,367,000	8,423,000		43,240,000

Month-Year	RG4 Muddy River
Oct-03	
Nov-03	
Dec-03	
Jan-04	0
Feb-04	0
Mar-04	0
Apr-04	0
May-04	0
Jun-04	0
Jul-04	0
Aug-04	0
Sep-04	0
Oct-04	0
Nov-04	
Dec-04	
Jan-05	0
Feb-05	0
Mar-05	0
Apr-05	0
May-05	0
Jun-05	0
Jul-05	0
Aug-05	0
Sep-05	0
Oct-05	0
Nov-05	0
Dec-05	0
Jan-06	0
Feb-06	0
Mar-06	0
Apr-06	0
May-06	0
Jun-06	0
Jul-06	0
Aug-06	0
Sep-06	0
Oct-06	0
Nov-06	0
Dec-06	0
Jan-07	0
Feb-07	47,406,000
Mar-07	68,093,000
Apr-07	0
May-07	0
Jun-07	0

	Pumpage (gal)					
Month-Year	CSI-1	CSI-2	CSI-3	CSI-4	CSV-RW2	MX-5
Jul-07	18,203,000	71,633,000	34,664,000	0		
Aug-07	20,677,000	72,711,000	18,677,000	0		
Sep-07	19,526,000	77,311,000	25,277,000	0		
Oct-07	27,265,000	42,060,000	46,324,000	0		
Nov-07	45,593,000	12,282,000	18,834,000	583,000		
Dec-07	9,416,000	0	11,534,000	7,315,000		
Jan-08	13,347,000	813,000	6,694,000	0		
Feb-08	926,000	4,729,000	8,730,000	0		
Mar-08	0	28,384,000	8,644,000	0		
Apr-08	0	30,485,000	17,009,000	0		1,302,500
May-08	0	55,126,000	11,157,000	0		1,903,300
Jun-08	0	69,250,000	7,199,000	0		2,018,200
Jul-08	0	42,627,000	29,132,000	0		2,040,300
Aug-08	0	26,814,000	39,892,000	0		1,148,700
Sep-08	0	14,369,000	40,578,000	725,000		3,900
Oct-08	0	27,684,000	16,805,000	1,965,000		324,000
Nov-08	0	6,306,000	18,427,000	377,000		
Dec-08	0	6,928,000	5,472,000	272,000		
Jan-09	0	4,151,000	9,779,000	375,000		
Feb-09	0	29,000	6,922,000	3,474,000		
Mar-09	0	0	32,098,000	1,512,000		
Apr-09	0	0	41,982,000	925,000		
May-09	0	0	38,770,000	21,699,000		
Jun-09	0	0	48,049,000	10,056,000		
Jul-09	0	0	27,918,000	37,530,000		
Aug-09	0	0	34,132,000	19,130,000		
Sep-09	0	0	20,952,000	27,854,000		
Oct-09	0	0	0	34,276,000		
Nov-09	0	0	0	21,845,000		
Dec-09	0	0	3,376,000	8,693,000		
Jan-10	0	0	5,347,000	2,683,000	0	
Feb-10	0	0	8,939,000	0	0	
Mar-10	0	0	26,008,000	564,000	0	
Apr-10	0	0	39,588,648	850,000	0	
May-10	0	0	47,305,000	2,350,000	0	
Jun-10	0	0	35,030,000	25,593,000	0	
Jul-10	0	0	35,641,000	27,518,000	0	22,352
Aug-10	0	0	38,939,384	17,869,669	0	819,341
Sep-10	0	0	40,884,184	2,058,727	0	69,941,564
Oct-10	0	0	28,305,068	0	0	120,445,040
Nov-10	0	0	16,310,888	0	0	96,548,387
Dec-10	0	0	18,073,176	0	0	152,426,427
Jan-11	0	0	143,366,916	0	0	159,305,446
Feb-11	0	0	19,786,844	0	0	87,755,290
Mar-11	0	0	27,860,008	0	0	156,258,505

Month-Year	Coyote Spring Valley Jan-Dec total (af)	NV COGEN EBP-2	NV COGEN EGV-3	NV COGEN EBM-4
Jul-07		16,000	25,062,000	30,130,000
Aug-07		0	23,760,000	27,101,000
Sep-07		0	19,082,000	23,121,000
Oct-07		100,000	22,789,000	19,735,000
Nov-07		0	15,930,000	17,518,000
Dec-07		19,000	18,146,000	16,098,000
Jan-08	1,687	0	21,354,000	22,535,000
Feb-08		104,000	21,189,000	16,487,000
Mar-08		494,000	23,009,000	19,059,000
Apr-08		8,862,000	11,643,000	18,316,000
May-08		17,572,000	16,172,000	12,347,000
Jun-08		13,296,000	23,037,000	10,256,000
Jul-08		25,439,000	22,401,000	584,000
Aug-08		26,884,000	18,590,000	0
Sep-08		26,450,000	18,952,000	0
Oct-08		28,942,000	12,104,000	0
Nov-08		26,222,000	14,836,000	0
Dec-08		25,976,000	15,458,000	0
Jan-09	1,398	10,324,000	30,471,000	710,000
Feb-09		0	34,858,000	0
Mar-09		0	28,188,000	8,212,000
Apr-09		0	22,351,000	17,663,000
May-09		0	25,630,000	22,837,000
Jun-09		2,404,000	16,234,000	23,949,000
Jul-09		14,000	20,306,000	25,014,000
Aug-09		970,000	21,781,000	24,542,000
Sep-09		9,426,000	15,273,000	22,939,000
Oct-09		0	23,426,000	23,412,000
Nov-09		23,000	20,729,000	19,500,000
Dec-09		11,000	19,979,000	19,623,000
Jan-10	2,639	33,000	20,971,000	15,986,000
Feb-10		4,450,000	1,214,000	27,897,000
Mar-10		9,095,000	0	33,315,000
Apr-10		16,409,000	0	23,519,000
May-10		18,182,000	0	25,837,000
Jun-10		9,416,000	10,190,600	28,918,000
Jul-10		0	26,646,000	31,334,000
Aug-10		0	25,249,000	29,055,000
Sep-10		16,000	20,272,000	21,308,000
Oct-10		28,000	21,961,784	25,174,000
Nov-10		624,000	0	33,959,000
Dec-10		1,033,000	10,440,848	16,126,000
Jan-11	5,727	33,000	0	32,685,000
Feb-11		12,000	1,125,608	28,446,000
Mar-11		0	0	34,219,000

Month-Year	Black Mtns Jan-Dec total (af)	CHEM LIME OLD	CHEM LIME NEW	DRY LAKE GV-2
Jul-07		3,397,703	3,914,430	
Aug-07		3,626,184	3,687,650	
Sep-07		3,522,164	4,516,160	
Oct-07		4,042,180	6,339,750	
Nov-07		3,574,980	5,328,060	
Dec-07		1,893,090	4,926,630	
Jan-08	1,591	2,404,004	6,274,200	5,580,000
Feb-08		2,172,338	4,235,985	4,170,000
Mar-08		2,220,400	4,166,935	5,040,000
Apr-08		3,675,370	4,843,400	5,400,000
May-08		3,891,457	6,453,897	4,060,000
Jun-08		3,903,013	6,760,973	4,140,000
Jul-08		2,841,800	4,027,120	3,840,000
Aug-08		2,231,960	2,516,160	4,020,000
Sep-08		2,584,690	1,653,630	4,370,000
Oct-08		3,601,105	487,940	
Nov-08		2,237,365	653,680	
Dec-08		796,370	1,489,820	
Jan-09	1,568	1,189,039	1,585,180	2,770,000
Feb-09		2,028,261	337,450	2,300,000
Mar-09		2,186,440	1,741,240	0
Apr-09		2,181,100	2,399,997	0
May-09		2,499,380	877,820	0
Jun-09		2,296,240	395,210	0
Jul-09		2,707,000	935,000	0
Aug-09		3,322,000	4,253,000	0
Sep-09		2,866,000	3,795,000	0
Oct-09		3,168,953	3,842,809	0
Nov-09		2,031,317	3,361,171	0
Dec-09		1,498,840	3,321,000	490,000
Jan-10	1,561	2,252,476	1,970,727	
Feb-10		1,907,044	1,401,499	
Mar-10		2,438,060	1,193,834	
Apr-10		2,230,766	2,466,260	
May-10		2,644,809	2,806,106	
Jun-10		2,385,916	1,715,743	
Jul-10		2,110,760	2,816,023	
Aug-10		2,228,554	3,727,789	
Sep-10		1,962,066	2,658,139	
Oct-10		1,596,029	2,751,993	
Nov-10		1,814,948	2,394,431	
Dec-10		881,101	1,761,683	
Jan-11	1,398	142,063	187,458	220,000
Feb-11		138,731	207,161	249,800
Mar-11		166,212	307,838	389,100

Month-Year	REPUBLIC WELL #1	REPUBLIC WELL #2	REPUBLIC WELL #5
Jul-07			
Aug-07			
Sep-07			
Oct-07			
Nov-07			
Dec-07		8,741,000	8,072,100
Jan-08			
Feb-08			
Mar-08		5,730,400	13,949,100
Apr-08			
May-08			
Jun-08		13,410,500	18,318,400
Jul-08			
Aug-08			
Sep-08		11,995,800	20,788,700
Oct-08			
Nov-08			
Dec-08		8,658,000	25,396,640
Jan-09			
Feb-09			
Mar-09		10,620,500	12,194,300
Apr-09			
May-09			
Jun-09		9,160,300	17,920,100
Jul-09			
Aug-09			
Sep-09		10,649,300	17,175,900
Oct-09			
Nov-09			
Dec-09		9,544,300	10,951,200
Jan-10			
Feb-10			
Mar-10		6,845,600	13,084,800
Apr-10		2,163,000	3,309,000
May-10		3,763,000	3,037,000
Jun-10		4,127,000	2,553,000
Jul-10		5,237,500	3,139,500
Aug-10		4,564,400	5,107,100
Sep-10		3,138,600	4,558,100
Oct-10		4,950,100	2,588,800
Nov-10		1,810,200	3,843,500
Dec-10		1,354,800	3,784,200
Jan-11		4,245,500	0
Feb-11		4,742,700	0
Mar-11		3,276,700	0

Month-Year	REPUBLIC WELL #6	GV-MIRANT1	GV-DUKE-WS1	GV-DUKE-WS2	GV-PW-WS1
Jul-07		3,670,000	10,930,000	1,500,000	7,500,000
Aug-07		90,000	13,330,000	0	6,430,000
Sep-07		80,000	10,250,000	7,430,000	5,690,000
Oct-07		1,220,000	6,630,000	1,860,000	4,750,000
Nov-07		1,490,000	4,790,000	320,000	2,790,000
Dec-07	13,703,700	730,000	1,080,000	0	2,930,000
Jan-08		590,000	1,013,704	54,572	1,464,525
Feb-08		570,000	1,805,616	0	1,714,177
Mar-08	1,430,600	1,670,000	3,259,840	0	3,216,131
Apr-08		1,200,000	6,958,952	0	3,849,556
May-08		1,620,000	9,772,096	0	3,248,608
Jun-08	16,328,600	2,370,000	12,713,504	0	5,646,786
Jul-08		2,720,000	9,203,334	0	5,935,590
Aug-08		3,340,000	8,769,632	0	7,006,960
Sep-08	20,017,500	2,620,000	8,091,456	0	5,945,831
Oct-08		1,550,000	7,918,320	0	4,493,148
Nov-08		1,410,000	4,292,752	0	2,883,244
Dec-08	20,392,600	610,000	1,668,512	0	590,025
Jan-09		800,000	1,566,416	0	2,387,623
Feb-09		1,140,000	1,652,144	0	1,538,950
Mar-09	4,020,400	1,020,000	3,383,232	0	1,436,912
Apr-09		640,000	5,267,888	3,134,390	2,679,341
May-09		2,370,000	5,405,920	8,882,500	6,944,740
Jun-09	11,712,600	2,030,000	5,923,456	16,313,200	4,684,762
Jul-09		3,460,000	11,717,504	22,755,000	7,493,068
Aug-09		3,970,000	9,344,080	22,307,500	7,720,252
Sep-09	20,704,600	2,790,000	3,855,936	15,461,200	4,440,850
Oct-09		1,230,000	0	904	4,055,322
Nov-09		1,280,000	0	4,537,828	2,686,341
Dec-09	8,759,800	1,060,000	13,264	1,872,910	2,616,608
Jan-10		562,000	1,331,120	1,788	1,606,673
Feb-10		478,000	405,400	160,766	2,984,495
Mar-10	4,276,600	930,000	3,886,304	1,605,606	2,801,088
Apr-10	2,851,000	880,000	5,237,230	4,258,700	1,267,200
May-10	4,452,000	530,000	4,556,000	5,430,000	2,655,000
Jun-10	6,248,000	1,800,000	2,843,312	13,347,568	7,202,538
Jul-10	4,245,000	2,250,000	1,746,312	18,597,021	14,281,166
Aug-10	4,926,100	1,830,000	217,504	22,112,846	6,618,977
Sep-10	3,535,000	880,000	0	19,647,801	4,729,262
Oct-10	3,233,500	830,000	0	11,300,448	3,232,217
Nov-10	3,183,800	90,000	0	4,384,605	3,542,323
Dec-10	2,997,000	720,000	0	962,078	2,045,681
Jan-11	929,900	220,000	0	748,562	1,529,695
Feb-11	4,087,500	360,000	729,562	877	1,253,884
Mar-11	4,176,900	90,000	11,073	2,942,662	1,552,352

Month-Year	GV-RW1	Garnet Valley Jan-Dec total (af)	PAIUTES TH-1	PAIUTES ECP-1	PAIUTES ECP-2
Jul-07					
Aug-07					
Sep-07					
Oct-07					
Nov-07					
Dec-07					
Jan-08	189,500	1,522			
Feb-08	3,750				
Mar-08	53,800				
Apr-08	1,244,300				
May-08	4,305,000				
Jun-08	10,069,000				
Jul-08	16,055,000				
Aug-08	14,405,000				
Sep-08	9,832,700				
Oct-08	4,666,000				
Nov-08	7,440				
Dec-08	185,600				
Jan-09	0	1,451	250,000	0	0
Feb-09	0		220,000	0	0
Mar-09	11,841,518		250,000	0	0
Apr-09	1,626,613		250,000	0	0
May-09	2,913,495		270,000	0	0
Jun-09	3,807,522		520,000	0	0
Jul-09	2,935,032		540,000	0	0
Aug-09	5,368,988		540,000	0	0
Sep-09	6,370,800		520,000	0	0
Oct-09	11,368,584		540,000	0	0
Nov-09	2,975,124		520,000	0	0
Dec-09	5,938,988		580,000	0	0
Jan-10	1,921,464	1,176	610,000	0	0
Feb-10	344,360		560,000	0	0
Mar-10	81,072		610,000	0	0
Apr-10	2,908,426		440,000	0	0
May-10	1,131,127		460,000	0	0
Jun-10	2,908,426		440,000	0	0
Jul-10	3,005,373		440,000	0	0
Aug-10	1,950,880		550,000	0	0
Sep-10	3,766,338		610,000	0	0
Oct-10	2,067,895		530,000	0	0
Nov-10	1,055,320		520,000	0	0
Dec-10	261,968		530,000	0	0
Jan-11	8,061,800	1,210	520,000	0	0
Feb-11	5,855,711		470,000	0	0
Mar-11	5,286,612		520,000	0	0

Month-Year	PAIUTES-ECP-3	CA Wash Jan-Dec total (af)	MX-6	ARROW CANYON 1
Jul-07			18,480,000	105,360,000
Aug-07			19,020,000	91,410,000
Sep-07			18,710,000	80,650,000
Oct-07			1,000,000	63,680,000
Nov-07			0	50,000
Dec-07			0	0
Jan-08		0	0	0
Feb-08			0	0
Mar-08			2,880,000	19,000
Apr-08			9,890,000	38,480,000
May-08			17,900,000	70,850,000
Jun-08			17,270,000	89,360,000
Jul-08			17,760,000	100,620,000
Aug-08			17,670,000	94,830,000
Sep-08			17,360,000	74,880,000
Oct-08			17,840,000	50,060,000
Nov-08			6,500,000	38,530,000
Dec-08			0	25,480,000
Jan-09	0	15	0	24,280,000
Feb-09	0		0	51,100,000
Mar-09	0		0	72,600,000
Apr-09	0		0	19,120,000
May-09	0		0	21,360,000
Jun-09	0		4,000	71,380,000
Jul-09	0		0	71,500,000
Aug-09	0		0	65,510,000
Sep-09	0		0	55,850,000
Oct-09	0		0	7,880,000
Nov-09	0		500,000	450,000
Dec-09	0		0	0
Jan-10	0	19	0	0
Feb-10	0		0	0
Mar-10	0		0	0
Apr-10	0		0	0
May-10	0		0	0
Jun-10	0		3,650,000	65,310,000
Jul-10	0		0	98,530,000
Aug-10	0		0	91,289,543
Sep-10	0		0	77,843,265
Oct-10	0		0	43,847,694
Nov-10	0		0	1,446,864
Dec-10	0		0	0
Jan-11	0	26	0	703,352
Feb-11	0		0	1,233,612
Mar-11	0		0	941,816

Month-Year	ARROW CANYON 2	Muddy River (carbonate) Jan-Dec total (af)	LDS EAST	LDS WEST
Jul-07	2,000		27,544,000	35,303,000
Aug-07	110,000		35,022,000	58,556,000
Sep-07	0		36,642,000	25,920,000
Oct-07	2,530,000		21,798,000	
Nov-07	46,870,000		24,091,000	
Dec-07	31,800,000		13,781,000	
Jan-08	19,760,000	2,272	25,943,000	0
Feb-08	1,800,000			27,704,000
Mar-08	1,280,000			8,779,000
Apr-08	0		1,000	18,632,000
May-08	520,000			
Jun-08	0		7,299,000	32,528,000
Jul-08	48,000		18,963,000	42,070,000
Aug-08	0		39,600,000	12,752,000
Sep-08	19,000		26,265,000	12,752,000
Oct-08	1,000		15,475,000	10,881,000
Nov-08	0		1,395,000	
Dec-08	8,730,000		30,320,000	1,000
Jan-09	18,280,000	2,034	0	0
Feb-09	2,780,000		2,377,000	3,202,000
Mar-09	0		0	0
Apr-09	26,810,000		0	0
May-09	50,290,000		0	30,384,000
Jun-09	53,000		25,547,000	26,950,000
Jul-09	260,000		0	24,733,000
Aug-09	0		16,025,000	8,514,000
Sep-09	0		19,602,000	14,444,000
Oct-09	31,750,000		0	18,473,000
Nov-09	37,210,000		0	2,716,000
Dec-09	33,950,000		0	38,682,000
Jan-10	33,843,000	1,834	0	27,130,000
Feb-10	23,330,000		0	13,322,000
Mar-10	34,980,000		7,000	0
Apr-10	38,600,000		867,000	10,830,000
May-10	50,830,000		11,531,000	4,256,000
Jun-10	11,800,000		16,684,000	2,000
Jul-10	0			37,453,000
Aug-10	0		0	38,348,000
Sep-10	3,296		15,097,000	19,981,000
Oct-10	0		8,534,000	9,425,000
Nov-10	17,273,900		0	3,123,000
Dec-10	4,917,994		0	3,659,000
Jan-11	630,632	1,836	3,186,000	0
Feb-11	5,434		6,214,000	0
Mar-11	6		0	0

Month-Year	LDS CENTRAL	PERKINS PRODUCTION	BEHMER	LEWIS 1	LEWIS 2
Jul-07	30,369,000	23,893,000	22,361,000	15,272,000	24,427,000
Aug-07	43,565,000	14,150,000	25,123,000	22,401,000	23,722,000
Sep-07	36,908,000	21,913,000	24,861,000	10,800,000	21,484,000
Oct-07	24,030,000	22,940,000	22,619,000	8,474,000	13,670,000
Nov-07	23,819,000	14,078,000	11,567,000		6,283,000
Dec-07		24,641,000			1,000
Jan-08	6,059,000	23,893,000			
Feb-08	38,690,000	14,150,000			
Mar-08	19,605,000	21,503,000			
Apr-08	10,870,000	7,049,000			27,110,000
May-08				21,926,000	18,479,000
Jun-08		20,510,000	29,066,000	18,579,000	27,110,000
Jul-08	19,046,000	20,425,000	19,970,000	16,378,000	24,038,000
Aug-08	25,493,000	23,379,000	26,112,000	25,445,000	11,490,000
Sep-08	26,181,000	17,670,000	20,909,000	20,497,000	
Oct-08	15,036,000	23,563,000	25,088,000	593,000	1,000
Nov-08	32,383,000	19,410,000	18,953,000		
Dec-08	5,265,000	27,222,000	15,993,000		
Jan-09	0	17,599,000	14,756,000	0	0
Feb-09	0	14,199,000	19,225,000	0	0
Mar-09	0	12,689,000	16,147,000	0	0
Apr-09	0	16,158,000	16,939,000	0	0
May-09	20,676,000	16,764,000	22,291,000	10,069,000	22,443,000
Jun-09	38,419,000	17,307,000	17,092,000	6,338,000	14,804,000
Jul-09	37,479,000	19,884,000	34,901,000	0	26,941,000
Aug-09	38,889,000	19,886,000	31,571,000	1,000,000	17,844,000
Sep-09	64,562,000	32,513,000	52,568,000	0	15,658,000
Oct-09	15,790,000	8,154,000	0	0	0
Nov-09	11,638,000	19,614,000	40,233,000	0	0
Dec-09	39,941,000	15,438,000	30,074,000	0	0
Jan-10	37,267,000	13,525,000	32,702,000	0	0
Feb-10	20,056,000	1,859,000	31,778,000	0	0
Mar-10	0	0	0	0	0
Apr-10				0	0
May-10	13,131,000	22,129,000	24,627,000	0	4,334,000
Jun-10	23,773,000	21,288,000	22,087,000		24,876,000
Jul-10	43,306,000	24,908,000	17,698,000	12,127,000	25,928,000
Aug-10	33,415,000	25,515,000	16,590,000	20,312,000	26,374,000
Sep-10	25,557,000	20,422,000	24,944,000	6,234,000	23,994,000
Oct-10	25,926,000	18,214,000	20,934,000	4,615,000	1,930,000
Nov-10	9,094,000	19,027,000	1,352,000	189,000	0
Dec-10	0	22,581,000	6,815,000	781,000	5,811,000
Jan-11	0	8,129,000	18,236,000	0	1,000
Feb-11	1,652,000	15,501,000	12,879,000	0	0
Mar-11	0	3,328,000	6,815,000	0	0

Month-Year	LEWIS 3	LEWIS 4	LEWIS 5	Muddy River (alluvial) Jan-Dec total (af)	RG1-3 Muddy River
Jul-07	15,457,000	20,601,000	3,395,000		36,609,000
Aug-07	16,267,000	3,247,600	6,000		39,202,000
Sep-07	29,267,000	20,606,000	8,000		14,369,000
Oct-07	14,169,000	13,062,000			61,393,000
Nov-07	2,000	1,635,000			75,014,000
Dec-07		6,585,000			78,547,000
Jan-08		1,061,200		4,286	75,442,000
Feb-08		794,200	6,927,000		92,272,000
Mar-08					77,664,000
Apr-08		7,000			141,250,000
May-08		27,645,000	23,450,000		33,017,000
Jun-08		28,821,000	31,501,000		37,309,000
Jul-08	1,089,000	24,877,000	25,146,000		29,228,000
Aug-08	25,965,000	11,105,000	14,559,000		38,199,000
Sep-08	17,124,400	7,702,000	13,437,000		30,435,000
Oct-08	8,773,200	5,989,000	4,064,000		56,594,000
Nov-08					65,689,000
Dec-08					111,548,000
Jan-09	0	100	0	4,092	55,068,000
Feb-09	0	0	0		60,082,000
Mar-09	0	0	0		31,320,000
Apr-09	0	2,000	0		105,608,000
May-09	8,759,400	11,327,000	19,621,000		28,279,000
Jun-09	10,731,500	14,943,000	14,960,000		17,860,000
Jul-09	25,842,300	19,370,000	27,777,000		28,998,000
Aug-09	7,397,300	14,362,000	18,498,000		31,036,000
Sep-09	1,251,100	7,661,000	10,599,000		50,537,000
Oct-09	0	0	0		43,318,000
Nov-09	0	0	0		42,240,000
Dec-09	0	0	7,000		82,884,000
Jan-10	0	0	0	3,895	99,391,000
Feb-10	0	3,000	7,000		94,395,000
Mar-10	0	1,000	0		93,631,000
Apr-10	0	1,000	0		98,600,000
May-10		24,088,000	12,086,000		33,214,000
Jun-10	3,089,000	19,521,000	26,519,000		33,179,000
Jul-10	18,187,000	10,974,000	26,660,000		41,769,000
Aug-10	19,623,000	9,999,000	20,610,000		32,186,000
Sep-10	8,354,000	8,907,000	17,982,000		34,333,000
Oct-10	9,415,000	13,332,000	16,630,000		10,682,000
Nov-10	0	1,000	0		13,246,000
Dec-10	1,393,000	2,267,000	1,196,000		67,252,000
Jan-11	13,000	0	1,000	4,392	63,327,000
Feb-11	0	0	0		26,249,000
Mar-11	0	0	0		5,228,000

Month-Year	RG4 Muddy River
Jul-07	0
Aug-07	0
Sep-07	1,000
Oct-07	22,189,000
Nov-07	25,964,000
Dec-07	49,676,000
Jan-08	6,378,000
Feb-08	0
Mar-08	0
Apr-08	0
May-08	0
Jun-08	0
Jul-08	0
Aug-08	0
Sep-08	0
Oct-08	35,067,000
Nov-08	37,191,000
Dec-08	42,023,000
Jan-09	41,411,000
Feb-09	36,359,000
Mar-09	60,965,000
Apr-09	48,045,000
May-09	2,131,000
Jun-09	0
Jul-09	0
Aug-09	0
Sep-09	0
Oct-09	0
Nov-09	47,280,000
Dec-09	0
Jan-10	21,000
Feb-10	11,884,000
Mar-10	0
Apr-10	26,064,000
May-10	0
Jun-10	441,000
Jul-10	0
Aug-10	0
Sep-10	0
Oct-10	0
Nov-10	10,688,000
Dec-10	43,005,000
Jan-11	-157,000
Feb-11	31,987,000
Mar-11	7,851,000

	Pumpage (gal)					
Month-Year	CSI-1	CSI-2	CSI-3	CSI-4	CSV-RW2	MX-5
Apr-11	0	0	38,732,188	1,625,000	0	123,048,954
May-11	0	0	36,690,896	10,306,000	0	74,433,430
Jun-11	0	0	32,288,916	15,025,000	0	0
Jul-11	0	0	35,276,428	11,206,000	0	5,838,744
Aug-11	0	0	22,267,212	27,557,000	0	134,466,070
Sep-11	0	0	5,521,736	36,166,000	0	152,068,347
Oct-11	0	0	0	27,186,000	0	157,317,044
Nov-11	0	0	1,130,228	14,111,000	0	141,495,160
Dec-11	0	0	0	13,672,000	0	154,256,747
Jan-12	0	0	3,306,160	13,623,000	0	73,963,556
Feb-12	0	0	12,938,904	4,060,000	0	0
Mar-12	0	0	196,724	22,715,000	0	1,510,693
Apr-12	0	0	7,708,140	24,452,000	0	41,315,179
May-12	0	0	8,013,324	38,227,000	0	152,286,915
Jun-12	0	0	18,106,088	30,394,000	0	150,642,078
Jul-12	0	0	32,344,268	16,787,000	0	129,473,669
Aug-12	0	0	24,018,280	14,783,000	0	149,756,403
Sep-12	0	0	31,304,548	9,280,000	0	148,705,679
Oct-12	0	0	26,338,576	5,802,000	0	145,450,716
Nov-12	374,000	0	17,186,048	722,000	0	146,797,608
Dec-12	6,511,242	0	2,320,296	0	0	150,654,944

Oct 2010-Dec 2012 Pump Test totals (ac-ft)						9,333
						4076

Month-Year	Coyote Spring Valley Jan-Dec total (af)	NV COGEN EBP-2	NV COGEN EGV-3	NV COGEN EBM-4
Apr-11		37,000	20,873,304	13,872,000
May-11		17,000	21,804,192	21,422,000
Jun-11		32,000	23,915,136	26,573,000
Jul-11		27,000	20,109,000	22,623,000
Aug-11		69,000	20,480,000	24,890,000
Sep-11		568,000	17,241,000	21,626,000
Oct-11		0	19,685,776	22,095,000
Nov-11		0	25,064,576	5,154,000
Dec-11		0	30,995,104	0
Jan-12	5,101	16,000	30,097,216	0
Feb-12		0	31,671,776	265,000
Mar-12		16,000	22,477,440	22,632,000
Apr-12		0	11,963,000	23,639,000
May-12		15,000	21,672,000	22,850,000
Jun-12		0	21,904,000	24,013,000
Jul-12		21,000	25,287,488	25,666,000
Aug-12		3,409,000	26,683,712	25,092,000
Sep-12		0	22,389,880	24,974,384
Oct-12		0	19,071,080	22,215,752
Nov-12		0	8,434,752	29,375,984
Dec-12		6,847,000	23,984,832	10,262,144
Oct 2010-Dec 2012 Pump Test totals (ac-ft)	12,327			
	5383			

Month-Year	Black Mtns Jan-Dec total (af)	CHEM LIME OLD	CHEM LIME NEW	DRY LAKE GV-2
Apr-11		2,698,000	4,357,344	284,500
May-11		3,411,000	4,749,000	353,100
Jun-11		3,003,200	3,892,276	443,000
Jul-11		1,394,000	4,542,000	316,400
Aug-11		2,486,000	3,766,000	443,000
Sep-11		2,411,000	3,005,000	367,400
Oct-11		2,951,000	4,307,000	344,500
Nov-11		2,153,000	1,719,000	291,600
Dec-11		2,516,000	1,322,000	374,900
Jan-12	1,556	2,142,000	2,415,000	892,000
Feb-12		2,911,000	2,221,000	637,000
Mar-12		1,890,000	3,198,000	1,548,000
Apr-12		417,000	4,120,000	1,125,000
May-12		1,173,000	4,529,000	1,360,000
Jun-12		1,851,000	4,434,000	1,202,000
Jul-12		1,015,000	4,406,000	1,462,000
Aug-12		1,224,000	3,870,000	2,046,000
Sep-12		1,362,000	2,080,000	2,534,000
Oct-12		2,009,000	2,534,000	364,000
Nov-12		1,565,000	2,012,000	0
Dec-12		1,538,000	1,142,000	0
Oct 2010-Dec 2012 Pump Test totals (ac-ft)				

Month-Year	REPUBLIC WELL #1	REPUBLIC WELL #2	REPUBLIC WELL #5
Apr-11	6,297,600	1,997,400	0
May-11	1,730,600	4,165,700	0
Jun-11	3,575,800	3,673,900	0
Jul-11	7,248,800	2,903,300	3,793,800
Aug-11	6,959,700	4,143,700	1,030,200
Sep-11	4,858,400	4,108,100	0
Oct-11	5,081,800	3,150,300	1,180,700
Nov-11	6,060,200	1,854,100	440,800
Dec-11	4,689,400	2,282,000	0
Jan-12	2,620,500	3,628,000	610,200
Feb-12	3,537,000	4,607,800	2,436,600
Mar-12	2,099,600	3,155,100	0
Apr-12	3,124,000	4,339,000	0
May-12	4,485,800	4,267,800	1,167,600
Jun-12	3,765,300	3,828,400	0
Jul-12	6,646,000	1,582,300	627,900
Aug-12	269,200	3,477,900	2,336,800
Sep-12	1,665,300	2,013,000	0
Oct-12	2,047,000	3,509,200	2,701,700
Nov-12	304,200	3,258,300	1,681,100
Dec-12	0	3,345,900	0

Oct 2010-Dec 2012
Pump Test
totals (ac-ft)

Month-Year	REPUBLIC WELL #6	GV-MIRANT1	GV-DUKE-WS1	GV-DUKE-WS2	GV-PW-WS1
Apr-11	930,400	30,000	0	11,710,775	3,548,789
May-11	3,205,800	60,000	528	9,882,948	1,567,908
Jun-11	2,239,700	520,000	1,821	19,965,418	5,251,030
Jul-11	1,137,700	2,620,000	1,733,667	22,228,693	6,353,554
Aug-11	744,000	2,490,000	4,831,092	18,641,142	8,592,263
Sep-11	2,127,100	1,670,000	5,239,681	7,466,669	5,684,061
Oct-11	2,891,600	1,130,000	4,292,270	7,790,687	3,409,258
Nov-11	1,284,700	800,000	561,239	992,050	1,233,952
Dec-11	741,700	620,000	1,031,392	871,808	3,580,765
Jan-12	751,200	520,775	1,034,059	901,402	320,179
Feb-12	1,840,500	330,165	1,239,578	453,483	371,661
Mar-12	4,016,800	239,085	561,767	1,037,890	2,642,196
Apr-12	2,135,300	0	3,724,077	3,199,028	4,158,243
May-12	3,464,100	0	4,113,824	11,206,421	5,364,118
Jun-12	3,288,600	0	7,217,205	15,170,621	4,120,703
Jul-12	3,357,400	0	9,649,203	11,665,543	8,322,838
Aug-12	4,286,000	0	5,300	21,178,823	8,199,432
Sep-12	1,832,483	2,739,975	0	17,589,011	4,688,199
Oct-12	3,268,517	600,000	0	17,545,216	4,241,646
Nov-12	4,799,000	170,000	2,231,692	2,065,291	2,592,553
Dec-12	6,307,000	560,000	2,074,903	552,594	972,472

Oct 2010-Dec 2012
Pump Test
totals (ac-ft)

Month-Year	GV-RW1	Garnet Valley Jan-Dec total (af)	PAIUTES TH-1	PAIUTES ECP-1	PAIUTES ECP-2
Apr-11	3,548,789		710,000	0	0
May-11	2,713,060		730,000	0	0
Jun-11	0		710,000	0	0
Jul-11	2,713,060		460,000	1,395,100	0
Aug-11	4,682,687		460,000	172,900	0
Sep-11	7,533,770		440,000	0	0
Oct-11	0		490,000	60,600	0
Nov-11	0		470,000	252,600	0
Dec-11	0		490,000	47,400	0
Jan-12	0	1,245	500000	0	0
Feb-12	0		450000	0	0
Mar-12	0		500000	0	0
Apr-12	0		410,000	0	0
May-12	1,114,000		650,000	0	0
Jun-12	949,000		760,000	0	0
Jul-12	6,721,361		840,000	0	0
Aug-12	7,146,469		420,000	0	0
Sep-12	6,812,658		690,000	0	0
Oct-12	3,069,804		820,000	0	0
Nov-12	1,429,520		520,000	0	0
Dec-12	1,312,544		230,000	0	0

Oct 2010-Dec 2012
Pump Test
totals (ac-ft)

Month-Year	PAIUTES-ECP-3	CA Wash Jan-Dec total (af)	MX-6	ARROW CANYON 1
Apr-11	0		0	33,920,000
May-11	0		0	61,640,000
Jun-11	0		0	49,240,000
Jul-11	0		0	96,620,000
Aug-11	0		0	92,430,000
Sep-11	0		0	82,150,000
Oct-11	0		0	70,770,000
Nov-11	0		0	50,360,000
Dec-11	0		460,000	7,230,000
Jan-12	0	21	0	0
Feb-12	0		0	0
Mar-12	0		2,100,000	0
Apr-12	0		15,530,000	45,710,000
May-12	0		16,240,000	77,990,000
Jun-12	0		15,840,000	91,660,000
Jul-12	0		8,190,000	100,550,000
Aug-12	0		0	104,200,000
Sep-12	0		0	88,330,000
Oct-12	0		0	61,350,000
Nov-12	0		0	53,990,000
Dec-12	0		0	18,130,000

Oct 2010-Dec 2012
Pump Test
totals (ac-ft)

Month-Year	ARROW CANYON 2	Muddy River (carbonate) Jan-Dec total (af)	LDS EAST	LDS WEST
Apr-11	0		0	0
May-11	0		36,288,000	3,188,000
Jun-11	19,280,000		37,801,000	12,450,000
Jul-11	0		40,456,000	28,975,000
Aug-11	0		31,698,000	22,951,000
Sep-11	0		27,437,000	27,806,000
Oct-11	0		13,559,000	30,387,000
Nov-11	0		0	3,462,000
Dec-11	30,620,000		0	0
Jan-12	41,720,000	2,638	0	0
Feb-12	40,320,000		0	0
Mar-12	47,700,000		4,515,000	0
Apr-12	7,070,000		13,839,000	0
May-12	0		0	0
Jun-12	0		0	0
Jul-12	11,000		30,448,000	32,844,000
Aug-12	0		19,548,000	16,358,000
Sep-12	0		35,124,000	2,681,000
Oct-12	0		18,705,000	11,471,000
Nov-12	0		32,817,000	1,969,000
Dec-12	22,940,000		33,440,000	0
Oct 2010-Dec 2012 Pump Test totals (ac-ft)		4,681		

Month-Year	LDS CENTRAL	PERKINS PRODUCTION	BEHMER	LEWIS 1	LEWIS 2
Apr-11	0	1,916,000	2,439,000	5,124,900	4,238,000
May-11	13,824,000	16,776,000	4,428,000	17,809,300	16,509,000
Jun-11	32,909,000	23,256,000	4,935,000	22,845,600	25,389,000
Jul-11	41,282,000	14,009,000	2,693,000	23,560,900	27,499,000
Aug-11	30,852,000	23,398,000	5,000	29,510,000	31,491,000
Sep-11	25,890,000	21,300,000	25,955,000	25,279,200	19,636,000
Oct-11	15,333,000	33,403,000	25,005,000	9,009,300	2,941,000
Nov-11	0	30,903,000	20,405,000	0	0
Dec-11	0	15,138,000	17,726,000	0	0
Jan-12	0	5,274,000	3,221,000	0	0
Feb-12	0	454,000	8,172,000	0	0
Mar-12	0	12,917,000	6,815,000	0	0
Apr-12	0	22,231,000	8,707,000	0	0
May-12	0	1,000	10,538,500	8,033,000	0
Jun-12	0	12,129,000	14,352,000	11,221,200	0
Jul-12	19,573,000	13,653,000	19,295,000	13,758,600	15,331,000
Aug-12	2,906,000	31,170,000	20,798,000	10,062,900	8,693,000
Sep-12	5,483,000	33,518,000	16,362,000	5,752,900	6,736,000
Oct-12	8,728,000	40,292,000	1,194,000	21,968,400	4,777,000
Nov-12	35,446,000	42,115,000	6,183,000	968,700	0
Dec-12	5,688,000	32,748,000	25,375,000	0	0

Oct 2010-Dec 2012
Pump Test
totals (ac-ft)

Month-Year	LEWIS 3	LEWIS 4	LEWIS 5	Muddy River (alluvial) Jan-Dec total (af)	RG1-3 Muddy River
Apr-11	3,962,000	1,000	0		23,427,000
May-11	14,174,000	13,509,000	22,982,000		158,000
Jun-11	16,988,000	26,290,000	29,910,000		0
Jul-11	30,803,000	24,868,000	31,294,000		0
Aug-11	39,054,000	936,000	34,071,000		0
Sep-11	9,048,000	17,249,000	13,979,000		0
Oct-11	0	4,975,000	0		45,458,000
Nov-11	0	0	0		61,167,000
Dec-11	0	0	0		60,161,000
Jan-12	0	0	0	3,076	30,310,000
Feb-12	0	0	0		0
Mar-12	0	0	0		0
Apr-12	0	0	0		0
May-12	0	0	7,023,000		1,000
Jun-12	3,483,000	1,000	0		853,000
Jul-12	26,523,000	13,894,000	0		1,578,850
Aug-12	22,938,000	16,857,000	13,079,000		1,851,500
Sep-12	9,224,000	3,689,000	17,527,000		0
Oct-12	13,523,000	11,256,000	17,000,000		7,559,000
Nov-12	0	0	0		6,278,250
Dec-12	0	0	0		8,150,210

Oct 2010-Dec 2012
Pump Test
totals (ac-ft)

Month-Year	RG4 Muddy River
Apr-11	0
May-11	0
Jun-11	0
Jul-11	0
Aug-11	0
Sep-11	0
Oct-11	1,523,000
Nov-11	43,510,000
Dec-11	49,497,000
Jan-12	54,514,000
Feb-12	16,953,000
Mar-12	9,000
Apr-12	0
May-12	0
Jun-12	0
Jul-12	0
Aug-12	0
Sep-12	0
Oct-12	0
Nov-12	0
Dec-12	0
Oct 2010-Dec 2012 Pump Test totals (ac-ft)	

Annual Pumpage (ac-ft) by Hydrographic Basin

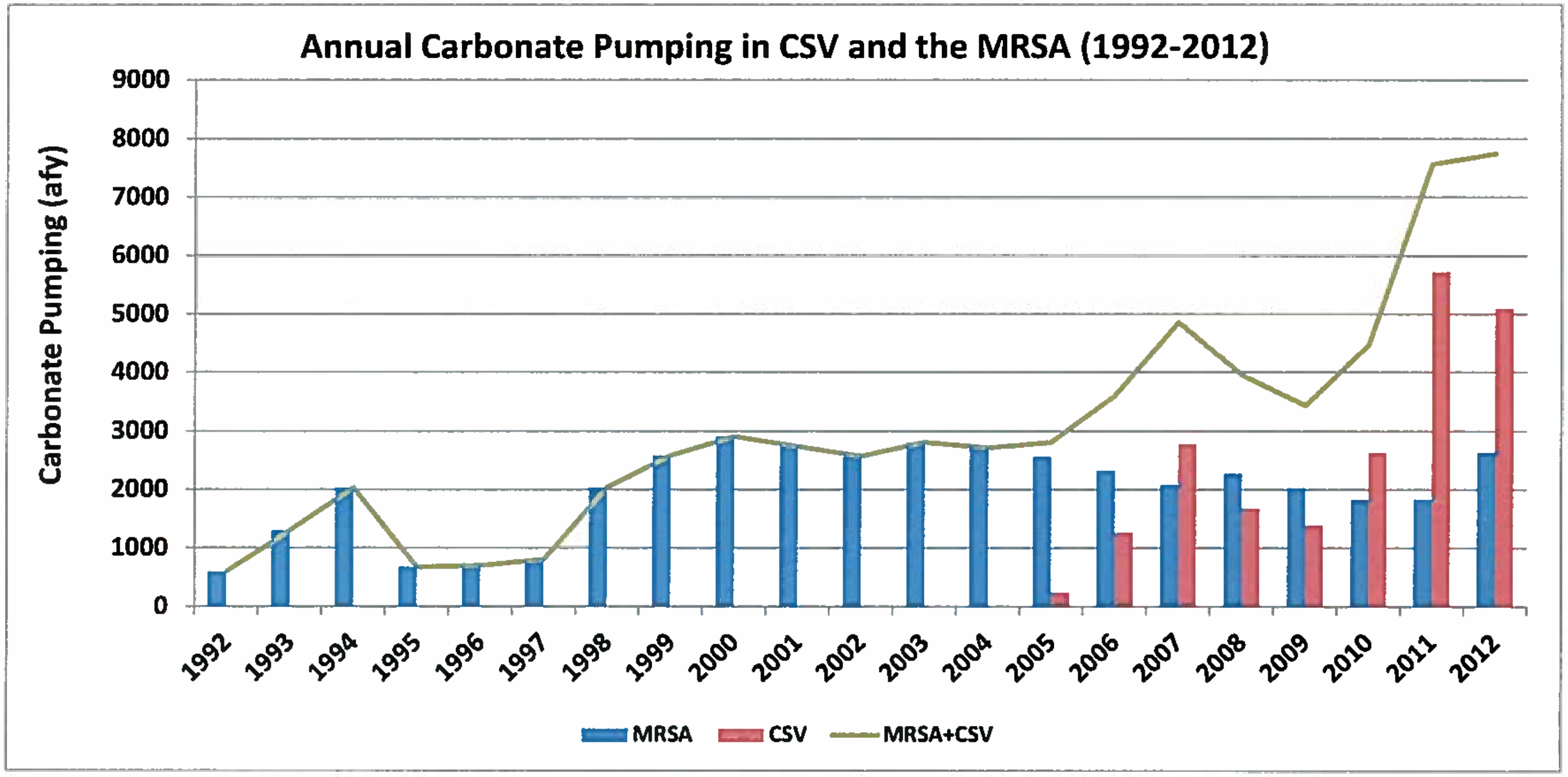
Year	Coyote Spring Valley (210)	Black Mtns	Garnet Valley	CA Wash (218)	Muddy River carbonate (219)	Muddy River alluvial (219)
2000	0	1,693	470	0	2,908	5,966
2001	0	1,588	708	0	2,743	4,867
2002	0	1,744	885	0	2,573	5,735
2003	0	1,709	855	0	2,816	5,017
2004	0	1,710	807	0	2,609	4,450
2005	259	1,640	940	0	2,557	5,227
2006	1,277	1,569	1,027	0	2,325	5,721
2007	2,781	1,585	1,115	0	2,079	4,741
2008	1,687	1,591	1,522	0	2,272	4,286
2009	1,398	1,568	1,451	15	2,034	4,092
2010	2,639	1,561	1,176	19	1,834	3,895
2011	5,727	1,398	1,210	26	1,836	4,392
2012	5,101	1,556	1,245	21	2,638	3,076

Oct 2010-Dec 2012 Pump Test totals (ac-ft)	12,153				4,681
	5402				

Year	Muddy River Sprs (ac-ft)	CSV (ac-ft)	Total	Alluvial pumping (ac-ft)
1987	245			1995
1988	245			4588
1989	245			5310
1990	245			4097
1991	245			3867
1992	600		600	3575
1993	1298		1298	3668
1994	2034		2034	4462
1995	678		678	3464
1996	705		705	4753
1997	808		808	4096
1998	2039		2039	5967
1999	2579		2579	4748
2000	2908		2908	5966
2001	2743		2743	4867
2002	2573		2573	5735
2003	2816		2816	5017
2004	2718		2718	4450
2005	2557	259	2815	5227
2006	2325	1277	3602	7380
2007	2079	2781	4859	7517
2008	2272	1687	3959	7076
2009	2034	1398	3432	6588
2010	1834	2639	4473	6178
2011	1836	5727	7563	5679
2012	2638	5101	7739	3469
Oct 2010-Dec 2012 Pump Test Totals (ac-ft)	4681	12327	17008	
annual pumping rate afy			7559	
Total Spring Discharge reduction (cfs)			0.77	
Total Spring Discharge reduction (ac-ft)			1254	
% spring discharge/pumping			7%	

Month-Year	Alluvial pumping (ac-ft/yr)
Jan-00	5966
Jan-01	4867
Jan-02	5735
Jan-03	5017
Jan-04	4450
Jan-05	5227
Jan-06	7380
Jan-07	7517
Jan-08	7076
Jan-09	6588
Jan-10	6178
Jan-11	5679
Jan-12	3469

extra chart not included in report



LWRFS GI

Basin	Permit	Priority Date	Cumulative Duty
Coyote Spring Valley	*85249	10/22/1919	109.80
Coyote Spring Valley	*85250	10/22/1919	343.00
Muddy River Springs Area	*50733	8/13/1947	413.00
Muddy River Springs Area	*50723	8/13/1947	501.00
Muddy River Springs Area	*50729	8/13/1947	621.00
Muddy River Springs Area	*50728	8/13/1947	779.00
Muddy River Springs Area	*50731	8/13/1947	1365.00
Muddy River Springs Area	*50732	8/13/1947	2295.00
Muddy River Springs Area	*29296	2/4/1948	2595.00
Muddy River Springs Area	38871	2/4/1948	2670.00
Muddy River Springs Area	*86209	4/20/1948	2684.01
Muddy River Springs Area	*82096	4/20/1948	2685.91
Muddy River Springs Area	*82097	4/20/1948	2688.80
Muddy River Springs Area	*77381	4/20/1948	2694.87
Muddy River Springs Area	*77382	4/20/1948	2704.09
Muddy River Springs Area	*71026	5/20/1948	2708.09
Muddy River Springs Area	*71344	5/20/1948	2714.15
Muddy River Springs Area	59257	5/20/1948	2729.15
Muddy River Springs Area	63504	5/20/1948	2744.15
Muddy River Springs Area	59256	5/20/1948	2773.03
Muddy River Springs Area	59253	5/20/1948	2816.90
Muddy River Springs Area	*24186	8/14/1948	3126.90
Muddy River Springs Area	*64840	10/7/1948	3146.70
Muddy River Springs Area	*50851	10/7/1948	3176.70
Muddy River Springs Area	*50275	10/7/1948	3209.58
Muddy River Springs Area	*22633	12/20/1948	3507.08
Muddy River Springs Area	*50724	10/4/1949	3669.63
Muddy River Springs Area	*22636	6/19/1952	3929.63
Muddy River Springs Area	*22632	6/19/1952	4244.63
Muddy River Springs Area	*22635	12/18/1958	4269.63
Garnet Valley	83553	7/24/1959	4272.63
Muddy River Springs Area	*50934	11/20/1959	4328.03
Muddy River Springs Area	18437	11/20/1959	4348.18
Muddy River Springs Area	21466	8/15/1963	4531.38
Muddy River Springs Area	*50730	4/28/1965	4556.38
Muddy River Springs Area	*50725	4/28/1965	4621.38
Muddy River Springs Area	*50727	4/28/1965	4681.38
Muddy River Springs Area	*50726	4/28/1965	4746.38
Muddy River Springs Area	27216	8/25/1965	4747.77
Muddy River Springs Area	22738	8/25/1965	4766.58
Muddy River Springs Area	*22949	2/2/1966	5199.58
Muddy River Springs Area	**22950	2/2/1966	5199.58
Muddy River Springs Area	**22951	2/2/1966	5199.58
Muddy River Springs Area	**22952	2/2/1966	5199.58

Muddy River Springs Area	**24185	2/2/1966	5199.58
Garnet Valley	*64880	7/24/1967	5333.39
Muddy River Springs Area	*25310	10/9/1969	5493.39
California Wash	26371	11/18/1969	5583.39
Muddy River Springs Area	*50272	7/7/1970	5682.90
Muddy River Springs Area	*50273	7/7/1970	5972.81
Muddy River Springs Area	*85156	7/7/1970	6294.98
Muddy River Springs Area	*29298	7/7/1970	6622.48
Muddy River Springs Area	*79068	7/7/1970	7055.18
Garnet Valley	*74399	7/20/1981	7129.75
Garnet Valley	*63261	10/20/1981	7229.75
Garnet Valley	*83715	10/20/1981	7266.75
Garnet Valley	*83714	10/20/1981	7423.75
Garnet Valley	63348	10/20/1981	7427.75
Garnet Valley	77745	10/20/1981	7437.77
Coyote Spring Valley	*74095	3/31/1983	7937.77
Coyote Spring Valley	*74094	3/31/1983	8937.77
Coyote Spring Valley	*70430	3/31/1983	10077.77
Coyote Spring Valley	*70429	3/31/1983	11577.77
Coyote Spring Valley	*70430R01	3/31/1983	12037.77
Coyote Spring Valley	*77292	3/31/1983	12437.77
Muddy River Springs Area	*46932	5/19/1983	13437.92
Coyote Spring Valley	**77293	9/27/1985	17437.92
Garnet Valley	**86961T	9/27/1985	17437.92
Garnet Valley	**86962T	9/27/1985	17437.92
Garnet Valley	**86959T	9/27/1985	17437.92
Garnet Valley	**86960T	9/27/1985	17437.92
Coyote Spring Valley	77164	12/30/1985	19937.92
Coyote Spring Valley	*77294	1/27/1986	20037.92
Coyote Spring Valley	**77295	1/27/1986	20037.92
Coyote Spring Valley	**77296	1/27/1986	20037.92
Muddy River Springs Area	**52520	4/14/1986	20037.92
Coyote Spring Valley	*77297	7/15/1986	24537.92
Coyote Spring Valley	**77298	7/15/1986	24537.92
Coyote Spring Valley	**77299	7/15/1986	24537.92
Coyote Spring Valley	**77300	7/15/1986	24537.92
Coyote Spring Valley	**77301	7/15/1986	24537.92
Coyote Spring Valley	**77302	7/15/1986	24537.92
Coyote Spring Valley	**77303	7/15/1986	24537.92
Coyote Spring Valley	**77304	7/15/1986	24537.92
Coyote Spring Valley	**77305	7/15/1986	24537.92
Coyote Spring Valley	**77306	7/15/1986	24537.92
Garnet Valley	56855	10/28/1986	24682.07
California Wash	**50559	2/2/1987	24682.07
California Wash	50558	2/2/1987	24711.04
California Wash	50560	2/2/1987	24740.01
Garnet Valley	*66784	3/6/1987	24896.85

Black Mountains Area	*68351	6/21/1988	25439.83
Garnet Valley	*83707	10/3/1988	25439.94
Garnet Valley	*83709	10/3/1988	25440.05
Garnet Valley	*83710	10/3/1988	25440.16
Garnet Valley	*83712	10/3/1988	25443.86
Garnet Valley	*83713	10/3/1988	25467.66
Garnet Valley	*83711	10/3/1988	25508.44
Garnet Valley	*83717	10/3/1988	25576.83
Garnet Valley	*83708	10/3/1988	25645.33
Garnet Valley	*83716	10/3/1988	25713.83
Black Mountains Area	*68350	10/18/1988	25833.27
Black Mountains Area	*68352	10/18/1988	25970.82
California Wash	75198	4/4/1989	25995.82
California Wash	*70257	10/17/1989	28495.82
California Wash	**70258	10/17/1989	28495.82
California Wash	**70259	10/17/1989	28495.82
Garnet Valley	**79002	10/17/1989	28495.82
Garnet Valley	**79003	10/17/1989	28495.82
Garnet Valley	**79004	10/17/1989	28495.82
Garnet Valley	**79005	10/17/1989	28495.82
Garnet Valley	**54073	10/17/1989	28495.82
Garnet Valley	**86967T	10/17/1989	28495.82
Garnet Valley	**86968T	10/17/1989	28495.82
Garnet Valley	**86969T	10/17/1989	28495.82
Garnet Valley	**83490	10/17/1989	28495.82
Garnet Valley	**86970T	10/17/1989	28495.82
Garnet Valley	**79001	10/17/1989	28495.82
Garnet Valley	**68822	10/17/1989	28495.82
Hidden Valley	*54074	10/17/1989	30695.82
Garnet Valley	*87169T	10/17/1989	30700.82
Black Mountains Area	*55269	10/30/1989	30796.82
Black Mountains Area	*58031	10/30/1989	31620.82
Black Mountains Area	*58032	9/13/1990	32365.82
Muddy River Springs Area	*55450	11/9/1990	34537.72
Black Mountains Area	*68353	12/10/1990	35129.78
California Wash	57441E	4/16/1992	35162.37
Muddy River Springs Area	*58269	10/27/1992	36248.31
Muddy River Springs Area	*66043	10/27/1992	38782.21
Muddy River Springs Area	61427	7/26/1995	38783.57
Garnet Valley	*81344	8/25/2000	38791.57
Garnet Valley	*72098	8/25/2000	38804.73
Garnet Valley	**79948	8/25/2000	38804.73
Garnet Valley	**66785	8/25/2000	38804.73
Garnet Valley	**77389	8/25/2000	38804.73
Muddy River Springs Area	*75161E	12/6/2006	39710.54
California Wash	**76643	1/18/2008	39710.54
Coyote Spring Valley	**77291	8/13/2008	39710.54

Garnet Valley	**79009	11/2/2009	39710.54
Garnet Valley	**79008	11/2/2009	39710.54
Garnet Valley	**79010	11/2/2009	39710.54
Garnet Valley	**79007	11/2/2009	39710.54
Garnet Valley	**79006	11/2/2009	39710.54
Garnet Valley	**86965T	11/2/2009	39710.54
Garnet Valley	**86964T	11/2/2009	39710.54
Garnet Valley	**86963T	11/2/2009	39710.54
Garnet Valley	**86966T	11/2/2009	39710.54
Muddy River Springs Area	**80843	5/9/2011	39710.54
Muddy River Springs Area	**80844	5/9/2011	39710.54
Muddy River Springs Area	**80845	5/9/2011	39710.54
Muddy River Springs Area	**80846	5/9/2011	39710.54
Muddy River Springs Area	*71766	7/21/2011	39731.83
Garnet Valley	**84041	7/1/2014	39731.83

ROUNDWATER RIGHTS BY PRIORITY

Owner of Record	Site ID	Point_X
BEDROC LIMITED LLC	210 S11 E62 24DB 1	679415.9657
BEDROC LIMITED LLC	210 S11 E62 24BA 2	678994.4984
LDS	219 S14 E65 16AACD1	704095.5619
LDS	219 S14 E65 15BBCA1	704511.1582
LDS	219 S14 E65 09CCBC1	702750.1662
LDS	219 S14 E65 09CCBC1	702750.1662
LDS	219 S14 E65 15BBCA1	704511.1582
LDS	219 S14 E65 16AACD1	704095.5619
NEVADA POWER COMPANY	219 S14 E65 23BBBB1	706035.1054
EGTEDAR, ASCAR	219 S14 E65 23BBBB1	706035.1054
3335HILLSIDE LLC	219 S14 E65 22AADB1	705825.5606
CLOUD, MARY K	219 S14 E65 26ABDB1	707142.4168
CLOUD, MARY K	219 S14 E65 26ABDB1	707142.4168
WILLIAM O`DONNELL	219 S14 E65 09CACC1	703186.2268
WILLIAM O`DONNELL	219 S14 E65 09CACC1	703186.2268
PARSON, BILLY & LINDA	219 S14 E65 09DDCB1	703965.5489
PARSON, BILLY & LINDA	219 S14 E65 09DDCB1	703965.5489
BRUNDY, LARRY	219 S14 E65 23BC 1	706848.9150
KOLHOSS, KELLY	219 S14 E65 23BC 1	706848.9150
WHITMORE, DAN	219 S14 E65 23BC 1	706848.9150
LEAVITT, UTE	219 S14 E65 23BC 1	706848.9150
NEVADA POWER COMPANY	219 S14 E65 08AB 1	702141.1717
CLARK COUNTY	219 S14 E65 23BBCC1	706030.7904
CLARK COUNTY	219 S14 E65 23BBCC1	706030.7904
NEVADA POWER COMPANY	219 S14 E65 22AABB2	705691.1410
NEVADA POWER COMPANY	219 S14 E65 08AC 2	701911.5282
LDS	219 S14 E65 09CCBC1	702750.1662
NEVADA POWER COMPANY	219 S14 E65 08DB 2	701994.2240
NEVADA POWER COMPANY	219 S14 E65 08DBAC1	702155.9035
NEVADA POWER COMPANY	219 S14 E65 08ADBB1	702327.3808
TECHNICHROME	216 S19 E63 03ADDD1	686699.0151
NEVADA POWER COMPANY	219 S14 E65 22AABB2	705691.1410
COYOTE SPRINGS INVESTMENT LLC	219 S14 E65 09DDBC1	703956.0895
CASA DE WARM SPRINGS LLC	219 S14 E65 08DDBB1	702364.2688
LDS	219 S14 E65 09CCBC1	702750.1662
LDS	219 S14 E65 09CCBC1	702750.1662
LDS	219 S14 E65 09CCBC1	702750.1662
LDS	219 S14 E65 09CCBC1	702750.1662
UNITED STATES OF AMERICA	219 S14 E65 16DBCA1	703709.5266
DAVIS, DON J. & MARSHA L.	219 S14 E65 22AAAA1	706011.4762
NEVADA POWER COMPANY	219 S14 E65 08ADBB1	702327.3808
NEVADA POWER COMPANY	219 S14 E65 08AC 2	701911.5282
NEVADA POWER COMPANY	219 S14 E65 08DB 2	701994.2240
NEVADA POWER COMPANY	219 S14 E65 08DBAC1	702155.9035

NEVADA POWER COMPANY	219 S14 E65 08AB 1	702141.1717
CHEMICAL LIME COMPANY	216 S18 E63 23DCAA1	687749.4039
NEVADA POWER COMPANY	219 S14 E65 08ADBB1	702327.3808
MOAPA VALLEY WATER COMPANY	218 S14 E65 25CACC1	708114.0324
NEVADA POWER COMPANY	219 S14 E65 22AABB2	705691.1410
NEVADA POWER COMPANY	219 S14 E65 22AABB2	705691.1410
NEVADA POWER COMPANY	219 S14 E65 08DBAC1	702155.9035
NEVADA POWER COMPANY	219 S14 E65 23BBBB1	706035.1054
NEVADA POWER COMPANY	219 S14 E65 22AABB2	705691.1410
NEVADA POWER COMPANY	216 S17 E64 21CBBD1	692929.6284
CHEMICAL LIME COMPANY OF ARIZONA	216 S18 E63 14AABD1	687940.1014
REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 19ABBB1	690679.3344
REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 19CDDD1	690548.1807
WESTERN MINING & MINERALS, INC.	216 S18 E63 13CAAA1	688913.2169
NORTH LAS VEGAS-CITY	216 S18 E63 16BBDA1	683730.5385
COYOTE SPRINGS INVESTMENT, LLC	210 S13 E63 05ABCC1	682369.2570
CLARK COUNTY COYOTE SPRINGS WATER RESOU	210 S13 E63 10DCCA1	685740.8682
COYOTE SPRINGS INVESTMENT, LLC	210 S13 E63 22DCAC1	686013.6601
CLARK COUNTY COYOTE SPRINGS WATER RESOU	210 S13 E63 23BAAB1	687044.5320
COYOTE SPRINGS INVESTMENT LLC		698483.4225
SNWA	210 S13 E63 26AAAA1	688052.7833
MOAPA VALLEY WATER DISTRICT	219 S13 E64 35DCAD1	697611.9410
SNWA	210 S13 E63 26AAAA1	688052.7833
SNWA	216 S17 E64 21CBBD1	692929.6284
SNWA	216 S18 E63 15AACD1	686286.8792
SNWA	216 S18 E63 15AACC1	686199.6845
SNWA	216 S18 E63 05DACC1	683006.1888
NEVADA POWER COMPANY	210 S13 E63 26AABD1	687822.3216
SNWA	210 S13 E63 26AAAA1	688052.7833
SNWA	210 S13 E63 26AAAA1	688052.7833
SNWA	210 S13 E63 26AAAA1	688052.7833
MOAPA VALLEY WATER DISTRICT	219 S14 E65 07ADDA1	701053.8273
SNWA	210 S13 E63 26AAAA1	688052.7833
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SNWA	210 S13 E63 26AAAA1	688052.7833
SNWA	210 S13 E63 26AAAA1	688052.7833
SNWA	210 S13 E63 26AAAA1	688052.7833
SNWA	210 S13 E63 26AAAA1	688052.7833
SNWA	210 S13 E63 26AAAA1	688052.7833
SNWA	210 S13 E63 26AAAA1	688052.7833
SNWA	210 S13 E63 26AAAA1	688052.7833
GEORGIA PACIFIC CORPORATION	216 S18 E63 34ADAB1	686553.4551
NEVADA POWER COMPANY	218 S15 E66 05CDBD1	711550.4822
NEVADA POWER COMPANY	218 S15 E66 05CAAC1	711664.0427
NEVADA POWER COMPANY	218 S15 E66 05CAAC2	711722.0855
DRY LAKE WATER, LLC	216 S18 E63 27ACAD1	686222.2237

DRY LAKE WATER, LLC	215 S19 E63 13AADD1	689940.2391
REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 18ACDB1	690780.0253
REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 07DDCB1	691041.8320
REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 20BABA1	691936.0521
REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 19ABBB1	690679.3344
REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 19ABBB1	690679.3344
REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 19ABBB1	690679.3344
REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 07DDCC1	691049.5420
REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 18ACDB1	690780.0253
REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 18ACDB1	690780.0253
DRY LAKE WATER, LLC	215 S19 E63 13AADD1	689940.2391
DRY LAKE WATER, LLC	215 S19 E63 13AADD1	689940.2391
COYOTE SPRINGS INVESTMENT LLC	218 S14 E65 25CACC1	708114.0324
MOAPA BAND OF PAIUTE INDIANS	218 S16 E64 15ADAA1	696739.7747
MOAPA BAND OF PAIUTE INDIANS	218 S16 E64 15AAAA1	696714.7967
MOAPA BAND OF PAIUTE INDIANS	218 S16 E64 15AADA1	696725.6937
SNWA	216 S18 E63 05DACC1	683006.1888
SNWA	216 S17 E64 21CBBD1	692929.6284
SNWA	216 S18 E63 15AACD1	686286.8792
SNWA	216 S18 E63 15AACC1	686199.6845
SNWA	216 S17 E63 32CCCB1	681775.6464
SNWA	216 S18 E63 15AACC1	686199.6845
SNWA	216 S18 E63 15AACD1	686286.8792
SNWA	216 S17 E64 21CBBD1	692929.6284
SNWA	216 S18 E63 16BBDA1	683730.5385
SNWA	216 S18 E63 05DACC1	683006.1888
SNWA	216 S18 E63 05AADB1	683113.9361
SNWA	216 S18 E63 05AADB1	683113.9361
SNWA	217 S16 E62 25CCCA1	679695.7593
SNWA	216 S18 E63 02ABDC1	687567.3739
NEVADA COGENERATION ASSOCIATES #1	215 S19 E63 13DDBB1	689638.3166
NEVADA COGENERATION ASSOCIATES #1	215 S19 E63 13DAAB1	689868.6478
NEVADA COGENERATION ASSOCIATES	215 S19 E63 13DACA1	689795.9912
MOAPA VALLEY WATER DISTRICT	219 S14 E65 07ADDA1	701053.8273
DRY LAKE WATER, LLC	215 S19 E63 13ABCB1	689282.7713
NDOT	218 S15 E66 02ACBB1	716776.0126
MOAPA VALLEY WATER DISTRICT	219 S14 E65 07ADDA1	701053.8273
MOAPA VALLEY WATER DISTRICT	219 S14 E65 07ADDA2	701006.5335
S & R, INC.	219 S14 E65 09CDCB1	703172.6426
DRY LAKE WATER. LLC	216 S18 E63 13CDBC1	688657.6070
DRY LAKE WATER, LLC	216 S18 E63 13CDBC1	688657.6070
DRY LAKE WATER LLC	216 S18 E63 13CDBC1	688657.6070
DRY LAKE WATER, LLC	216 S17 E63 32AABA1	682983.9731
DRY LAKE WATER, LLC	216 S18 E63 33DBBA1	684409.0599
NEVADA POWER COMPANY	219 S14 E65 23BBBB1	706035.1054
MOAPA BAND OF PAIUTE INDIANS	218 S16 E64 23BCAA1	697235.0499
SNWA	210 S13 E63 23BAAB1	687044.5320

SNWA	216 S18 E63 15AACD1	686286.8792
SNWA	216 S17 E64 21CBBD1	692929.6284
SNWA	216 S18 E63 15AACC1	686199.6845
SNWA	216 S18 E63 05DACC1	683006.1888
SNWA	216 S18 E63 05AADB1	683113.9361
SNWA	216 S17 E64 21CBBD1	692929.6284
SNWA	216 S18 E63 15AACD1	686286.8792
SNWA	216 S18 E63 15AACC1	686199.6845
SNWA	216 S18 E63 05DACC1	683006.1888
NEVADA POWER COMPANY	219 S14 E65 08ADBB1	702327.3808
NEVADA POWER COMPANY	219 S14 E65 08AC 2	701911.5282
NEVADA POWER COMPANY	219 S14 E65 08AB 1	702141.1717
NEVADA POWER COMPANY	219 S14 E65 08DB 2	701994.2240
333SHILLSIDE, LLC	219 S14 E65 22AADB1	705825.5606
DRY LAKE WATER LLC	216 S18 E63 13CDBC1	688657.6070

Point_Y	Cumulative Pumpage
4094155.3445	109.8
4094392.7286	559.57
4066521.4015	559.57
4066640.5300	647.57
4067033.8615	702.72
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4065020.3597	912.53
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4022256.9150	1184.71
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4067072.3977	1201.82
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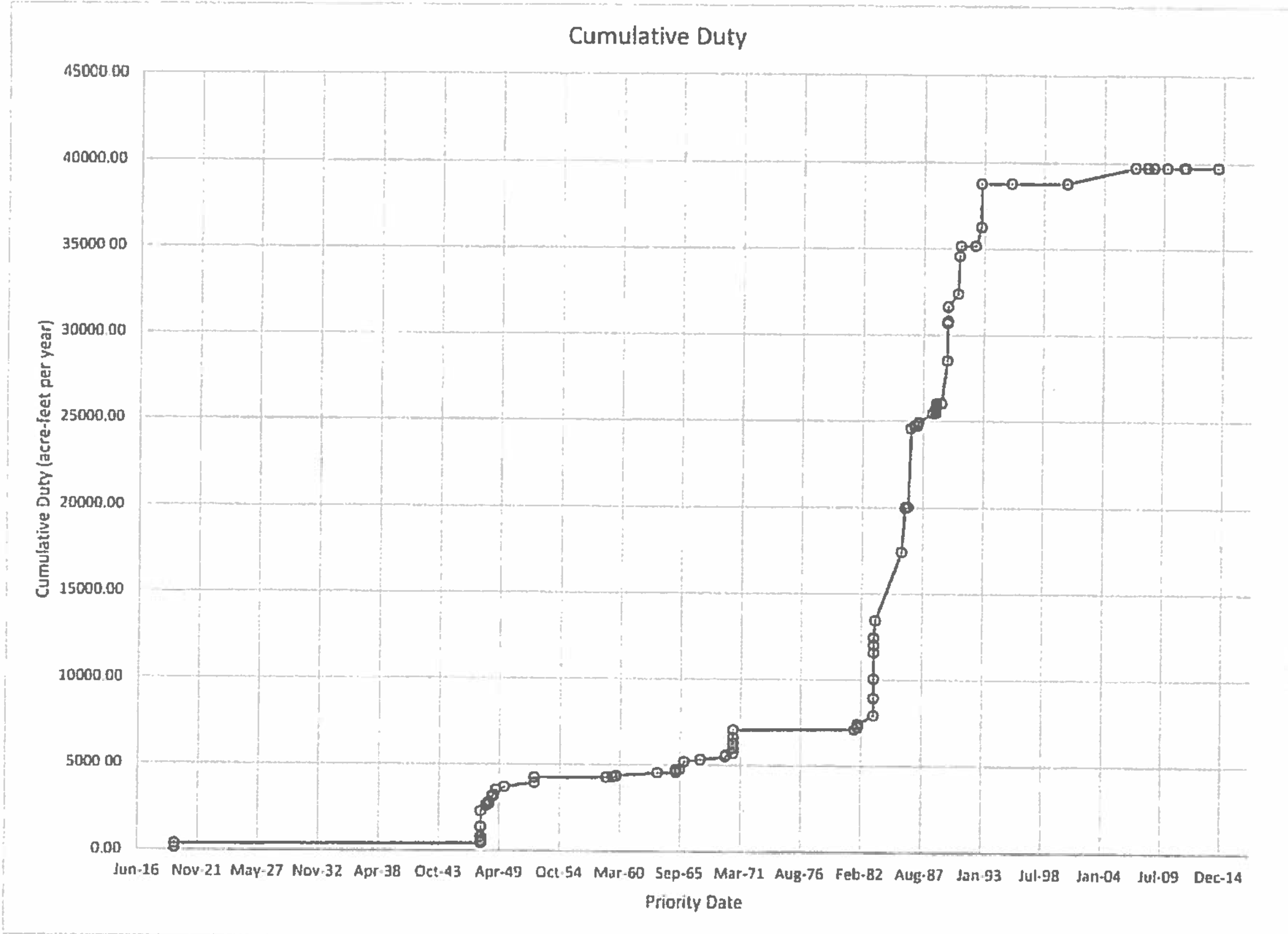
Cumulative Duty
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40000.00
35000.00
30000.00
25000.00
20000.00
15000.00
10000.00
5000.00
0.00
Cumulative Duty (acre-feet per year)
Jun-16 Nov-21 May-27 Nov-32 Apr-38 Oct-43 Apr-49 Oct-54 Mar-60 Sep-65 Mar-71 Aug-76 Feb-82 Aug-87 Jan-93 Jul-98 Jan-04 Jul-09 Dec-14
Priority Date

LWRFS GROUNDWATER RIGHTS BY PRIORITY

Basin	Permit	Priority Date	MOU	Annual Duty	Cumulative Duty	Owner of Record	Site ID	2017 Pumpage	Cumulative Pumpage
Coyote Spring Valley	*85249	10/22/1919	COM	109.8	109.80	BEDROC LIMITED LLC	210 S11 E62 24DB 1	109.8	109.8
Coyote Spring Valley	*85250	10/22/1919	COM	233.2	343.00	BEDROC LIMITED LLC	210 S11 E62 24BA 2	449.77	559.57
Muddy River Springs Area	*50733	8/13/1947	IND	70	413.00	LDS	219 S14 E65 16AACD1	0	559.57
Muddy River Springs Area	*50723	8/13/1947	IND	88	501.00	LDS	219 S14 E65 15BBCA1	88	647.57
Muddy River Springs Area	*50729	8/13/1947	IND	120	621.00	LDS	219 S14 E65 09CCBC1	55.15	702.72
Muddy River Springs Area	*50728	8/13/1947	IND	158	779.00	LDS	219 S14 E65 09CCBC1		702.72
Muddy River Springs Area	*50731	8/13/1947	IND	586	1365.00	LDS	219 S14 E65 15BBCA1	96.44	799.16
Muddy River Springs Area	*50732	8/13/1947	IND	930	2295.00	LDS	219 S14 E65 16AACD1	0	799.16
Muddy River Springs Area	*29296	2/4/1948	IND	300	2595.00	NEVADA POWER COMPANY	219 S14 E65 23BBBB1	88.26	887.42
Muddy River Springs Area	38871	2/4/1948	IRR	75	2670.00	EGTEDAR, ASCAR	219 S14 E65 23BBBB1	11.1	898.52
Muddy River Springs Area	*86209	4/20/1948	COM	14.01	2684.01	3335HILLSIDE LLC	219 S14 E65 22AADB1	14.01	912.53
Muddy River Springs Area	*82096	4/20/1948	QM	1.903	2685.91	CLOUD, MARY K	219 S14 E65 26ABDB1		912.53
Muddy River Springs Area	*82097	4/20/1948	QM	2.891	2688.80	CLOUD, MARY K	219 S14 E65 26ABDB1	2.29	914.82
Muddy River Springs Area	*77381	4/20/1948	COM	6.069	2694.87	WILLIAM O DONNELL	219 S14 E65 09CACC1		914.82
Muddy River Springs Area	*77382	4/20/1948	COM	9.221	2704.09	WILLIAM O DONNELL	219 S14 E65 09CACC1	0	914.82
Muddy River Springs Area	*71026	5/20/1948	IRR	3.993	2708.09	PARSON, BILLY & LINDA	219 S14 E65 09DDCB1	13.27	928.09
Muddy River Springs Area	*71344	5/20/1948	IRR	6.067	2714.15	PARSON, BILLY & LINDA	219 S14 E65 09DDCB1		928.09
Muddy River Springs Area	59257	5/20/1948	IRR	15	2729.15	BRUNDY, LARRY	219 S14 E65 23BC 1	9.54	937.63
Muddy River Springs Area	63504	5/20/1948	IRR	15	2744.15	KOLHOSS, KELLY	219 S14 E65 23BC 1	9.54	947.17
Muddy River Springs Area	59256	5/20/1948	IRR	28.875	2773.03	WHITMORE, DAN	219 S14 E65 23BC 1	18.37	965.54
Muddy River Springs Area	59253	5/20/1948	IRR	43.875	2816.90	LEAVITT, UTE	219 S14 E65 23BC 1	27.96	993.5
Muddy River Springs Area	*24186	8/14/1948	IND	310	3126.90	NEVADA POWER COMPANY	219 S14 E65 08AB 1	0	993.5
Muddy River Springs Area	*64840	10/7/1948	IRR	19.8	3146.70	CLARK COUNTY	219 S14 E65 23BBCC1	0.04	993.54
Muddy River Springs Area	*50851	10/7/1948	IRR	30	3176.70	CLARK COUNTY	219 S14 E65 23BBCC1		993.54
Muddy River Springs Area	*50275	10/7/1948	IND	32.88	3209.58	NEVADA POWER COMPANY	219 S14 E65 22AABB2	55	1048.54
Muddy River Springs Area	*22633	12/20/1948	IND	297.5	3507.08	NEVADA POWER COMPANY	219 S14 E65 08AC 2	0	1048.54
Muddy River Springs Area	*50724	10/4/1949	IND	162.55	3669.63	LDS	219 S14 E65 09CCBC1		1048.54
Muddy River Springs Area	*22636	6/19/1952	IND	260	3929.63	NEVADA POWER COMPANY	219 S14 E65 08DB 2	2.09	1050.63
Muddy River Springs Area	*22632	6/19/1952	IND	315	4244.63	NEVADA POWER COMPANY	219 S14 E65 08DBAC1	134.08	1184.71
Muddy River Springs Area	*22635	12/18/1958	IND	25	4269.63	NEVADA POWER COMPANY	219 S14 E65 08ADBB1		1184.71
Garnet Valley	83553	7/24/1959	IND	3	4272.63	TECHNICHROME	216 S19 E63 03ADDD1		1184.71
Muddy River Springs Area	*50934	11/20/1959	IND	55.4	4328.03	NEVADA POWER COMPANY	219 S14 E65 22AABB2	16.11	1200.82
Muddy River Springs Area	18437	11/20/1959	IRR	20.15	4348.18	COYOTE SPRINGS INVESTMENT LLC	219 S14 E65 09DDBC1	1	1201.82
Muddy River Springs Area	21466	8/15/1963	IRR	183.2	4531.38	CASA DE WARM SPRINGS LLC	219 S14 E65 08DDBB1		1201.82
Muddy River Springs Area	*50730	4/28/1965	IND	25	4556.38	LDS	219 S14 E65 09CCBC1		1201.82
Muddy River Springs Area	*50725	4/28/1965	IND	65	4621.38	LDS	219 S14 E65 09CCBC1		1201.82
Muddy River Springs Area	*50727	4/28/1965	IND	60	4681.38	LDS	219 S14 E65 09CCBC1		1201.82
Muddy River Springs Area	*50726	4/28/1965	IND	65	4746.38	LDS	219 S14 E65 09CCBC1		1201.82
Muddy River Springs Area	27216	8/25/1965	COM	1.381005	4747.77	UNITED STATES OF AMERICA	219 S14 E65 16DBCA1	0.18	1202
Muddy River Springs Area	22738	8/25/1965	COM	18.81	4766.58	DAVIS, DON J. & MARSHA L.	219 S14 E65 22AAAA1	18.81	1220.81
Muddy River Springs Area	*22949	2/2/1966	IND	433	5199.58	NEVADA POWER COMPANY	219 S14 E65 08ADBB1		1220.81
Muddy River Springs Area	**22950	2/2/1966	IND	0	5199.58	NEVADA POWER COMPANY	219 S14 E65 08AC 2		1220.81
Muddy River Springs Area	**22951	2/2/1966	IND	0	5199.58	NEVADA POWER COMPANY	219 S14 E65 08DB 2		1220.81
Muddy River Springs Area	**22952	2/2/1966	IND	0	5199.58	NEVADA POWER COMPANY	219 S14 E65 08DBAC1		1220.81
Muddy River Springs Area	**24185	2/2/1966	IND	0	5199.58	NEVADA POWER COMPANY	219 S14 E65 08AB 1		1220.81
Garnet Valley	*64880	7/24/1967	MM	133.81	5333.39	CHEMICAL LIME COMPANY	216 S18 E63 23DCAA1	117.17	1337.98
Muddy River Springs Area	*25310	10/9/1969	IND	160	5493.39	NEVADA POWER COMPANY	219 S14 E65 08ADBB1		1337.98
California Wash	26371	11/18/1969	IRR	90	5583.39	MOAPA VALLEY WATER COMPANY	218 S14 E65 25CACC1		1337.98
Muddy River Springs Area	*50272	7/7/1970	IND	99.51	5682.90	NEVADA POWER COMPANY	219 S14 E65 22AABB2		1337.98
Muddy River Springs Area	*50273	7/7/1970	IND	289.91	5972.81	NEVADA POWER COMPANY	219 S14 E65 22AABB2		1337.98
Muddy River Springs Area	*85156	7/7/1970	IND	322.17	6294.98	NEVADA POWER COMPANY	219 S14 E65 08DBAC1		1337.98

*TCD, additive duty
**TCD, supplemental duty

Basin	Permit	Priority Date	MOU	Annual Duty	Cumulative Duty	Owner of Record	Site ID	2017 Pumpage	Cumulative Pumpage
Muddy River Springs Area	*29298	7/7/1970	IND	327.5	6622.48	NEVADA POWER COMPANY	219 S14 E65 23BBBB1		1337.98
Muddy River Springs Area	*79068	7/7/1970	IND	432.7	7055.18	NEVADA POWER COMPANY	219 S14 E65 22AABB2		1337.98
Garnet Valley	*74399	7/20/1981	IND	74.57	7129.75	NEVADA POWER COMPANY	216 S17 E64 21CBBD1	74.57	1412.55
Garnet Valley	*63261	10/20/1981	COM	100	7229.75	CHEMICAL LIME COMPANY OF ARIZONA	216 S18 E63 14AABD1	68.81	1488.16
Garnet Valley	*83715	10/20/1981	IND	37	7266.75	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 19ABBB1		1488.16
Garnet Valley	*83714	10/20/1981	IND	157	7423.75	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 19CDDD1	209.3	1677.46
Garnet Valley	63348	10/20/1981	COM	4	7427.75	WESTERN MINING & MINERALS, INC.	216 S18 E63 13CAAA1	2.71	1680.17
Garnet Valley	77745	10/20/1981	COM	10.02	7437.77	NORTH LAS VEGAS-CITY	216 S18 E63 16BBDA1	10.02	1690.19
Coyote Spring Valley	*74095	3/31/1983	MUN	500	7937.77	COYOTE SPRINGS INVESTMENT, LLC	210 S13 E63 05ABCC1	178.78	1868.97
Coyote Spring Valley	*74094	3/31/1983	MUN	1000	8937.77	CLARK COUNTY COYOTE SPRINGS WATER RESOURCES GID	210 S13 E63 10DCCA1		1868.97
Coyote Spring Valley	*70430	3/31/1983	MUN	1140	10077.77	COYOTE SPRINGS INVESTMENT, LLC	210 S13 E63 22DCAC1		1868.97
Coyote Spring Valley	*70429	3/31/1983	MUN	1500	11577.77	CLARK COUNTY COYOTE SPRINGS WATER RESOURCES GID	210 S13 E63 23BAAB1	1219.84	3088.81
Coyote Spring Valley	*70430R01	3/31/1983	WLD	460	12037.77	COYOTE SPRINGS INVESTMENT LLC			3088.81
Coyote Spring Valley	*77292	3/31/1983	MUN	400	12437.77	SNWA	210 S13 E63 26AAAA1		3089.81
Muddy River Springs Area	*46932	5/19/1983	MUN	1000.15451	13437.92	MOAPA VALLEY WATER DISTRICT	219 S13 E64 35DCAD1	0	3089.81
Coyote Spring Valley	**77293	9/27/1985	MUN	4000	17437.92	SNWA	210 S13 E63 26AAAA1		3089.81
Garnet Valley	**86961T	9/27/1985	MUN	0	17437.92	SNWA	216 S17 E64 21CBBD1	217.38	3306.99
Garnet Valley	**86962T	9/27/1985	MUN	0	17437.92	SNWA	216 S18 E63 15AACD1		3306.99
Garnet Valley	**86959T	9/27/1985	MUN	0	17437.92	SNWA	216 S18 E63 15AACC1		3306.99
Garnet Valley	**86960T	9/27/1985	MUN	0	17437.92	SNWA	216 S18 E63 05DACC1		3306.99
Coyote Spring Valley	77164	12/30/1985	IND	2500	19937.92	NEVADA POWER COMPANY	210 S13 E63 26AABD1		3306.99
Coyote Spring Valley	*77294	1/27/1986	MUN	100	20037.92	SNWA	210 S13 E63 26AAAA1		3306.99
Coyote Spring Valley	**77295	1/27/1986	MUN	0	20037.92	SNWA	210 S13 E63 26AAAA1		3306.99
Coyote Spring Valley	**77296	1/27/1986	MUN	0	20037.92	SNWA	210 S13 E63 26AAAA1		3306.99
Muddy River Springs Area	**52520	4/14/1986	MUN	0	20037.92	MOAPA VALLEY WATER DISTRICT	219 S14 E65 07ADDA1	1447.93	4754.92
Coyote Spring Valley	*77297	7/15/1986	MUN	4500	24537.92	SNWA	210 S13 E63 26AAAA1		4754.92
Coyote Spring Valley	**77298	7/15/1986	MUN	0	24537.92	SNWA	210 S13 E63 26AAAA1		4754.92
Coyote Spring Valley	**77299	7/15/1986	MUN	0	24537.92	SNWA	210 S13 E63 26AAAA1		4754.92
Coyote Spring Valley	**77300	7/15/1986	MUN	0	24537.92	SNWA	210 S13 E63 26AAAA1		4754.92
Coyote Spring Valley	**77301	7/15/1986	MUN	0	24537.92	SNWA	210 S13 E63 26AAAA1		4754.92
Coyote Spring Valley	**77302	7/15/1986	MUN	0	24537.92	SNWA	210 S13 E63 26AAAA1		4754.92
Coyote Spring Valley	**77303	7/15/1986	MUN	0	24537.92	SNWA	210 S13 E63 26AAAA1		4754.92
Coyote Spring Valley	**77304	7/15/1986	MUN	0	24537.92	SNWA	210 S13 E63 26AAAA1		4754.92
Coyote Spring Valley	**77305	7/15/1986	MUN	0	24537.92	SNWA	210 S13 E63 26AAAA1		4754.92
Coyote Spring Valley	**77306	7/15/1986	MUN	0	24537.92	SNWA	210 S13 E63 26AAAA1		4754.92
Garnet Valley	56855	10/28/1986	IND	144.146233	24682.07	GEORGIA PACIFIC CORPORATION	216 S18 E63 34ADAB1	94.27	4849.19
California Wash	**50559	2/2/1987	IND	0	24682.07	NEVADA POWER COMPANY	218 S15 E66 05CDBD1	28.97	4878.16
California Wash	50558	2/2/1987	ENV	28.970416	24711.04	NEVADA POWER COMPANY	218 S15 E66 05CAAC1		4878.16
California Wash	50560	2/2/1987	ENV	28.970416	24740.01	NEVADA POWER COMPANY	218 S15 E66 05CAAC2		4878.16
Garnet Valley	*66784	3/6/1987	QM	156.84	24896.85	DRY LAKE WATER, LLC	216 S18 E63 27ACAD1		4878.16
Black Mountains Area	*68351	6/22/1988	QM	542.98	25439.83	DRY LAKE WATER, LLC	215 S19 E63 13AADD1		4878.16
Garnet Valley	*83707	10/3/1988	IND	0.11	25439.94	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 18ACDB1		4878.16
Garnet Valley	*83709	10/3/1988	IND	0.11	25440.05	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 07DDCB1		4878.16
Garnet Valley	*83710	10/3/1988	IND	0.11	25440.16	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 20BABA1		4878.16
Garnet Valley	*83712	10/3/1988	IND	3.7	25443.86	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 19ABBB1		4878.16
Garnet Valley	*83713	10/3/1988	IND	23.8	25467.66	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 19ABBB1		4878.16
Garnet Valley	*83711	10/3/1988	IND	40.78	25508.44	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 19ABBB1		4878.16
Garnet Valley	*83717	10/3/1988	IND	68.39	25576.83	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 07DDCC1	271.07	5149.23
Garnet Valley	*83708	10/3/1988	IND	68.5	25645.33	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 18ACDB1	67.99	5217.22
Garnet Valley	*83716	10/3/1988	IND	68.5	25713.83	REPUBLIC ENVIRONMENTAL TECHNOLOGIES INC	216 S18 E64 18ACDB1		5217.22
Black Mountains Area	*68350	10/18/1988	QM	119.44	25833.27	DRY LAKE WATER, LLC	215 S19 E63 13AADD1		5217.22
Black Mountains Area	*68352	10/18/1988	QM	137.55	25970.82	DRY LAKE WATER, LLC	215 S19 E63 13AADD1		5217.22
California Wash	73198	4/4/1989	MUN	25	25995.82	COYOTE SPRINGS INVESTMENT LLC	218 S14 E65 25CACC1		5217.22

*TCD, additive duty

**TCD, supplemental duty

Basin	Permit	Priority Date	MOU	Annual Duty	Cumulative Duty	Owner of Record	Site ID	2017 Pumpage	Cumulative Pumpage
California Wash	*70257	10/17/1989	MUN	2500	28495.82	MOAPA BAND OF PAIUTE INDIANS	218 S16 E64 15ADAA1	12.82	5230.04
California Wash	**70258	10/17/1989	MUN	0	28495.82	MOAPA BAND OF PAIUTE INDIANS	218 S16 E64 15AAAA1		5230.04
California Wash	**70259	10/17/1989	MUN	0	28495.82	MOAPA BAND OF PAIUTE INDIANS	218 S16 E64 15AADA1		5230.04
Garnet Valley	**79002	10/17/1989	MUN	0	28495.82	SNWA	216 S18 E63 05DACC1		5230.04
Garnet Valley	**79003	10/17/1989	MUN	0	28495.82	SNWA	216 S17 E64 21CBBD1		5230.04
Garnet Valley	**79004	10/17/1989	MUN	0	28495.82	SNWA	216 S18 E63 15AACD1	233.33	5463.37
Garnet Valley	**79005	10/17/1989	MUN	0	28495.82	SNWA	216 S18 E63 15AACC1	230.34	5693.71
Garnet Valley	**54073	10/17/1989	MUN	0	28495.82	SNWA	216 S17 E63 32CCCB1		5693.71
Garnet Valley	**86967T	10/17/1989	MUN	0	28495.82	SNWA	216 S18 E63 15AACC1		5693.71
Garnet Valley	**86968T	10/17/1989	MUN	0	28495.82	SNWA	216 S18 E63 15AACD1		5693.71
Garnet Valley	**86969T	10/17/1989	MUN	0	28495.82	SNWA	216 S17 E64 21CBBD1		5693.71
Garnet Valley	**83490	10/17/1989	MUN	0	28495.82	SNWA	216 S18 E63 16BBDA1	17.5	5711.21
Garnet Valley	**86970T	10/17/1989	MUN	0	28495.82	SNWA	216 S18 E63 05DACC1		5711.21
Garnet Valley	**79001	10/17/1989	MUN	0	28495.82	SNWA	216 S18 E63 05AADB1		5711.21
Garnet Valley	**68822	10/17/1989	MUN	0	28495.82	SNWA	216 S18 E63 05AADB1	350	6061.21
Hidden Valley	*54074	10/17/1989	MUN	2200	30695.82	SNWA	217 S16 E62 25CCCA1		6061.21
Garnet Valley	*87169T	10/17/1989	COM	5	30700.82	SNWA	216 S18 E63 02ABDC1		6061.21
Black Mountains Area	*55269	10/30/1989	IND	96	30796.82	NEVADA COGENERATION ASSOCIATES #1	215 S19 E63 13DDBB1	33.06	6094.28
Black Mountains Area	*58031	10/30/1989	IND	824	31620.82	NEVADA COGENERATION ASSOCIATES #1	215 S19 E63 13DAAB1	834.72	6928.98
Black Mountains Area	*58032	9/13/1990	IND	745	32365.82	NEVADA COGENERATION ASSOCIATES	215 S19 E63 13DACA1	639.54	7568.52
Muddy River Springs Area	*55450	11/9/1990	MUN	2171.906564	34537.72	MOAPA VALLEY WATER DISTRICT	219 S14 E65 07ADDA1	1013.76	8582.28
Black Mountains Area	*68353	12/10/1990	QM	592.06	35129.78	DRY LAKE WATER, LLC	215 S19 E63 13ABCB1		8582.28
California Wash	57441E	4/16/1992	ENV	32.591718	35162.37	NDOT	218 S15 E66 02ACBB1		8582.28
Muddy River Springs Area	*58269	10/27/1992	MUN	1085.94	36248.31	MOAPA VALLEY WATER DISTRICT	219 S14 E65 07ADDA1		8582.28
Muddy River Springs Area	*66043	10/27/1992	MUN	2533.9	38782.21	MOAPA VALLEY WATER DISTRICT	219 S14 E65 07ADDA2	361.79	8944.07
Muddy River Springs Area	61427	7/26/1995	COM	1.350316	38783.57	S & R, INC.	219 S14 E65 09CDCB1		8944.07
Garnet Valley	*81344	8/25/2000	QM	8	38791.57	DRY LAKE WATER, LLC	216 S18 E63 13CDBC1	8	8952.07
Garnet Valley	*72098	8/25/2000	QM	13.16	38804.73	DRY LAKE WATER, LLC	216 S18 E63 13CDBC1	13	8965.07
Garnet Valley	**79948	8/25/2000	QM	0	38804.73	DRY LAKE WATER LLC	216 S18 E63 13CDBC1	8.97	8974.04
Garnet Valley	**66785	8/25/2000	QM	0	38804.73	DRY LAKE WATER, LLC	216 S17 E63 32AABA1		8974.04
Garnet Valley	**77389	8/25/2000	QM	0	38804.73	DRY LAKE WATER, LLC	216 S18 E63 33DBBA1		8974.04
Muddy River Springs Area	*75161E	12/6/2006	ENV	905.81	39710.54	NEVADA POWER COMPANY	219 S14 E65 23BBBB1		8974.04
California Wash	**76643	1/18/2008	MUN	0	39710.54	MOAPA BAND OF PAIUTE INDIANS	218 S16 E64 23BCAA1	30.06	9004.1
Coyote Spring Valley	**77291	8/13/2008	MUN	0	39710.54	SNWA	210 S13 E63 23BAAB1		9004.1
Garnet Valley	**79009	11/2/2009	MUN	0	39710.54	SNWA	216 S18 E63 15AACD1		9004.1
Garnet Valley	**79008	11/2/2009	MUN	0	39710.54	SNWA	216 S17 E64 21CBBD1		9004.1
Garnet Valley	**79010	11/2/2009	MUN	0	39710.54	SNWA	216 S18 E63 15AACC1		9004.1
Garnet Valley	**79007	11/2/2009	MUN	0	39710.54	SNWA	216 S18 E63 05DACC1		9004.1
Garnet Valley	**79006	11/2/2009	MUN	0	39710.54	SNWA	216 S18 E63 05AADB1		9004.1
Garnet Valley	**86965T	11/2/2009	MUN	0	39710.54	SNWA	216 S17 E64 21CBBD1		9004.1
Garnet Valley	**86964T	11/2/2009	MUN	0	39710.54	SNWA	216 S18 E63 15AACD1		9004.1
Garnet Valley	**86963T	11/2/2009	MUN	0	39710.54	SNWA	216 S18 E63 15AACC1		9004.1
Garnet Valley	**86966T	11/2/2009	MUN	0	39710.54	SNWA	216 S18 E63 05DACC1		9004.1
Muddy River Springs Area	**80843	5/9/2011	IND	0	39710.54	NEVADA POWER COMPANY	219 S14 E65 08ADBB1		9004.1
Muddy River Springs Area	**80844	5/9/2011	IND	0	39710.54	NEVADA POWER COMPANY	219 S14 E65 08AC 2		9004.1
Muddy River Springs Area	**80845	5/9/2011	IND	0	39710.54	NEVADA POWER COMPANY	219 S14 E65 08AB 1		9004.1
Muddy River Springs Area	**80846	5/9/2011	IND	0	39710.54	NEVADA POWER COMPANY	219 S14 E65 08DB 2		9004.1
Muddy River Springs Area	*71766	7/21/2011	IRR	21.29	39731.83	3335HILLSIDE, LLC	219 S14 E65 22AADB1	24.2	9028.3
Garnet Valley	**84041	7/1/2014	QM	0	39731.83	DRY LAKE WATER LLC	216 S18 E63 13CDBC1		9028.3

Pumpage amount from same POD and within same TCD applied to most senior right first

*TCD, additive duty
**TCD, supplemental duty

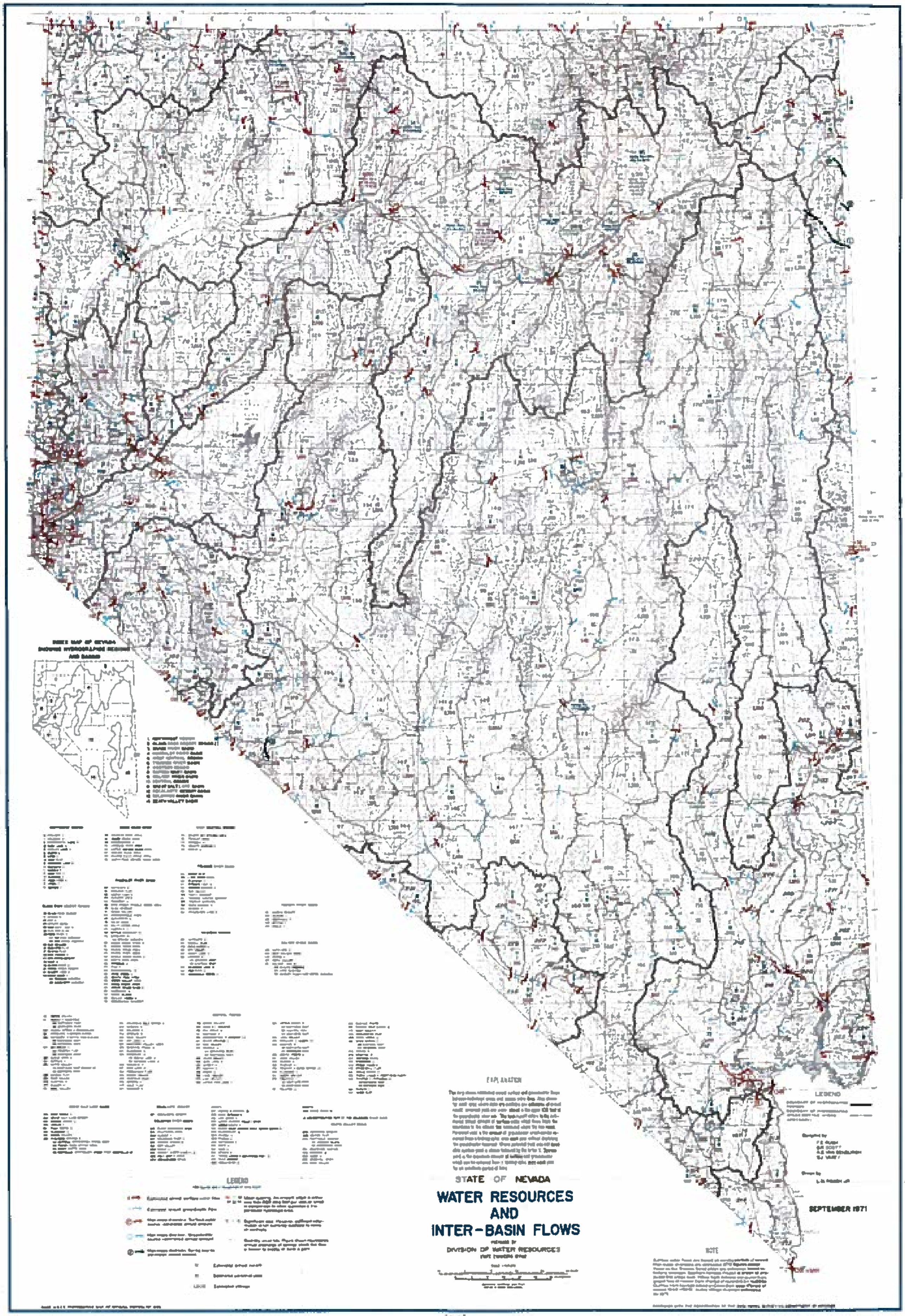

Figure 1

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MEMORANDUM OF AGREEMENT

This Memorandum of Agreement ("MOA") is entered into this 20th day of April, 2006, (the "Effective Date") by and between the Southern Nevada Water Authority ("SNWA"), a political subdivision of the State of Nevada, the United States Fish and Wildlife Service ("FWS"), Coyote Springs Investment LLC, a Nevada limited liability company ("CSI"), the Moapa Band of Paiute Indians ("Tribe") and the Moapa Valley Water District ("MVWD"), a political subdivision of the State of Nevada. For convenience, SNWA, FWS, CSI, the Tribe and MVWD are at times herein referred to individually as "Party" and collectively as "Parties."

RECITALS

A. In Order No. 1169 the Nevada State Engineer held in abeyance applications for new groundwater rights in certain groundwater basins, and mandated that SNWA, MVWD and other parties conduct a regional groundwater study including the pumping of at least 50 percent of the permitted water rights within the Coyote Spring Valley hydrographic basin for a period of at least two consecutive years ("Pump Test").[1] SNWA currently owns 9,000 afy of water rights with points of diversion within the Coyote Spring Valley hydrographic basin under Permit Nos. 49414, 49660 through 49662 and 49978 through 49987 ("SNWA Water Rights").

B. To facilitate the Pump Test and delivery of SNWA Water Rights, SNWA applied to the Bureau of Land Management ("BLM") for a right-of-way across Federal land for the

[1] Currently there are 16,100 acre-feet per year ("afy") of permitted groundwater rights in the Coyote Spring Valley hydrologic basin, including the SNWA Water Rights and CSI Water Rights, defined in Recitals A and D herein, and Order No. 1169 requires the continuous diversion of 8,050 acre-feet per year during the Pump Test.

construction and operation of a pipeline to deliver groundwater from the Coyote Spring hydrographic basin to either the Muddy River System or to MVWD's service system.

C. In Ruling No. 5115 the Nevada State Engineer granted Application No. 54075, filed by the Las Vegas Valley Water District ("District") on October 17, 1989, for a total duty of 2,500 afy with a diversion rate of 5.0 cubic feet per second ("cfs") within the California Wash hydrographic basin ("Permit No. 54075"). By separate agreement, the District has transferred ownership of Permit No. 54075 to the Tribe. The Tribe plans to divert and utilize groundwater under Permit No. 54075.

D. CSI is a private landowner in the Coyote Spring Valley hydrographic basin and owns 4,600 afy of water rights with points of diversion within the basin under Permit Nos. 70429 and 70430 ("CSI Water Rights").

E. MVWD is responsible for supplying the municipal water needs of Upper and Lower Moapa Valley located in Clark County, Nevada. MVWD owns several water rights within Upper Moapa Valley including surface rights to spring flows in the Muddy Springs area and groundwater rights (Permit Nos. 52520, 55450 and 58269) with points of diversion at the Arrow Canyon well and a right to 1.0 cfs of spring flow from the Jones Spring (Certificate No. 10060) ("Jones Water Right").

F. FWS is a Federal agency within the Department of the Interior. FWS' responsibilities include implementation of the Endangered Species Act and administration of the National Wildlife Refuge System. FWS holds a Nevada State water right certificate for a flow rate of not less than 3.5 cfs as measured at the Warm Springs West flume (Permit No. 56668; Certificate No. 15097 issued subject to the terms of Permit No. 56668) for the maintenance of habitat of the Moapa dace and other wildlife purposes ("FWS Water Right").

G. The Moapa dace (*Moapa coriacea*) is an endemic fish that inhabits the upper Muddy River and tributary thermal spring systems within the Warm Springs area in Clark County, Nevada. The Moapa dace was federally listed as endangered on March 11, 1967 (32 FR 4001). FWS manages the Moapa Valley National Wildlife Refuge established in 1979 as part of the National Wildlife Refuge System.

H. Based upon its evaluation of available data, FWS postulates that current groundwater pumping by MVWD at the Arrow Canyon well is causing a decline in spring flows in the Warm Springs area and that future withdrawals of groundwater by SNWA and/or CSI in the Coyote Spring Valley hydrographic basin and/or by the Tribe in the California Wash hydrographic basin may cause spring flows to decline. SNWA, CSI, and MVWD do not believe the available hydrologic data supports these conclusions.

I. The Tribe believes that regional groundwater monitoring and scientifically valid, but conservative, regional computer modeling have demonstrated and will continue to demonstrate that on-Reservation groundwater pumping authorized under Permit No. 54075 will not cause appreciable declines in spring flows in the Warm Springs area.

J. Prior to the issuance of Order No. 1169, a stipulation was executed on July 19, 2001, between Federal agencies and SNWA regarding protests filed by Federal agencies against SNWA applications for new groundwater rights in the Coyote Spring Valley hydrographic basin. The Federal agencies and SNWA agreed to implement a monitoring study that was clarified in a Monitoring, Management, and Mitigation Plan for Existing and Future Permitted Groundwater Development in Coyote Spring Valley ("3M Plan") attached to and incorporated in that stipulation.

K. As part of the approval of the MVWD water rights at the Arrow Canyon well, the Nevada State Engineer required a monitoring plan. A monitoring plan has been developed and agreed upon jointly by MVWD, Nevada Power Company, FWS and National Park Service, with the most recent amendments to that plan being submitted to the State Engineer in September 2002 ("MVWD Monitoring Plan").

L. State Engineer Ruling No. 5115 requires that "[a] monitoring program approved by the State Engineer prior to the diversion of any water [under Permit No. 54075] be prepared in conjunction with the [Pump Test] ordered in State Engineer's Order No. 1169."[2] The Tribe will develop, in coordination with the other Parties, a monitoring plan approved by the Nevada State Engineer prior to applying any groundwater to beneficial use under Permit No. 54075 ("Tribal Monitoring Plan").

M. On March 11, 2005, the Nevada State Engineer approved a document entitled "Southern Nevada Water Authority's Monitoring Plan for Groundwater Applications and Permits in Coyote Spring Valley, Hidden and Garnet Valleys, and California Wash Hydrographic Basin, Clark and Lincoln Counties March, 2005" ("SNWA Monitoring Plan"). The State Engineer directed that the SNWA Monitoring Plan serve as the monitoring plan required by the State Engineer for the SNWA Water Rights and the CSI Water Rights.

N. The Parties share a common interest in the conservation and recovery of the Moapa dace and its habitat. Each Party also has an interest in the protection, use and enjoyment of its water rights and entitlements. To serve these interests, the Parties have identified certain conservation measures with the objective of making measurable progress toward the conservation and recovery of the Moapa dace, and have agreed to coordinate the monitoring, management and mitigation measures included and to be included in the 3M Plan, MVWD

Monitoring Plan, SNWA Monitoring Plan, and Tribal Monitoring Plan (collectively the "Regional Monitoring Plans").

O. The Parties desire that FWS engage in consultation and prepare a formal biological opinion under the provisions of Section 7 of the Endangered Species Act and its implementing regulations prior to execution of this MOA. The consultation shall consider the effects on the Moapa dace from the pumping of 9,000 afy under the SNWA Water Rights, 4,600 afy under the CSI Water Rights, and 2,500 afy by the Tribe under Permit No. 54075, together with the implementation of the monitoring, management and conservation measures identified herein.

NOW, THEREFORE, in consideration of the mutual promises and covenants contained herein, the Parties do agree as follows:

I. Conservation Measures. The Parties agree that in order to make measurable progress toward protection and recovery of the Moapa dace and its habitat concurrent with the operation and development of water projects for human use, it is beneficial to the public interest to establish the following conservation measures:

1. Establishment of Recovery Implementation Program. To effectuate the goals of this MOA the Parties agree to establish a Recovery Implementation Program ("RIP") whereby measures necessary to accomplish the protection and recovery of the Moapa dace, the operation and development of regional water facilities, and the inclusion of necessary and interested third parties are outlined and implemented. To facilitate establishment of the RIP:

a. The Parties agree to cooperate in the selection of qualified personnel and/or contractors to oversee the development of the RIP.

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[2] Ruling No. 5115 at 40.

b. SNWA agrees to provide funding in the amount of $300,000.00 to develop the RIP. SNWA agrees to execute such documents as may be necessary to ensure that these funds are available to meet the needs of those persons designated by the Parties with the task of establishing the RIP.

c. The Parties agree to seek the cooperation of other parties within the region that have an interest in the development and management of water and biological resources. To achieve the goals of the RIP, the Parties agree to employ principles of adaptive management to further the current understanding of the habitat and aquatic needs of the Moapa dace. The Parties will jointly negotiate the participation of any other party in the RIP.

2. Dedication of the Jones Water Right. The Parties agree that the recovery of the Moapa dace will be enhanced by the guarantee of additional in-stream flows in areas of historical Moapa dace habitat. One such area is the Apcar Stream down gradient of the Jones Spring. The Parties concur that the dedication of the Jones Water Right to the purpose of providing in-stream flows will be beneficial to the Moapa dace population in this area and further the recovery of the species. To effectuate the dedication of the Jones Water Right to the provision of in-stream flows in the Apcar Stream, the Parties agree as follows:

a. MVWD agrees to record an agreement between MVWD and FWS ("Jones Springs Agreement") on the Jones Water Right with both the Nevada State Engineer and the Clark County, Nevada, Recorder's Office that requires the entire 1.0 cfs flow right under the Jones Water Right to be dedicated to the purpose of maintaining in-stream flows in the Apcar Stream subject to the provisions of paragraph 7 of the Jones Springs Agreement. MVWD shall retain ownership of the Jones Water Right. The Jones Springs Agreement shall be executed and recorded promptly upon execution of this MOA. A draft of the Jones Springs Agreement is attached hereto as "Exhibit A." The Jones Springs Agreement ultimately recorded pursuant to this paragraph shall be in substantially the same form as Exhibit A.

b. SNWA agrees to transfer to MVWD, at no cost, a portion of Permit No. 49414 equal to 724 afy. This transferred portion of Permit No. 49414 shall remain of equal priority date with that portion of Permit No. 49414 retained by SNWA.

c. MVWD agrees to transfer to SNWA, at no cost, the first 724 afy, or any portion thereof if less than 724 afy is permitted, of any permit(s) issued by the Nevada State Engineer pursuant to Application Nos. 54055 through 54059, inclusive.

d. The Parties agree to cooperate with MVWD in the filing and processing of any change applications, including applications to change the manner or place of use that are filed by MVWD with the Nevada State Engineer in order to effectuate the Jones Springs Agreement referenced in paragraph I(2)(a) above.

e. Subject to paragraph 2 of the Jones Springs Agreement, the Parties agree to cooperatively determine the best methods to ensure that the Jones Water Right accomplishes the purpose stated in paragraph I(2)(a) above, as related to the recovery of the Moapa dace and other endemic species, including the possibility of restoration of the springhead at Jones Spring.

3. <u>Dedication of Portion of CSI Water Rights</u>.

a. CSI agrees to record a conservation easement with both the Nevada State Engineer and the Clark County, Nevada, Recorders Office dedicating 460 afy of the CSI Water Rights to the survival and recovery of the Moapa dace and its habitat. The use of this water would be at the discretion of the FWS in consultation with the CSI and the Parties.

b. In addition, CSI agrees to dedicate 5 percent of all water rights above 4,600 afy that CSI may in the future be entitled to withdraw from Coyote Spring Valley hydrographic basin or any water rights that CSI imports into and uses in the basin. The Parties, consistent with the RIP, will determine the most effective method for utilizing such water rights. CSI shall execute and record such documentation, including conservation easements, deeds, change applications and reports of conveyance, as may be necessary to effectuate the dedication of that portion of such water rights that is subject to the terms and conditions contained herein.

4. Habitat Restoration and Recovery Measures. To restore the habitat necessary for the Moapa dace and take other steps to protect and recover the species, the Parties agree as follows:

a. SNWA agrees to provide funding in the amount of $750,000.00 for the restoration of Moapa dace habitat under the direction of FWS on the Apcar Unit of the Moapa National Wildlife Refuge or otherwise. All tasks funded under this paragraph I(4)(a) shall be agreed to in advance by SNWA and FWS in consultation with the other Parties. SNWA agrees to execute such documents as may be necessary in order to ensure that these funds are available for such habitat restoration.

b. FWS agrees to provide funding in the amount of $125,000.00 and SNWA agrees to provide funding in the amount of $125,000.00 to develop an ecological model designed to investigate the effects of habitat change on the ecology of the Moapa dace. FWS and SNWA shall, in consultation with the other Parties, agree upon the selection of a contractor to prepare the model.

c. SNWA agrees to provide funding in the amount of $50,000.00 to construct fish barriers to help eliminate the predacious Tilapia from areas of Moapa dace habitat. FWS and SNWA shall, in consultation with the other Parties, agree upon the selection of a contractor to perform such work.

d. SNWA agrees to provide funding in the amount of $25,000.00 to implement programs related to the eradication of non-native fish species, including predacious Tilapia, in the Warm Springs area. FWS and SNWA shall, in consultation with the other Parties, agree upon the selection of a contractor to perform such work.

e. CSI agrees to provide FWS with funding on an annual basis in the amount of $50,000.00 for a period of four years following the execution of this MOA for the restoration of Moapa dace habitat outside the boundaries of the Moapa National Wildlife Refuge along the Apcar Stream, or at such other locations as CSI and FWS, in consultation with the other Parties, agree.

f. The Tribe agrees to use a reasonable portion of the existing on-Reservation greenhouse facility for a reasonable period of years, for the purpose of cultivating native vegetation for use in RIP-approved habitat restoration. The Parties understand that the greenhouse is in a state of major disrepair and that such use of the greenhouse will require repairs and a water supply. FWS will work with the Tribe to obtain the funding necessary to provide for such repairs and to identify and secure a water supply adequate for such use. The Tribe reserves the right to pursue, and if feasible implement, separate arrangements for the improvement and commercial operation of the remainder of the greenhouse.

g. The Tribe agrees to provide access to the Tribe's Reservation for the construction and subsequent maintenance of at least one fish barrier, at a mutually agreeable location, to help eliminate the predacious Tilapia from Moapa dace habitat. FWS will work with the Tribe to obtain the funding necessary for construction, maintenance and repair of such barrier(s).

h. The Tribe agrees to provide the services of the Tribe's Environmental Director for in-kind staff services and participation in the RIP.

5. Protection of In-Stream Flows. The Parties recognize that maintenance of minimum in-stream flows in the Warm Springs area is essential for the protection and recovery of the Moapa dace. Although those flows are unknown at this time, the Parties agree as follows:

a. For purposes of this paragraph I(5), all "Average Flow Levels" specified herein shall be determined by flow measurements at the Warm Springs West flume. Average Flow Levels will be determined to have reached a particular level within a range specified in paragraphs I(5)(b) through (g) ("Trigger Range"): (1) if the daily average flow for each of 45 consecutive days decreases to an amount within the Trigger Range, or if the 90 day average flow over any 90 consecutive day period decreases to an amount within the Trigger Range; or (2) if the daily average flow for each of 90 consecutive days increases to an amount within the Trigger Range, or if the 135 day average flow over any 135 consecutive day period increases to an amount within the Trigger Range. If determined to be necessary by the Parties, the Parties will cooperate in removing phreatophytes, repairing or replacing the flume or taking any other steps to ensure the accuracy of flume measurements. Any adjustment in the rating curve for the Warm Springs West flume shall result in a pro-rata adjustment of the Trigger Ranges. The remaining provisions of this paragraph I(5) apply both during and after the Pump Test, except for paragraphs I(5)(c)(i) and (ii) which apply only during the Pump Test.

b. If the Average Flow Level decreases to an amount within the Trigger Range of 3.2 cfs or less, the Parties agree to meet as soon as practicably possible to discuss and interpret all available data and plan for mitigation measures in the event flows continue to decline.

c. If the Average Flow Level decreases to an amount within the Trigger Range of 3.0 cfs or less, the following Parties agree to take the following further actions:

i. During the pendency of the Pump Test, MVWD agrees to immediately cease pumping from the Arrow Canyon well; and

ii. While the Arrow Canyon Well is shut down pursuant to paragraph I(5)(c)(i) above, SNWA agrees to supply MVWD with all necessary municipal and domestic water supplies from the MX-5 and RW-2 wells or other sources available to the SNWA. Except for the express provision contained in paragraph I(2)(b) of this MOA, nothing in this MOA will obligate SNWA to supply MVWD with any water from SNWA's existing permits in the Coyote Spring Valley following the completion of the Pump Test; and

iii. SNWA and CSI agree to take necessary actions to prepare to geographically redistribute their groundwater pumping in the Coyote Spring Valley should flow levels continue to decline; and

d. If the Average Flow Level is within the Trigger Range of 3.0 cfs or less but greater than 2.9 cfs, the pumping of SNWA from the MX-5, RW-2, CS-1 and CS-2 wells in combination with the pumping of CSI from the MX-5, RW-2, CS-1 and CS-2 and CSI's pumping from other wells within the Coyote Springs Valley ("CSV") shall be restricted to 8,050 afy.

e. If the Average Flow Level is within the Trigger Range of 2.9 cfs or less but greater than 2.8 cfs, the pumping of SNWA from the MX-5, RW-2, CS-1 and CS-2 wells in combination with the pumping of CSI from the MX-5, RW-2, CS-1 and CS-2 and CSI's pumping from other wells in CSV shall be restricted to 6,000 afy, and the pumping of the Tribe under Permit No. 54075 shall be restricted to 2,000 afy.

f. If the Average Flow Level is within the Trigger Range of 2.8 cfs or less but greater than 2.7 cfs, the pumping of SNWA from the MX-5, RW-2, CS-1 and CS-2 wells in combination with the pumping of CSI from the MX-5, RW-2, CS-1 and CS-2 and CSI's pumping from other wells in CSV shall be restricted to 4,000 afy, and the pumping of the Tribe under Permit No. 54075 shall be restricted to 1,700 afy.

g. If the Average Flow Level is within the Trigger Range of 2.7 cfs or less, the pumping of SNWA from the MX-5, RW-2, CS-1 and CS-2 wells in combination with the pumping of CSI from the MX-5, RW-2, CS-1 and CS-2 and CSI's pumping from other wells in CSV shall be restricted to 724 afy, and the pumping of the Tribe under Permit No. 54075 shall be restricted to 1,250 afy.

h. The Parties agree that any pumping of the 460 afy of CSI Water Rights dedicated to the survival and recovery of the Moapa dace pursuant to paragraph 3.a. of this MOA shall be at the discretion of FWS and not counted against the pumping restrictions set forth in paragraphs 5(d) through 5(g) of this MOA.

6. Hydrologic Review Team. Upon execution of this MOA, the Parties shall establish a Hydrologic Review Team ("HRT") which shall be constituted and function as follows:

a. Membership. Each Party shall appoint two representatives ("HRT Representatives"), including at least one with substantial formal training and experience in hydrogeology ("Technical Representative"). Except as otherwise provided herein, the two HRT Representatives shall together have one vote on HRT matters. By consensus, the HRT

Representatives may offer voting or non-voting HRT membership to others who provide regional monitoring records and analyses to the HRT.

b. Objectives. The objectives of the HRT shall be: (1) to identify opportunities and make recommendations for the purpose of coordinating and ensuring accuracy, consistency and efficiency in monitoring, other data collection, and analytical activities performed under the Regional Monitoring Plans; (2) to establish technically sound analyses of impacts on Muddy River Springs and Muddy River flows resulting from regional groundwater pumping; (3) to assess based thereon whether the pumping restrictions, but not the Trigger Ranges, under paragraphs I(5)(c) through (g) above (or any successors thereto) should be adjusted to better reflect the extent to which regional groundwater pumping by the respective Parties causes, or is likely to cause, impacts on Muddy River Springs and Muddy River flows; and (4) to adopt by consensus appropriate adjustments to such restrictions, if warranted.

c. Regional Baseline Pumping Analysis. Within one year following the execution of this MOA, the Technical Representatives shall prepare a written analysis of regional groundwater pumping data and impacts ("Regional Baseline Pumping Analysis"). In preparing such baseline analysis, the HRT shall consider all relevant and available data and analytical materials. The Regional Baseline Pumping Analysis shall set forth all shared and dissenting analyses, interpretations and recommendations of the participating Technical Representatives. All modeling analyses contained therein shall be based on modeling codes in the public domain and data files that are available for comprehensive review by all Technical Representatives.

d. Annual Determination. Based on the Regional Baseline Pumping Analysis, and no later than one year after preparation of that analysis and annually thereafter, the HRT shall endeavor to determine by consensus ("Annual Determination") whether the groundwater pumping restrictions, but not the Trigger Ranges, under paragraphs I(5)(c) through (g) above (or any successors thereto) should remain in place, or whether and how any of such restrictions should be adjusted ("Pumping Restriction Adjustments") to better reflect the extent to which regional groundwater pumping hy the respective Parties causes, or is likely to cause, impacts on Muddy River Springs and Muddy River flows. However, no Pumping Restriction Adjustments will be made within the first five years following the Effective Date of this MOA. All Annual Determinations (including any Pumping Restriction Adjustments adopted by HRT consensus) shall be final and binding on all Parties, except that by consensus the HRT may at any time modify or vacate any Annual Determination.

e. <u>Annual Determination Reports</u>. Each Annual Determination shall be set forth and explained in a written Annual Determination Report which includes as appendices the Regional Baseline Pumping Analysis, all previously submitted Annual Technical Representative's Reports, and any other data or analytical materials considered by the HRT. If the Annual Determination is not made due to lack of consensus or any other reason, the positions thereon of the HRT Representatives shall be set forth and explained in the Annual Determination Report. Furthermore, if the HRT fails to adopt Pumping Restriction Adjustments recommended in a timely submitted Annual Technical Representative's Report, the Annual Determination Report shall briefly explain why such recommendation was not adopted.

f. <u>Annual Technical Representative's Reports</u>. Within six months after the close of the year of this MOA and annually thereafter, based on the best available scientific data and information, any Technical Representative may submit to all other HRT Representatives a written report ("Annual Technical Representative's Report") containing both: (1) a well-documented professional analysis of monitored regional pumping and pumping impacts; and (2) recommendations, if any, for Pumping Restriction Adjustments.

g. Provision for Peer Review. If the HRT Representatives are unable to reach consensus on an Annual Determination, the Parties shall refer the matter to a qualified panel of third party reviewers ("Panel") consisting of three scientists unaffiliated with any Party and having substantial formal training and experience in hydrogeology. If the Parties cannot agree by consensus on the make-up of the Panel, one member of the Panel shall be designated by each of the following from its own ranks: U.S. Geologic Survey, Desert Research Institute and a private firm with the requisite expertise designated by a majority of the Parties ("Appointing Entities"), provided that the Parties by consensus may designate different similarly qualified Appointing Entities. If any Appointing Entity for any reason is unable or refuses to designate a member of the Panel, the Parties by majority vote shall designate a qualified replacement Appointing Entity. The purpose of the referral to the Panel will be to obtain peer review of the then-current Annual Determination Report, the data upon which it is based, all previously submitted Annual Technical Representative's Reports, and any other relevant and available data and analytical materials. The Panel will be asked to make its recommendation based on the foregoing information concerning the appropriate content of the Annual Determination. All Parties shall have a fair and reasonable opportunity to present factual and analytical submissions in person and/or in writing to the Panel. The Parties contemplate that a determination of the Panel on the Annual Determination will constitute the best available scientific information concerning the impacts on Muddy River Springs and Muddy River flows resulting from regional groundwater pumping, and the appropriateness of any proposed Pumping Restriction Adjustments. The cost of the Panel shall be borne equally by the Parties.

7. Acquisition of Additional Land and Water Rights. As a potential conservation measure, the Parties agree to work cooperatively to identify both land and water rights that, if acquired and dedicated to the recovery of the Moapa dace, will assist in making measurable progress towards the recovery of the Moapa dace. SNWA agrees to make a good faith effort to acquire land and water rights identified by the Parties. The Parties expressly agree that the reasonableness of any terms and conditions for any acquisition of land or water rights by SNWA shall be determined by SNWA at SNWA's sole discretion, and that SNWA shall have no obligation to acquire any land or water rights upon terms and conditions that SNWA finds unreasonable. When such land or water rights are acquired by SNWA, SNWA will cooperate with FWS in establishing restrictions upon the use of such lands and water rights consistent with existing laws so as to effectuate the conservation of these resources and the recovery of the Moapa dace.

8. Operational Coordination Among FWS, SNWA, CSI and MVWD. Consistent with the terms of this MOA and to accomplish the goals of protecting and recovering the Moapa dace, and accommodating the operation of municipal water supply infrastructure, FWS, SNWA, CSI and MVWD agree to examine all reasonable water operational scenarios and agree to implement feasible scenarios that will minimize impacts to the Moapa dace and its habitat, including, but not limited to the provision of water to MVWD from the Coyote Spring Valley hydrographic basin during the Pump Test or other water supplies available to SNWA and MVWD. MVWD shall have the right during the Pump Test to use the Arrow Canyon Well only in the event and to the extent SNWA is unable to supply MVWD with "all necessary municipal and domestic water supplies" pursuant to the provisions of paragraph I(5)(c)(ii) of this MOA. Except for the express provision contained in paragraph I(2)(b) of this MOA, nothing in this

MOA will obligate SNWA to supply MVWD with any water from SNWA's existing permits in the Coyote Spring Valley hydrographic basin following the completion of the Pump Test.

SNWA and CSI agree, following the execution of this MOA, and in coordination with FWS, to cooperate in locating and drilling one or more production wells in the northern part of the Coyote Spring Valley hydrographic basin. The details of this cooperative effort shall be contained in a separate agreement between CSI and SNWA.

9. Adaptive Management Measures. The Parties agree to carry out additional conservation measures that will need to be taken to protect and recover the Moapa dace following the initiation of the RIP and as more data becomes available both as to the biology of the Moapa dace and regional hydrology. Thus, the Parties agree to cooperate in carrying out the following measures as may be appropriate:

a. Funding, preparation and implementation of biological and hydrological studies and activities supporting the recovery of the Moapa Dace; and

b. Establish a regional monitoring and management plan that will include science-based management and mitigation measures for RIP participants; and

c. Assessing the feasibility of augmenting and/or restoring in-stream flows and establishing those flows as deemed feasible.

d. Continue to re-evaluate necessary measures to protect and recover the Moapa dace.

II. Current Access Agreement. SNWA currently has an access agreement with the owners of the Warm Springs Ranch, which contains Moapa dace habitat, in order to conduct biological surveys of the Moapa dace. SNWA agrees to use its best efforts to seek to amend this access agreement so that each of the Parties to this MOA will have similar rights of access to the Warm Springs Ranch.

III. Modification of MVWD Monitoring Plan. Pursuant to the MVWD Monitoring Plan, submitted to the Nevada State Engineer in September 2002. FWS and MVWD agreed to a monitoring plan for development of MVWD's water rights at the Arrow Canyon well that contained certain management and mitigation measures that would be taken if flows at the Warm Springs West flume reached 3.17 cfs and 2.94 cfs respectively. This monitoring plan was recognized by the Nevada State Engineer in Ruling No. 5161. The Parties agree that, in order to effectuate a uniform regional monitoring and management plan, that the flow level restrictions and mitigation measures contained in this MOA shall replace the flow and water level restrictions and mitigation measures contained in the MVWD Monitoring Plan.

IV. No Assertion of FWS State Water Right. Provided that the other Parties to this MOA are in full compliance with the terms of this MOA, FWS expressly agrees not to assert a claim of injury to the FWS Water Right against either MVWD for pumping at the Arrow Canyon Well, against the Tribe for pumping within the California Wash hydrographic basin or against SNWA or CSI for any pumping in the Coyote Spring Valley for any diminution in flows at the Warm Springs West flume above 2.7 cfs. This provision shall in no way prejudice the FWS' ability and/or right to assert any and all rights inherent to the FWS Water Right for any diminution in flows at the Warm Springs West flume below 2.7 cfs.

V. No Waiver of Statutory Duties or Legal Rights. This MOA does not waive any of the authorities or duties of the FWS or the United States, nor does it relieve SNWA, CSI, the Tribe and MVWD from complying with any Federal laws, including but not limited to, the National Environmental Policy Act, Endangered Species Act, National Wildlife Refuge System

Improvement Act of 1997, and Federal Land Policy and Management Act of 1976, and any and all rules and regulations thereunder. Except as provided in paragraph IV of this MOA, it is the expressed intention of the Parties that FWS and the United States are not waiving any legal rights or obligations of any kind, including obligations to consult or re-consult under the Endangered Species Act, by entering into this MOA. Further, this agreement is entered as a good faith resolution of certain issues and is not intended to waive any party's rights in a subsequent legal proceeding regarding those issues. In addition, except for the restrictions set forth in paragraphs I(5)(c) through (g) above, this MOA does not in any respect waive, limit, or diminish any rights or claims of the Tribe to any federally-reserved or State surface or groundwater rights.

VI. No Modification of Previous Agreements. The Parties recognize that CSI, SNWA and MVWD have previously entered into multiple agreements concerning the sale, purchase and settlement of water rights within the Coyote Spring Basin including a certain *Agreement For Settlement Of All Claims To Groundwater In The Coyote Spring Basin* entered into between MVWD, CSI, SNWA and the District on March 7, 2002, and a certain *Agreement For Option, Purchase and Sale of Water Rights, Real Property and Easements* entered into between SNWA and CSI on April 16, 1998. Nothing contained herein is intended to abrogate or modify in any manner any of the provisions contained in any of those agreements except as expressly provided in paragraphs I(2)(b) and I(2)(c) of this MOA.

VII. Miscellaneous Provisions.

1. Notices. If notice is required to be sent by the Parties, the addresses are as follows:

If to FWS:

Supervisor
Nevada Fish and Wildlife Office
Fish and Wildlife Service
1340 Financial Blvd., #234
Reno, Nevada 89502

If to SNWA:

General Manager
Southern Nevada Water Authority
1001 South Valley View Boulevard
Las Vegas, Nevada 89153

If to MVWD:

General Manager
Moapa Valley Water District
Post Office Box 257
Logandale, Nevada 89021

If to CSI:

Carl Savely, General Counsel
Wingfield Nevada Group
6600 North Wingfield Parkway
Sparks, Nevada 89436

If to the Tribe:

Chairperson, Moapa Band of Paiute Indians
Post Office Box 340
Moapa, Nevada 89025
Fax: 702-865-2875

With copies to:

Steven H. Chestnut
Richard M. Berely
Ziontz, Chestnut, Varnell, Berely & Slonim
2101 Fourth Avenue, Suite 1230
Seattle, Washington 98121
Fax: 206-448-0962

2. Choice of Law. This MOA shall be governed in accordance with applicable Federal laws, and the laws of the State of Nevada to the extent not inconsistent with Federal law.

3. Funding. Any commitment of fnnding by FWS, MVWD or SNWA under this MOA is subject to appropriations by the respective governing bodies of those entities.

4. Amendment. This MOA may be amended in writing by mntnal agreement of the Parties.

5. Integration. This MOA sets forth the entire agreement of the Parties and supercedes all prior discnssions, negotiations, understandings or agreements with respect to the subject matter hereof. No alteration or variation of this MOA shall be valid or binding unless contained in an amendment in accordance with paragraph VI(4) of this MOA.

6. Binding Effect, Withdrawal From MOA. The terms and conditions of this MOA shall be binding upon and inure to the benefit of the Parties hereto and their respective personal representatives, successors, transferees and assigns. However, the Parties expressly agree that should the execution of this MOA, or any consultation held or biological opinion issued under Section 7 of the Endangered Species Act which is premised thereon, be challenged in a court of competent jurisdiction and be found in violation of the Endangered Species Act or any other law, any of the Parties may withdraw from the MOA upon thirty days written notice to the other Parties. Upon such withdrawal, the withdrawing Party shall have no further obligation to perform any commitment contained in this MOA.

7. Effective Date, Counterparts. This MOA will become effective as between the Parties upon all Parties signing this MOA. The Parties may execute this MOA in two or more counterparts, which shall, in the aggregate, be signed by all Parties; each counterpart shall be deemed an original as against any party who has signed it.

8. Additional Parties. Other entities may become Parties to this MOA by mutual written assent of the Parties.

9. Headings. The underlined paragraph headings used in this MOA are for the convenience of the Parties only, and shall not be deemed to be of substantive force in interpreting the MOA.

10. No Third Party Beneficiaries. This MOA does not create any right or benefit, substantive or procedural, enforceable by any third parties against the Parties or against any other person or entity. The terms of this MOA are not enforceable by any person or entity other than a Party.

IN WITNESS WHEREOF, the Parties have executed this Memorandum of Agreement on the 20th day of April, 2006.

MOAPA VALLEY WATER DISTRICT

By: Ivan Cooper
Title: Chairman

U.S. FISH AND WILDLIFE SERVICE

for By: Steve Thompson
Title: Manager, California/Nevada Operations Office

SOUTHERN NEVADA WATER AUTHORITY

Amanda M. Cyphers
By: Amanda M. Cyphers
Title: Chair

COYOTE SPRINGS INVESTMENT, LLC

By: Robert R. Derck
Title: General Manager

MOAPA BAND OF PAIUTE INDIANS

By: Dalton Tom
Title: Chairman

When Recorded Mail To:

____
____
____

Jones Springs Agreement

This Jones Springs Agreement ("Agreement") is entered into for the purposes described herein this 20th day of April, 2006 by between Moapa Valley Water District ("MVWD"), Muddy Valley Irrigation Company ("MVIC") and the U.S. Fish and Wildlife Service ("FWS").

RECITALS

1. MVWD was created in 1983 by an act of the Nevada Legislature and is the municipal water purveyor in upper and lower Moapa Valleys and serves the communities of Moapa, Glendale, Logandale and Overton, and the surrounding areas, located in Clark County, Nevada.

2. One of MVWD's water sources is a spring known locally as Pipeline Jones Spring ("Jones Spring"). Certificate No.10060 issued by the Nevada State Engineer provides MVWD the right to divert 1 c.f.s. of flow of water from Jones Spring for municipal purposes. The waters of Jones Spring and Certificate No.10060 constitute a portion of the Muddy River Decreed water rights.

3. Water from Jones Spring, as well as numerous other springs, form small streams which make up the Muddy River ("Tributary Streams").

4. There lives in the upper reaches of the Muddy River and in the Tributary Streams, a small minnow known as the Moapa Dace ("Dace"). The Dace was listed as endangered in 1967 under the Endangered Species Preservation Act of 1966 and continues to be so listed and protected under the Endangered Species Act of 1973 as amended.

5. MVWD needs the quantity of water represented by Certificate No.10060 to serve its municipal customers.

6. As an inducement to MVWD to grant this Agreement, the Southern Nevada Water Authority ("SNWA") has agreed to furnish to MVWD a quantity of water equal to MVWD's rights under Certificate No.10060 from SNWA's wells and water rights in Coyote Spring Valley ("Coyote Spring Water"). The terms and conditions of SNWA's obligations are set forth in a separate agreement.

7. MVWD desires to help in the recovery and preservation of the Dace.

NOW THEREFORE, for the purpose of aiding in the recovery and preservation of the Dace, MVWD and FWS hereby agree as follows:

1. Effective on MVWD receiving Coyote Spring Water from Southern Nevada Water Authority, the water from Jones Spring shall not be diverted for municipal purposes pursuant to Certificate No.10060, but shall be allowed to flow down the Tributary Streams to the Muddy River.

2. MVWD may, as soon as Coyote Spring Water is available and being furnished to MVWD for municipal purposes disconnect their existing pumping facilities from the Jones Spring diversion pipe and or otherwise affix appurtenances that will allow the entire flow of water from Jones Spring to flow down to the Muddy River, thus increasing the flow of water in one or more Tributary Streams.

3. MVWD shall file any necessary change applications with the State Engineer as may be required by Nevada Law as a result of this Agreement.

4. The Agreement herein granted shall be for a non-consumptive use of water, with no warranty as to quality or quantity of flow.

5. MVWD reserves the right to change the point of diversion for its consumptive use right to the water from Jones Spring to a point on the Muddy River below that site generally known as the White Tank Narrows and to utilize such water for any purpose permitted by the Nevada State Engineer. Any such change shall not affect the flow of water at Jones Spring for in-stream purposes.

6. This Agreement will be recorded with the Clark County Recorder and filed with the Nevada State Engineer.

7. So long as MVWD is in full compliance with the terms and conditions applicable to MVWD in the Memorandum of Agreement dated April 20, 2006 and attached hereto as Attachment 1, then, if for any reason, whether natural, man-made or otherwise, any portion of the Coyote Spring Water becomes unavailable or unusable to meet MVWD's municipal needs previously supplied by Certificate 10060 (Jones Spring), then MVWD shall have the right to utilize a like portion of water from Jones Spring to replace such portion of the Coyote Spring Water that remains unavailable to MVWD for so long as the Coyote Spring Water remains unavailable.

8. MVIC has joined in the execution of this Agreement to reflect MVIC's approval of the terms thereof.

IN WITNESS WHEREOF, MVWD, MVIC and FWS have executed this Agreement the date first above written.

MOAPA VALLEY WATER DISTRICT

By: ____________________
Ivan Cooper, Chairman of the Board

U.S. FISH AND WILDLIFE SERVICE

By: ____________________
for Steve Thompson, Manager
California/Nevada Operations Office

MUDDY VALLEY IRRIGATION COMPANY

By: ____________________
Todd Robison, Chairman of the Board

STATE OF NEVADA)
)
COUNTY OF CLARK)

This instrument was acknowledged before me on April 20, 2006, by Ivan Cooper as Chairman of the Board of MOAPA VALLEY WATER DISTRICT.

DIANNE K. WEST
Notary Public State of Nevada
No. 98-0443-1
My appt. exp. Dec. 16, 2009

Dianne K West
NOTARY PUBLIC in and for the State of Nevada
My Commission Expires: 12-16-09

[SEAL]

STATE OF NEVADA)
)
COUNTY OF CLARK)

This instrument was acknowledged before me on April 20, 2006, by Robert D. Williams as Field Supervisor of U.S. FISH AND WILDLIFE SERVICE

DIANNE K. WEST
Notary Public State of Nevada
No. 98-0443-1
My appt. exp. Dec. 16, 2009

Dianne K West
NOTARY PUBLIC in and for the State of Nevada
My Commission Expires: 12-16-09

[SEAL]

STATE OF NEVADA)
)
COUNTY OF CLARK)

This instrument was acknowledged before me on April 20, 2006, by Todd Robison as Chairman of the Board of MUDDY VALLEY IRRIGATION COMPANY.

DIANNE K. WEST
Notary Public State of Nevada
No. 98-0443-1
My appt. exp. Dec. 16, 2009

Dianne K West
NOTARY PUBLIC in and for the State of Nevada
My Commission Expires: 12-16-09

[SEAL]

Doc No. WMP-ED-0001

SOUTHERN NEVADA WATER AUTHORITY

Water & Environmental Resources Department
Water Management and Planning

Nevada State Engineer Order 1169 and 1169A Study Report

June 2013

Monitor wells CSVM-3 and CSVM-5 do not show any response due to pumping from the MX-5 and CSI 1-4 wells, strongly suggesting the presence of flow barriers between these wells and MX-5 rather than a delayed response (Figure 20). CSVM-4 may be showing a slight response with December 2012 water levels approximately 1 ft lower than September 2010 water levels, but the transducer in CSVM-4 has had a high failure rate due to the high water temperature in the well, so fluctuations of a foot or less should not be used to infer an absolute response.

The seasonal, spring water-level rise observed in the groundwater elevations prior to the Test is apparent in the April 2012 water levels in wells CSVM-1, CSVM-2, and CE-VF-2 and less noticeable in the April 2011 and 2013 water levels. The April 2012 water level rise coincided with a roughly 3-month period of non-pumping at well MX-5. This shutdown resulted in groundwater levels in these distal Coyote Spring Valley monitor wells resuming the seasonal pattern observed prior to the Test, emphasizing the ability for the RCA to recover once pumping stresses are removed.

4.2.3 Groundwater Level Trends and Observation in Distal Wells

Figure 21 and Figure 22 depict the location of distal monitor wells outside of Coyote Spring Valley to the east and south, respectively. Figure 23 shows daily continuous water level elevation data from production well MX-5 and distal monitor wells UMVM-1, Paiutes-M1, EH-4, and CSV-2 to the east of MX-5. USGS daily average data from the USGS NWIS database for CSV-2 are final through September 2012 and provisional thereafter. Well EH-4 data are weekly average water level data from the NDWR Water Rights database prior to September 15, 2010, and daily average water levels from that point forward. An offset was applied to well CSV-2 (+20 ft) to display the groundwater level data on the same hydrograph as the MX-5 well.

The instantaneous pumping signal from well MX-5 is not discernible in these eastern, distal monitoring wells; however, a gradual decline of roughly 2 ft is observed from September 2010 to December 2012, slightly less than the 2.5 ft of decline observed at CSVM-2 located in the southern portion of Coyote Spring Valley. The seasonal rise observed in the spring of 2012 in the proximal monitoring wells is also present in these wells, but to a lesser degree.

Figure 24 shows daily continuous water level elevation data from production well MX-5 and distal monitor wells GV-1, BM-DL-2 (monthly data), and Paiutes-M2 located to the south of Coyote Spring Valley. An offset was applied to well GV-1 (+7 ft) to display the groundwater level data on the same hydrograph as the MX-5 well. The instantaneous pumping signal from well MX-5 is also not discernible in these monitoring wells, and the same gradual decline of roughly 2 ft is observed from September 2010 to December 2012. The seasonal rise observed in the spring of 2012 in the proximal monitoring wells is present, but to a lesser degree. The overall groundwater level trends in the southern distal wells are more muted than the eastern distal wells.

The observations discussed above relating to the four groups of spatially located sets of monitoring wells are the result of not only well MX-5 pumping but the combined pumping from the three pumping centers depicted on Figure 14, as well as, climatic variability. As noted earlier, climatic conditions during the Test were near average or dry, and groundwater development within the two pumping centers outside of Coyote Spring Valley was on-going during the Test. The similarity in

In this report, we analyze groundwater level, pumping, spring/stream discharge, and climatic data collected before and during the Order 1169 pumping test to address these three questions. In Section 1, we present a detailed evaluation of the impacts of pumping on groundwater levels and spring discharge. In Section 2, we present results from a numerical groundwater model that was used to evaluate impacts at future times and under varying pumping scenarios. We also use the model to evaluate the recovery of the system following curtailment of pumping. In Section 3, we address the central question of availability, given what was learned from the pumping test and previous water budget and perennial yield information. In Section 4 of the report, we briefly discuss the potential implications of decreased spring/stream discharge on groundwater-dependent resources, such as Moapa dace and the Moapa Valley National Wildlife Refuge (NWR). In the last section, we summarize our findings and conclusions.

Summary of Conclusions

What information was obtained from the pumping test?

Groundwater level, pumping, and spring/stream discharge data collected before and during the Order 1169 pumping test are sufficient to:

- Document the immediate effects of the test pumping, including pumping approximately one-third of existing permitted groundwater rights in CSV, on groundwater levels and spring/stream flows in the Study Area.
- Delineate a portion of the carbonate-rock aquifer, a subset of the Order 1169 Study Area, in which pumping results in roughly equal drawdown throughout the area in a relatively short period of time.
- Develop a conceptual model of the delineated portion of the carbonate-rock aquifer with significant implications for the impacts of carbonate pumping anywhere within the area on spring and stream flows and phreatophytic vegetation in the MRSA and California Wash.
- Estimate the extent to which pumping was captured from groundwater storage (a lowering of groundwater levels) as opposed to spring/stream discharge as of the end of the test, and consequently the degree to which the full impacts of the test on spring/stream flows and phreatophytic vegetation have been realized to date.
- Determine the availability of water pursuant to applications pending under Order 1169.

What were the impacts of pumping under the pumping test?

Based on our analyses of groundwater level data from the pumping test, we have delineated a portion of the carbonate-rock aquifer, consisting of five hydrologic basins within the Study Area, in which carbonate pumping results in drawdown of nearly uniform magnitude everywhere within the five basin area within a period of months. The delineated area encompasses almost 700,000 acres, or 1,100 square miles, and includes the following hydrographic basins: CSV, the MRSA, Hidden and Garnet valleys, and

California Wash. Drawdown during the pumping test ranged from 1.9 to 2.5 ft throughout this portion of the carbonate-rock aquifer, with over half of the drawdown attributable to MX-5 pumping in CSV. The observed declines in groundwater levels are unprecedented in the record.

The near uniformity and large areal extent of drawdown indicates a high degree of hydrologic connectivity throughout the five basins and suggests that carbonate pumping anywhere within these five basins will affect groundwater levels throughout the delineated area. We hypothesize that this portion of the carbonate-rock aquifer acts as a high-transmissivity (high-diffusivity) reservoir with fixed inflows. The potential for pumping to induce additional groundwater inflow into this portion of the carbonate-rock aquifer system is very limited. As a consequence, carbonate pumping would eventually capture the only major forms of natural groundwater discharge in the area – spring/stream discharge and ET in the MRSA and California Wash.

The drawdown observed, to date, has resulted in a small capture of spring discharge, and possibly ET, in the MRSA and California Wash. Almost all the springs and flow monitoring sites in the MRSA showed some level of decline during the pumping test. The degree to which spring discharges were impacted is a function of the land surface elevation of the springs, with the higher elevation springs showing the greater relative declines in discharge. The discharge at Pederson Spring, the highest elevation spring in the MRSA, declined about 63% during the pumping test. If the current rate of carbonate pumping and drawdown continues, this spring will be dry in another 1.5 years. The discharge at Pederson East Spring, the second highest elevation spring in the MRSA, declined about 45% during the test and will be dry in another 2.5 to 3 years, if the current rate of pumping and drawdown continues. Flows at Warm Spring West flume declined about 9% during the test. Relative changes in flows at other lower elevation springs and flow sites during the pumping test were -6% at Iverson Flume, -4% at both Jones Spring and Baldwin Spring, and +19% per year at Muddy Springs. The flow increase at Muddy Springs may be partially due to upstream effects from the July 2010 fire in the MRSA.

We estimate that 80 to 90% of groundwater withdrawn during the pumping test was captured from groundwater storage, with only a small fraction captured from natural groundwater discharge. We interpret this to mean that the system has not yet reached equilibrium with respect to the increased carbonate pumping imposed during the test. The potential for drawdown to induce more inflow into the area is very low because the increase in hydraulic gradient will be 1% or less. Therefore, all pumping from the carbonate-rock aquifer in this area must eventually capture the only forms of natural groundwater discharge in the area before a new state of equilibrium can be established. Consequently, we expect the longer-term impacts from the current level of pumping on spring discharge and ET rates in the MRSA and California Wash to be much greater as the system transitions from capture of groundwater storage to capture of groundwater discharge.

Although the pumping test has been completed, SNWA has chosen so far to continue the pumping at MX-5 in CSV at approximately the same rate, presumably to augment water supply for Las Vegas. It is not known how much longer this pumping will continue. Numerical pumping simulations performed by Tetra Tech (2012b) show that pumping in the carbonate-rock aquifer at the rates imposed during the test (or greater) can be expected to result in substantial additional declines in groundwater levels and spring and stream flows beyond those observed as of the end of the test. The results of the 'post-audit' simulation of the second year of the test suggest that the Tetra Tech Version 1.0 Model used to perform these pumping simulations (Tetra Tech, 2012a) underestimates the amount of drawdown created by pumping and the impacts to spring discharges, and overestimates the timeframes in which the projected impacts will occur, but the areal extent of drawdown is simulated accurately.

The recovery simulation, in which MX-5 pumping was simulated as being stopped as of the end of the test, suggests that recovery of water levels from the effects of MX-5 pumping would take years, and that in the MRSA, recovery from the MX-5 test pumping would be approximately 70% complete after 15 years. Longer periods or greater volumes of pumping will result in even slower recovery. This has some serious implications for the effectiveness of management strategies aimed at reducing or curtailing pumping in order to protect spring flows, biological resources, and downstream water rights.

While the pumping test yielded much information, there are some things that are still uncertain. The level of pumping in CSV during the test was only one-third of the annual volume allocated in CSV under existing water right permits, although the Order required that 50% of the existing permitted rights be pumped. Therefore, the impacts of pumping half or all of the permitted allocation in this basin were not evaluated. The effectiveness of pumping reductions or curtailment was simulated with the modeling but was not directly evaluated during the test. If the higher elevation springs stop flowing completely, it is not known how fast or how effectively the system will respond to adjustments in pumping and whether biological resources may be adversely affected in the process.

What is the availability of water pursuant to the pending applications?

Our review of earlier water budget and perennial yield information for CSV, as presented in Order 1169 (NSE, 2002a), leads to the conclusion that there is no water available for appropriation within the five-basin area delineated through our groundwater analyses (CSV, the MRSA, Hidden and Garnet valleys, and California Wash). The water budget information and pumping test results suggest that all available water in CSV is appropriated and our additional analysis of information in recent rulings suggests that the basin may currently be over-appropriated. Additionally, the groundwater modeling simulation results, which examined progressively greater pumping of pending water rights in these five basins, provide supporting evidence to the wide-ranging effects that can be expected in these five basins with increased pumping.

An average of 5,400 afy of groundwater was withdrawn in CSV over the period of the test. This is only one-third of the 16,300 afy of existing permitted rights to groundwater already appropriated in CSV. The pumping test provides evidence that even this reduced volume of groundwater pumping cannot be developed long-term without adverse impacts to springs, endangered fish, Federal trust resources, and downstream senior water rights. Consequently, we conclude that no additional groundwater is available for appropriation to satisfy the pending water right applications that are currently being held in abeyance for this portion of the carbonate-rock aquifer.

Time Series Hydrographs of Groundwater Levels and Drawdown in the Carbonate-Rock Aquifer

Water level hydrographs are presented for carbonate monitoring wells EH-4, EH-5b, CSV-2, UMVM-1, CSVM-1, MX-4, and CSVM-6 in CSV and the MRSA (**Figures 1.2, 1.3, and A.2-2 to A.2-8**). We focus first on EH-4 and EH-5b, two carbonate monitoring wells located in the MRSA (**Figure 1.1**) that have some of the longest records of any of the carbonate monitoring wells in the Study Area. The water level records at these two wells reflect an annual seasonal cycle, long-term declines related primarily to the carbonate-rock aquifer pumping (**Figure 1.2**), and wet year responses in 1992, 1993, 2005, and, to a lesser degree, 1998 and 2011 (**Figure 1.3**). In contrast to the obvious wet year responses, there is no indication that dry years cause a comparable response in water levels. For example, the declining trend in water levels from 1998 to 2004 seems unaffected by water year 2002, which was extremely dry. Mayer and Congdon (2008) showed statistically that carbonate water level response to precipitation was asymmetric, with the groundwater system being much more responsive to wet years than dry years.

The seasonal cycle observed in the early part of the records of carbonate monitoring wells EH-4 and EH-5b (**Figure 1.2**) is likely related to evapotranspiration (ET) and/or basin-fill pumping, both of which are seasonal. Basin-fill pumping in the MRSA from 1987 to 1997 was fairly constant and averaged about 4,000 afy. There was very little carbonate pumping during this period. There was a slight decline in water levels in both EH-4 and EH-5b from 1987 to 1992 which may have been a response to basin-fill pumping. The increase in water levels in 1992 and 1993 was likely a response to wet years. Water levels were fairly stable from 1994 to 1997.

Increased carbonate pumping at the Arrow Canyon well in the MRSA, beginning in 1998, increased the seasonal variation and caused water levels in EH-4 and EH-5b to decline considerably from 1998 to 2004 (**Figure 1.2**). The Arrow Canyon pumping is also mainly seasonal and greatest in the summer. There is little evidence in the precipitation record that suggests the multi-year decline was a response to climate (**Figure 1.3**), as is discussed further in the multiple regression analysis below. The 1998 to 2004 declines were interrupted by the extreme wet year in 2005 but resumed again from 2006 to 2010. Increased carbonate pumping with the initiation of the pumping test in late 2010 caused the declines to accelerate significantly. The steepest decline in carbonate water levels occurred during the pumping test, specifically following the initiation of MX-5 pumping from the carbonate-rock aquifer in southern CSV at an annual-mean rate of 4,072 afy (**Table 1.1**). The annual rate of drawdown in EH-4 during the pumping test was 0.92 ft per year based on a multiple linear regression with time and seasonal effects (see appended data file: Order 1169 EH4 Data_NDWR_Dec 2012.xlsx).

The lowest carbonate water levels in the 25 years of record for both EH-4 and EH-5b occurred in December 2012, at the end of the pumping test. These unprecedented declines in carbonate water levels were accompanied by unprecedented declines in the discharge of the two highest-elevation warm springs in the Muddy River Springs Area, Pederson and Pederson East springs, as well as declines in the discharge at the Warm Springs West gage in the Moapa Valley National Wildlife Refuge (Moapa Valley NWR) (**Figures 1.4 and 1.5**). Impacts to spring discharges are analyzed and discussed further below.

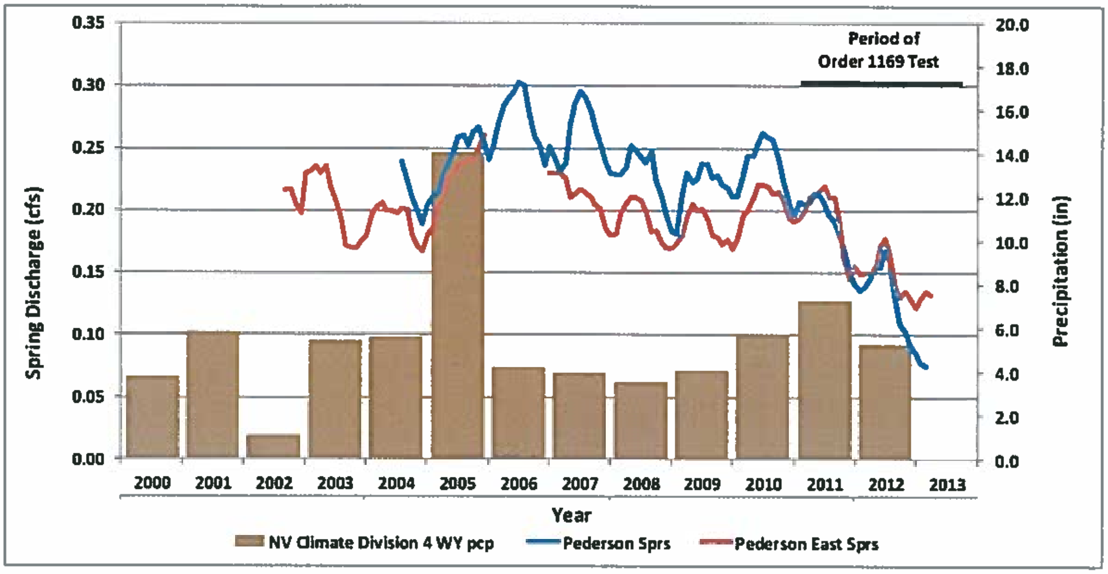

Figure 1.23. Monthly flows at the USGS Pederson Spring gage (USGS No. 09415910), Pederson East Spring gage (USGS No. 09415908), and Nevada Climate Division 4 water year precipitation (centered on April of each water year) for the period Jan 2000 to Dec 2012.

The first spring considered is the Pederson Spring, the highest elevation spring in the area (the gage datum or zero point of flow is 1810.99 ft). During the pumping test, the flows at Pederson Spring declined from a maximum of 0.22 cfs to 0.08 cfs (a 0.14 cfs or 63% reduction total from the maximum flow observed during the pumping test, **Figure 1.24**). The correlation between spring discharge and water level for EH-4 is very high ($r^2 = 0.98$ during the pumping test and $r^2 = 0.93$ for the entire 2004-2012 record). The slope of the discharge-water level relationship over the pumping test equates to -0.062 cfs (-28%) per unit foot of drawdown in the carbonate-rock aquifer. This means that for every one foot decline in the EH-4 water level, Pederson Spring loses about 0.06 cfs of discharge (about 28% relative to the maximum discharge observed during the pumping test). The next question we address is: "Is this reasonable and close to what we expect for this site?"

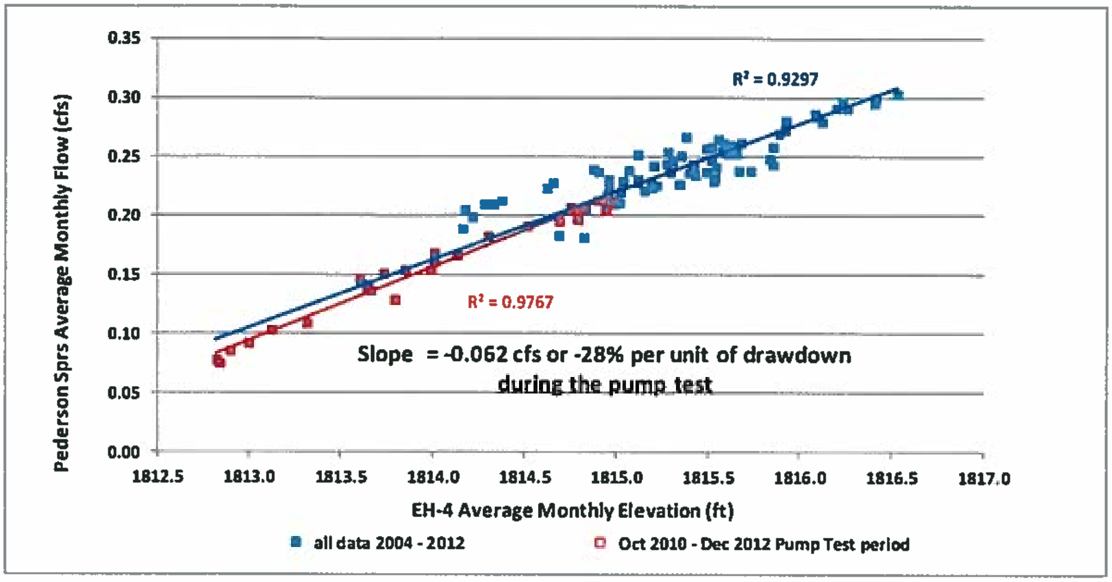

Figure 1.24. Monthly flows at Pederson Spring versus monthly carbonate water level elevations in EH-4 for the period May 2004 to Dec 2012.

The maximum and minimum monthly EH-4 carbonate water level elevations observed from October 2010 to December 2012 were 1815 ft and 1812.8 ft, respectively. At the maximum groundwater level elevation, Pederson Spring, with a water surface elevation of 1811 ft, had a hydraulic head differential of 4.0 ft (the "head differential" being estimated as the difference between EH-4 water level elevation and the spring water surface elevation). At the minimum EH-4 water level elevation observed during the pumping test, 1812.8 ft, the "head differential" is only 1.8 ft. Based on these two estimates, there is a predicted 25% decrease in hydraulic head differential per unit foot of drawdown, or a total reduction in head differential of 55% (assuming the maximum head of 4.0 ft represents 100%). Under the assumption that flow is proportionate to head, we should expect a similar percentage decline in flow. As shown above, there was a 28% decrease in flow per unit foot of drawdown or about 63% over the 2.2 foot range of carbonate water levels observed during the pumping test. The observed decline is very close to the independent estimate. The spring appears to be behaving in response to the decline in carbonate water levels and head differential as expected.

The x-intercept of the discharge/water level regression for the period of the pumping test is 1811.5 ft (**Figure 1.24**). This is the predicted carbonate water level elevation at which the spring discharge goes to zero (the spring dries up), based on the relationship between spring discharge and EH-4 levels. It differs from the estimated spring water surface elevation, perhaps because of the errors associated with the assumption that the water level in EH-4 represents the hydraulic head at the springs. Anyway, if the current rate of drawdown in EH-4 (0.92 ft/year) continues, the spring will stop flowing in about 1.5 years.

Next, we consider Pederson East Spring, which is the second highest elevation spring in the area, with a gage datum or zero point of flow of 1807.7 ft. During the pumping test, the flows at Pederson East Spring ranged from 0.22 cfs to 0.12 cfs (a 0.10 cfs or 45% reduction in total discharge, Figure 1.25). The correlation between spring discharge and EH-4 water level for Pederson East Spring is high during the pumping test but poorer for the entire period of record (r^2 = 0.92 during the pumping test and r^2 = 0.59 for the entire record). The reason for the poorer correlation over the entire record is not clear but it may indicate some changes or problems in the earlier flow record at the site. The slope of the relationship over the pumping test equates to -0.043 cfs (-21%) per unit foot of drawdown in the carbonate-rock aquifer. This means that for every one foot decline observed in the EH-4 water level, Pederson East Spring loses about 0.04 cfs (or about 21% per unit foot of drawdown). This is less than Pederson Spring, as expected, since Pederson East Spring is slightly lower in elevation and has a greater hydraulic head differential, and therefore, should be less sensitive to drawdown (see Figure 1.19).

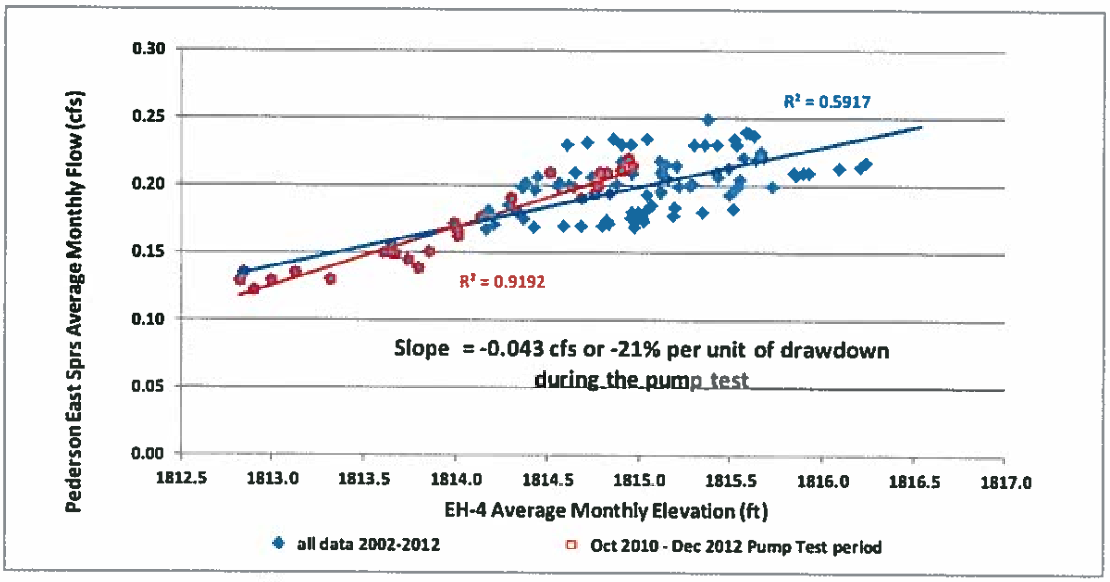

Figure 1.25. Average monthly flows at Pederson East Spring versus carbonate water level elevations in EH-4 for the period June 2002 to Dec 2012.

At 1815 ft., the maximum EH-4 carbonate water level elevation observed during the pumping test, Pederson East Spring has a hydraulic head differential of 7.3 ft (based on a water surface elevation of 1807.7 ft). At 1812.8 ft., the minimum EH-4 elevation observed, the "head differential" is 5.1 ft, which represents a 30% reduction in head from the maximum EH-4 water level elevation during the test. For every unit foot of drawdown, we expect about a 14% decrease in hydraulic head differential and flow. As shown above, the observed decline in flow was greater than this, about 21% per unit of drawdown or about 45% over the range of carbonate water levels. Nevertheless, the estimated and observed reductions are less than at Pederson Spring, and the Pederson East Spring discharge appears to be less sensitive to drawdown, as expected.

Section 5 - Overall Report Conclusions

In 2002, the Nevada State Engineer issued Order 1169, which stated that all pending and new water right applications in the carbonate-rock aquifer in Coyote Spring Valley (Basin 210), Black Mountains Area (Basin 215), Garnet Valley (Basin 216), Hidden Valley (Basin 217), the Muddy River Springs Area, a.k.a. Upper Moapa Valley (Basin 219), and Lower Moapa Valley (Basin 220) would be held in abeyance pending further study (NSE, 2002a). California Wash (Basin 218) was later added to the list through Ruling 5115 (NSE, 2002b). The applications were held in abeyance so that the State Engineer could collect more information on the effects of groundwater pumping from the carbonate-rock aquifer prior to making a determination on pending water right applications in the listed basins. The order called for a study covering a *"5-year minimum period of time during which at least 50% of the water rights then currently permitted in the Coyote Springs Valley groundwater basin are pumped for at least two consecutive years."*

The Order 1169 Study officially started on November 15, 2010 and was finished on December 31, 2012. Carbonate pumping in CSV, which averaged about 2,000 afy from 2006 to 2009, more than doubled to 5,400 afy during the pumping test. Groundwater pumping in adjacent basins remained relatively unchanged from previous years during the period of the pumping test. The volume of pumping in CSV during the test was approximately one-third of the groundwater rights currently permitted in that basin.

The U.S. Fish and Wildlife Service, National Park Service, and Bureau of Land Management prepared this report in response to the State Engineer's request for information related to the pumping test. The report addresses the three questions posed by the Nevada State Engineer in Order 1169A (NSE, 2012e):

- What information was obtained from the pumping study/test?
- What were the impacts of pumping under the pumping test?
- What is the availability of water pursuant to the pending applications?

The main findings of this report are:

- The effects of pumping MX-5 are readily apparent in water-level data from the carbonate-rock aquifer over a 1,100 square mile area that is hydrologically-connected and encompasses five hydrographic basins: Coyote Spring Valley, the Muddy River Springs Area, Hidden Valley, Garnet Valley, and California Wash. There is no scientific justification for managing groundwater production from the carbonate-rock aquifer separately in these five hydrographic basins.
- The results indicate carbonate pumping at any location within the five hydrologically-connected basins in this area (southern CSV, MRSA, Hidden Valley, Garnet Valley, and California Wash) will lower groundwater levels nearly uniformly throughout these basins within relatively short time periods and will eventually capture from the Muddy River Springs, Muddy River, and (or) ET associated with phreatophytic vegetation in the MRSA and California Wash, the only forms of natural discharge in this area, at a rate that approaches 100 percent of the pumping.

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SETTLEMENT AGREEMENT AMONG THE STATE ENGINEER, STATE OF NEVADA, TRACY TAYLOR, P.E., NEVADA STATE ENGINEER, JASON KING, P.E., ACTING NEVADA STATE ENGINEER, LINCOLN COUNTY WATER DISTRICT AND VIDLER WATER COMPANY

Lincoln County Water District (the "District"), Vidler Water Company ("Vidler"), the State Engineer, State of Nevada, Tracy Taylor, P.E., Nevada State Engineer, and Jason King, P.E., Acting Nevada State Engineer, (collectively, the "State Engineer") enter into the following Settlement Agreement and Mutual Release ("Agreement") this 1st of April, 2010. The parties shall be referred to individually as "Party" and collectively as "Parties."

RECITALS

1. On December 11, 1998, the District and Vidler filed Application 64692 to appropriate 7,240 acre feet of groundwater in the Tule Desert Hydrographic Basin.

2. On December 11, 1998, the District and Vidler filed Application 64693 to appropriate 7, 240 acre feet of groundwater in Tule Desert Hydrographic Basin. On November 8, 2000, the District and Vidler filed Change Application 66932 to change the point of diversion and place of use requested under Application 64693.

3. On November 26, 2002, the State Engineer issued Ruling 5181 granting Application 66932 in the amount of 2,100 acre feet per year.

4. Ruling 5181 also allowed the District and Lincoln to perform additional work to determine if additional water was available for appropriation in the Tule Desert Hydrographic Basin under Application 64692.

5. After the District and Vidler performed the work provided for under Ruling 5181, the State Engineer issued Ruling 5986 granting Application 64692 in the amount of 396 acre feet per year.

6. On May 27, 2009, the District and Vidler appealed Ruling 5986 to the Seventh Judicial District Court of the State of Nevada, in and for the County of Lincoln in Case No. CV-0518009 entitled *Lincoln County Water District and Vidler Water Company v. State Engineer, State of Nevada.*

7. On July 21, 2009, the District and Vidler sued State Engineer Tracy Taylor and Acting State Engineer King in the United States District Court for the District of Nevada in Case No. CV00392-LRH-VPC entitled *Lincoln County Water District and Vidler Water Company v. Tracy Taylor, P.E. and Jason King, P.E.*

8. In order to avoid the expense and uncertainty of litigation the Parties desire to settle the two lawsuits on the terms and conditions set forth below.

AGREEMENT

In consideration of the mutual promises, duties, and agreements set forth below, the Parties agree as follows:

I. **Conditional Grant of 7,240 Acre-Feet of Groundwater Per Year to the Lincoln County Water District and Vidler Water Company in the Tule Desert Hydrographic Basin Under N.R.S. § 533.3705 with 2,900 Acre-Feet Per Year Immediately Available for Use and the Remainder Subject to Staged Development.**

A. There are two projects supported by the water rights developed from the Tule Desert that have been identified under Lincoln County's Water Master Plan: the development of 13,000 acres under the Lincoln County Land Act and the development of the Toquop Energy Park. The District and Vidler estimate the total water demand for these projects at build out to range from 15,000 acre feet per year to 16,000 acre feet per year. The State Engineer granted 2,100 acre feet per year to the District and Vidler under Permit 66932. The water rights granted under Permit 66932 have been conveyed to owner-developers for dedication under the Lincoln County Land Act.

B. The State Engineer shall grant Application 64692 in the amount of 7,240 acre feet annually. The total combined duty of Permits 64692 and 66932 shall not exceed 9,340 acre-feet annually. However, the State Engineer finds, in order to gather the necessary information to more accurately determine the additional water available to appropriate under N.R.S. § 533.370, development of water will occur in stages in conjunction with the updated June 2005 Monitoring Plan approved by the State Engineer.

1. The initial use of water under Permit 64692 is limited to 2,900 acre-feet annually (a total of 5,000 acre-feet annually including Permit 66932).

2. The Applicant shall calibrate to actual field conditions the Tule Desert Groundwater Flow Model developed by Peter Mock Groundwater Consulting, Inc., which calibration may be peer reviewed by the third party Reviewing Consultant (as described below) at the cost of the District and Vidler.

3. The District and Vidler shall continue to collect hydrologic data throughout Tule Desert using the existing metering and data collection equipment at the locations they currently maintain and submit such data at least annually to the State Engineer.

4. The State Engineer, the District, and Vidler shall meet annually to review the data submitted by the District and Vidler. The third party Reviewing Consultant (as described below) shall participate in these meetings. The State Engineer shall apply the provisions of Section III of this Settlement Agreement in setting criteria and in determining whether to authorize the use of additional water under Permit 64692 and in identifying necessary studies.

5. The District and Vidler shall implement a staged pumping development program that shall consist of a minimum of eight consecutive years (the "Staged Development Period"). During this Stage Development Period, pumping must average at least 2,500 acre feet annually, and in no year shall pumping be less than 2,000 acre feet annually.

6. Annually after the initial calibration and every year thereafter during the Staged Development Period, the District and Vidler shall submit the updated groundwater flow model with the data obtained during the Staged Development Period and provide predictive results for 10 years, 25 years, 100 years, and 500 years.

7. The District and Vidler may at any time seek the use of additional water up to the full amount under Permit 64692 to the extent that the additional studies and evidence demonstrate to the satisfaction of the State Engineer that additional water is available for appropriation under N.R.S. § 533.370.

8. At any time, the State Engineer may at his discretion authorize the use of all or a portion of the remaining quantity of water permitted under Application 64692 to the extent that the additional studies and evidence demonstrate to the satisfaction of the State Engineer that such additional water is available for appropriation and use pursuant to N.R.S. § 533.370. If, prior to the completion of the Staged Development Period described above, the State Engineer refuses a request from the District and Vidler to pump additional water, such refusal by the State Engineer shall not be considered an appealable order or decision under N.R.S. § 533.370.

9. The District, Vidler, and the State Engineer agree that Daniel B. Stephens and Peter Mock shall serve as the Study Consultants (as described below) for Application 64692.

II. Monitoring and Reporting.

The District and Vidler shall submit a revised Monitoring Plan, updating the June 2005 Monitoring Plan approved by the State Engineer in the matter of Permit 66932, to include pumping under Permit 64692.

III. Studies Under N.R.S. § 533.368 and the Use of Third Party Technical Consultants.

A. Nevada Revised Statute § 533.368 provides that if the State Engineer determines that a hydrological study, an environmental study, or any other study is necessary before he makes a final determination on an application pursuant to N.R.S. § 533.370 and the applicant, a governmental agency or other person has not conducted such a study or the required study is not available, the State Engineer shall advise the applicant of the need for the study and the type of study required. The required study must be conducted by the State Engineer or a person designated by him, the applicant, or a consultant approved by the State Engineer, as determined by the State Engineer. The applicant is to bear the cost of study. The State Engineer is to consult with the applicant and the governing body of the county in which the point of diversion and place of use is located concerning the scope and progress of the study.

B. The following steps will be followed for all current and future applications to appropriate groundwater in hydrographic basins located wholly or partially within the boundaries of Lincoln County, filed by the District and Vidler, either individually or jointly, unless it is necessary for the State Engineer to deny the applications pursuant to N.R.S. § 533.370(1) and (6). This provision shall stay in effect for five (5) years from the date of the settlement, but may be renewed by agreement of the State Engineer, the District, and Vidler.

1. The State Engineer shall require the District and/or Vidler to perform a hydrological study to address the water resources of the particular hydrographic basin unless otherwise agreed to by the State Engineer, the District and Vidler. The District and Vidler may select the consultant ("Study Consultant") to perform the hydrologic study.

2. As set forth in NRS § 533.368(4)(a), the State Engineer shall consult with the District and Vidler concerning the scope and progress of the study and to determine the criteria necessary to adequately evaluate the applications. In addition to those required by Nevada law, the State Engineer shall set forth in writing as part of the criteria, any other procedures, policies, or methodologies that will be used to determine the amount of groundwater that is appropriable in the basins in which the applications are filed. This consultation will include the Reviewing Consultant discussed below. Additional meetings may be held as necessary among the State Engineer, the Reviewing Consultant, the District and Vidler concerning the scope and progress of the study. If during the course of study the State Engineer finds that additional studies, criteria, or scientific information are required to determine the amount of groundwater that is appropriable in the basins in which the applications are filed, the State Engineer shall identify the additional studies, criteria, or scientific information necessary and inform the District and/or Vidler. The District and/or Vidler

shall then develop studies and reports relating to the identified criteria. The State Engineer will agree to a reasonable extension of time to complete approved studies that are in progress. Once all reasonable extensions of time have elapsed, if the District and Vidler have not performed and submitted the required hydrologic study, the State Engineer may move forward under the provisions of N.R.S. § 533.368 with any study the State Engineer considers necessary for consideration of pending applications in the relevant hydrographic basins.

3. The State Engineer shall use an independent third party Reviewing Consultant selected by the State Engineer and paid for by the District and/or Vidler as set forth in N.R.S. § 533.368(3) to review and analyze the study or studies submitted to the State Engineer by the District and/or Vidler. The State Engineer shall advise the applicant of his selection and the applicant may indicate concerns relative to the qualifications and experience of the selected Reviewing Consultant, in writing to the State Engineer. The Reviewing Consultant shall serve as an advisor to the State Engineer on a hydrologic study prior to taking action on any application filed by the District and/or Vidler. The Reviewing Consultant may subcontract with other technical consultants to provide expertise in a given discipline after consulting with and approval by the State Engineer. If the State Engineer determines that an independent third party technical consultant is not needed, this provision to appoint a Reviewing Consultant can be waived by agreement of the Parties.

4. After a hydrologic study is completed and submitted to the State Engineer, the Reviewing Consultant shall evaluate the study and provide a report to the State Engineer regarding the study. The report shall be made part of the public records of the Nevada Division of Water Resources and shall be served by the applicant on any protestant to the particular applications. The District and/or Vidler and any protestant may comment on the Reviewing Consultant's report within 30 days after the date the report is filed in the Nevada Division of Water Resources. Under N.R.S. § 533.365(3), the State Engineer shall determine whether an administrative hearing is required or may require the filing of additional information as necessary for a full understanding of the matter before him. If a hearing is held, the Reviewing Consultant shall attend the hearing. The State Engineer shall consult with the Reviewing Consultant prior to issuing a ruling on the applications.

5. The State Engineer shall make the determination of the amount of water to be appropriated under each application taking into account the criteria established in Section III (B)(2), above, the report of the Reviewing Consultant, the comments filed with the State Engineer, and the criteria established in the Nevada Revised Statutes. The final determination of the water available for appropriation is the sole authority of the State Engineer.

IV. <u>Kane Springs Hydrographic Basin</u>.

Applications 74147 through 74150 for appropriations in the Kane Springs Hydrographic Basin filed by the District and Vidler will be returned to application status in the same priority as the applications had under the original filing in the records of the Nevada Division of Water Resources under a separate settlement agreement that follows the same general format as found in Section III of this Agreement.

V. **Ratification by Lincoln County Water District and Authority.**

A. The Parties recognize that this Agreement needs ratification by Lincoln County Water District's Board of Trustees.

B. The representatives of the Parties executing this Agreement represent and warrant that they are authorized to enter into this Agreement.

VI. **Dismissal of Actions.**

Upon full execution of the Agreements containing the terms herein and ratification by the Lincoln County Water District Board of Trustees, the State Engineer, the District, and Vidler shall stipulate to dismiss the state district court appeal of State Engineer's Ruling No. 5986, more specifically identified as *Lincoln County Water District and Vidler Water Company v. State Engineer, State of Nevada*, Case No. CV-0518009, filed in the Seventh Judicial District Court in and for the State of Nevada, and the federal lawsuit, more specifically identified as *Lincoln County Water District and Vidler Water Company v. Tracy Taylor, P.E. and Jason King, P.E.*, Case No. CV00392-LRH-VPC filed in the United States District Court in and for the District of Nevada, with each Party to bear its or his own costs and attorneys fees.

VII. **Extensions of Time.**

This Agreement shall not affect or limit the State Engineer's discretion in considering any applications for extensions of time for the filing of proof of completion of work, proofs of beneficial use, or to avoid a forfeiture. Any requests for extension of time shall be addressed under controlling provisions of law.

VIII. <u>No Precedential Effect.</u>

The State Engineer enters into this Agreement because of the unique factual circumstances surrounding this case. Aside from the rights and responsibilities established in this Agreement, the Agreement has no precedential effect in any proceeding involving these Parties or any other parties and may not be relied upon as evidence of policy or practices of the State Engineer; provided, however, that the provisions of Section III may be relied upon and control the processing of applications as set forth in the provisions of Section III. This Agreement does not limit the State Engineer's authority or discretion as it relates to consideration of any application to appropriate water, application for extension of time, or any application to change the manner of use, place of use, point of diversion, or means of diversion of any water right.

IX. <u>Mutual Release.</u>

Other than claims arising from rights and obligations set forth in this Agreement, each of the Parties, for and in consideration of the mutual promises, duties, agreements, and consideration set forth in this Agreement, release, acquit, and forever discharge the other Parties, their agents, employees, officers, directors, representatives, affiliate, successors, and assigns, of and from any and all claims, liabilities, demands, and causes of action, known or unknown, asserted or unasserted, which they had or may now have as a result of or arising out of or by reason of the facts and circumstances surrounding the claims and allegations filed in Case No. CV-0518009 entitled *Lincoln County Water District and Vidler Water Company v. State Engineer, State of Nevada* and in Case No. CV00392-LRH-VPC entitled *Lincoln County Water District and Vidler Water Company v. Tracy Taylor, P.E. and Jason King, P.E.*

X. No Admission of Liability.

The Parties agree and acknowledge that this is a compromise of disputed claims and that the agreements shall not be construed as an admission of liability on the part of any Party; the Parties expressly deny any liability relating to the claims asserted.

XI. Entire Agreement.

This Agreement contains the entire agreement among the Parties, and the terms of the Agreement are contracted and not mere recitals. No provision of the Agreement may be modified except in writing signed by all Parties hereto.

XII. Successors and Assigns.

This Agreement, and the rights and obligations contained herein, shall inure to the benefit and burden of and shall be binding on the grantees, successors, and assigns of the Parties to this Agreement.

XIII. Governing Law.

This Agreement will be governed by and in accordance with the laws of the State of Nevada. Any rule requiring construction or interpretation against the drafter of the document is waived and this Agreement has been and is deemed drafted by all Parties in a mutual effort.

XIV. Agreement Freely Entered into by the Parties.

Each Party represents and warrants that each has freely entered into this Agreement without fraud, duress, or any undue influence. Each Party represents and warrants that no promise or inducement has been offered except as set forth herein; that this Agreement is executed without reliance upon any statement or representation except as contained herein; and that the terms and conditions of this Agreement are fair and reasonable. Each Party represents and warrants that it or he was represented by competent counsel and was advised regarding the risks, duties, and obligations set forth in this Agreement.

XV. **Facsimile and Photocopies.**

Facsimiles and photocopies of this Agreement shall be considered originals for all purposes, including, but in no way limited to, any court proceedings.

XVI. **Signed Counterparts.**

This Agreement may be executed in any number of counterparts, each of which together shall be deemed to be an original, and all of which together shall be deemed to be one and the same instrument. The signatures required for execution may be transmitted by facsimile or e-mail, and such signatures shall be deemed duplicate originals, shall be effective upon receipt, may be admitted in evidence, and shall fully bind the Parties and persons making such signatures.

THE STATE ENGINEER, STATE OF NEVADA

P.E.

By: Jason King, P.E.,
Acting State Engineer

Dated: 4/15/10

TRACY TAYLOR, P.E., NEVADA STATE ENGINEER

P.E.

By: Tracy Taylor, P.E.,
Nevada State Engineer

Dated: 4/15/10

JASON KING, P.E., ACTING STATE ENGINEER

P.E.

By: Jason King, P.E.,
Acting State Engineer

Dated: 4/15/10

LINCOLN COUNTY WATER DISTRICT

Wade Poulsen

By: Wade Poulsen, Lincoln County Water District Manager

Dated: 4/15/2010

VIDLER WATER COMPANY

Dorothy A. Timian-Palmer

By: Dorothy Timian-Palmer, P.E., President and Chief Operating Officer

Dated: 4/16/2010

Approved and Consented to as to form:

RYLEY CARLOCK & APPLEWHITE

By:____________________
John C. Lemaster, Esq.
Jenny J. Winkler, Esq.
Sean T. Hood, Esq.

Dated: ________________

ALLISON, MacKENZIE, PAVLAKIS, WRIGHT & FAGAN, LTD.

By: Karen Peterson
Karen A. Peterson, Esq.

Dated: April 16, 2010

Attorneys for Vidler Water Company, Inc.

DYLAN V. FREHNER, ESQ.

By:____________________
Dylan V. Frehner, Esq.

Dated: ________________

Attorney for Lincoln County Water District

LINCOLN COUNTY WATER DISTRICT

By: Wade Poulsen, Lincoln
County Water District Manager

Dated: ____________________

VIDLER WATER COMPANY

By: Dorothy Timian-Palmer, P.E.,
President and Chief Operating Officer

Dated: ____________________

Approved and Consented to as to form:

RYLEY CARLOCK & APPLEWHITE

By: J. J. Winkler
John C. Lemaster, Esq.
Jenny J. Winkler, Esq.
Sean T. Hood, Esq.

Dated: 4/16/10

ALLISON, MacKENZIE, PAVLAKIS,
WRIGHT & FAGAN, LTD.

By: ____________________
Karen A. Peterson, Esq.

Dated: ____________________

Attorneys for Vidler Water Company, Inc.

DYLAN V. FREHNER, ESQ.

By: ____________________
Dylan V. Frehner, Esq.

Dated: ____________________

Attorney for Lincoln County Water District

LINCOLN COUNTY WATER DISTRICT

By: Wade Poulsen, Lincoln County Water District Manager

Dated: ____________________

VIDLER WATER COMPANY

By: Dorothy Timian-Palmer, P.E., President and Chief Operating Officer

Dated: ____________________

Approved and Consented to as to form:

RYLEY CARLOCK & APPLEWHITE

By: ____________________
John C. Lemaster, Esq.
Jenny J. Winkler, Esq.
Sean T. Hood, Esq.

Dated: ____________________

ALLISON, MacKENZIE, PAVLAKIS, WRIGHT & FAGAN, LTD.

By: ____________________
Karen A. Peterson, Esq.

Dated: ____________________

Attorneys for Vidler Water Company, Inc.

DYLAN V. FREHNER, ESQ.

By: ____________________
Dylan V. Frehner, Esq.

Attorney for Lincoln County Water District

Dated: 4/15/10

NEVADA ATTORNEY GENERAL'S OFFICE

By: [signature]
Bryan L. Stockton, Esq.
Michael L. Wolz, Esq.

Dated: 15 APR 2010

Attorneys for the State Engineer, State of Nevada, Tracy Taylor, P.E., Nevada State Engineer, and Jason King, P.E., Acting State Engineer

HS-14

NEVADA

EXHIBIT NO.________

IDEN.________ ADM.________

COPY OF DECREE

"In the Matter of the Determination of the Relative Rights in and to the Waters of the Muddy River and Its Tributaries in Clark County, State of Nevada

SE ROA 33770

IN THE TENTH JUDICIAL DISTRICT COURT OF THE STATE OF NEVADA,

IN AND FOR THE COUNTY OF CLARK.

MUDDY VALLEY IRRIGATION COMPANY, a corporation, NEVADA LAND & LIVESTOCK COMPANY, a corporation, SAMUEL H. WELLS, JOHN F. PERKINS and ELLEN C. PERKINS, his wife,

Plaintiffs

Vs.

MOAPA & SALT LAKE PRODUCE COMPANY, a corporation, GEORGE BALDWIN and ALETHA L. BALDWIN, his wife, ISAIAH COX and ANNA M. COX, his wife, JOSEPH PERKINS and KATHRYN PERKINS, his wife, D. H. LIVINGSTON and RICHARD SMITH, G. S. HOLMES and JULIA MAY KNOX, W. J. POWERS and MARY A. POWERS, his wife, SADIE GEORGE, LOS ANGELES & SALT LAKE RAILROAD COMPANY, a corporation, and WALKER D. HINES, as Director General of Railroads, and JACOB BLOEDEL.

Defendants.

AND

IN THE MATTER OF THE DETERMINATION OF THE RELATIVE RIGHTS IN AND TO THE WATERS OF THE MUDDY RIVER AND ITS TRIBUTARIES IN CLARK COUNTY, STATE OF NEVADA

)) ----------------------------000---------------------------((

JUDGMENT AND DECREE.

The above entitled action and the above entitled matter having come on for hearing before the Court on the 10th day of March, 1920, all of the parties to said action, appearing and being represented in court by their respective attorneys, and J. G. Scrugham, the State Engineer of the State of Nevada, appearing in person, and after hearing and the taking of testimony and evidence, and the making of an order for a further determination by the State Engineer, as hereinafter set forth in the said action and matter having been continued for further hearing and determination and have now come on for hearing this 12 th day of March, 1920, all of the parties to the above entitled action appearing and being represented in open court by their respective attorneys;

And it appearing that on the 23rd day of April, 1919, a stipulation was made and filed herein by and on behalf of all of the parties who had then appeared in said action, signed by their respective attorneys, which said stipulation, after the title of the court and cause was in words and figures following to-wit:

STIPULATION

The parties to the above entitled action, by their respective attorneys, for the purpose of settling and determining as between themselves the issues in said action, do hereby stipulate and agree as follows:

1. That the defendants in this paragraph named, their grantors and predecessors in interest, have diverted and appropriated from the Muddy River, its head waters, sources of supply and tributaries, for use upon the lands herein described or referred to, and that said defendants are respectively entitled to divert to their said lands for use thereon, the respective amounts of water herein specified.

The defendants, George Baldwin, and Aletha L. Baldwin, his wife, for use on the lands described in their Amended and Supplemental Answer, other than those described in their original answer, 16/70 of one cubic foot of water per second.

The defendant, Moapa and Salt Lake Produce Company, for use on the lands described in its separate Answer, 2 and 15/70 cubic feet of water per second.

The defendants, D. H. Livingston and Richard Smith, for use upon the said lands described in their separate Answer, 2 and 20/70 cubic feet of water per second.

The defendants, Joseph Perkins and Kathryn Perkins, his wife, for use upon the lands described in their separate Answer, 30/70 of a cubic foot of water per second.

The defendants, G. S. Holmes and Julia May Knox, for use upon the lands described in their separate Answer, 1 and 25/70 of a cubic foot of water per second.

The defendants, Isaiah Cox and Annie Cox, his wife, for use on ten acres of land described in their separate Answer, 10/70 of a cubic foot of water per second. Provided, that if the State Engineer in his adjudication shall find that because of the situation of said land, and the small stream or small head of water diverted, or other causes, said defendants need more than said amount to properly irrigate said land, the said defendants shall be entitled to divert such amount of water as the State Engineer may find necessary for said purpose.

The defendants, W. J. Powers and Mary Powers, his wife, for use on the land described in their separate Answer, and for 2 and 8/10 acres situate in the NW 1/4 of the SE 1/4 and the N. E. 1/4 of the S. W. 1/4, of Section 27, Township 14 South, Range 65 East, 29/70 of a cubic foot of water per second. Provided, however, that if the State Engineer in his adjudication shall find that because of the situation and character of said lands, the length of the ditch, or other causes, said defendants need more than said amount to properly irrigate, twenty-nine acres of said lands, being the lands heretofore irrigated, said defendants shall be entitled to divert such amount of water as the State Engineer may find necessary for said purposes.

The defendant, Sadie George, for use on 2.1 acres of land situate in the West side of the S. E. 1/4 of the N. E. 1/4, of Section 1, Township 15, South, Range 65 East, 21/700 of a cubic foot of water per second.

The defendants, Los Angeles and Salt Lake Railway and Walker D. Hines, as Director General of Railroads, are entitled to take from the Muddy River, by the pumping plant of said Railroad at Moapa, such amount of water as the State Engineer may find has by said Railroad been lawfully appropriated for any beneficial use at Moapa. Subject, however, to contest by any party hereto and to an appeal from such finding and review thereof by the Court.

The above volumes or amounts of water to which it is agreed the respective parties are entitled shall be understood to include and define the amount of all the waters now or heretobefore rightfully used on said lands, whether diverted directly from said Muddy River, or from its tributaries, springs, head waters or other sources of supply, including the waters claimed to have been developed heretofore by any of the said parties. All measurements of amounts diverted are to be made at the places of diversion, or as near thereto as practicable or convenient, as the State Engineer or Water Commissioner may select or approve.

2. That the waters now and heretofore used by defendants, George Baldwin and Aletha L. Baldwin, his wife, upon the lands described in their original separate Answer, are waters which have been developed and appropriated by said defendants in the manner and by the means alleged in their said Answer, and that such development and use has not and does not diminish the flow or volume of the Muddy River, or interfere with the rights of any of the other parties to this action.

The said defendants Baldwin shall during the present 1919 irrigating season permit the plaintiffs, or any agent or agents of plaintiffs, to enter upon the said lands of said defendants and make measurements of the cultivated areas and of the waters now developed or used thereon. The said defendants Baldwin shall not make any attempt to develop any additional water upon said land before October 1, 1919, and thereafter no further development of water, or additional use of water, shall be made on or for said lands which in any way diminishes the flow of the waters of the Muddy River, or impairs the rights therein or thereto of the other parties to this action.

3. The Indian Reservation, situated above Moapa, and the inhabitants thereof, are entitled to divert from the waters of said Muddy River, and to use upon lands on said reservation, 1.25 of a cubic foot of water per second, and no more, measured at place of diversion or such place as the State Engineer or Water Commissioner may select.

4. That the Plaintiff, Muddy Valley Irrigation Company, and the Plaintiffs John F. Perkins, and Ellen C. Perkins, his wife and their grantors and predecessors in interest, have diverted and appropriated from the Muddy River, its head waters, sources of supply and tributaries, for use on the lands hereinafter described or referred to, all of the waters flowing therein or therefrom, save and except the several amounts specified in paragraph 1 and 3 hereof. The said plaintiffs Perkins are entitled to water for the irrigation of two acres of ground at or near St. Thomas, in the N. E 1/4 of the S. E. 1/4, of Section 10, Township 17 South, Range 68 East, which water is diverted from the River and conveyed to their land by said Muddy Valley Irrigation Company.

The said Muddy Valley Irrigation Company is and at the time of the commencement of this action was the legal owner of the rights to divert, convey and use all of said waters of said River, its head waters, sources of supply and tributaries, save and except the rights hereinbefore specified and described, and to divert said waters, convey and distribute the same to its present stockholders, and future stockholders, and other persons who may have acquired or who may acquire temporary or permanent rights through said Company, for the various purposes described in the Complaint, and upon the land situated as stated in the Complaint; and that its stockholders are the equitable owners of rights to use said waters in accordance with its articles and amended Articles of Incorporation, and its By Laws, and the accepted uses and practices of said corporation.

5. That the parties named in paragraphs 1 and 3 of this Stipulation shall not be required to take or use the waters of said River in continuous flow, but may cumulate the same or any part thereof in rotation and in turn periods, with the approval of the Water Commissioner, and subject to his control and direction, and under such rules and regulations as may be prescribed by the State Engineer and the statutes of the State of Nevada. The whole amount of water diverted from the River at any one time by all of the parties named in paragraph 1 shall not exceed in the aggregate the total of the amounts of water awarded to the several parties named in said paragraph 1. Below the lowest diversion of the defendants Holmes and Knox the flow in the stream shall be maintained substantially constant, subject to seasonal variations, but only in so far as the parties named in paragraph 1 can be held to be responsible for the fluctuations of said stream. The whole of said River system shall be under the supervision, rules and regulations of the State Engineer, and the direction and control of the Water Commissioner, to be appointed as hereafter provided or as provided by law, as a fully adjudicated stream; but it is the intention hereof that so far as practicable the stream shall be treated as divided into two parts, that above and that below the lowest diversion of the ranch now belonging to the defendants Holmes and Knox; and the Muddy Valley Irrigation Company, although under the supervision and control of the State Engineer and Water Commissioner, will, subject to said supervision and general control, distribute and control the distribution of the waters diverted and conveyed by its works to its stockholders and other persons obtaining water by means thereof. Such head gates, measuring devices, etc., as the State Engineer or Water Commissioner may order shall be installed by all who divert or use the waters of said stream system.

6. The owners of land on the upper part of said River, as in the last paragraph defined, shall keep the channels through their respective lands clear of all ordinary obstructions, but

in case of of extraordinary obstruction, such as the formation of lime beds or deposits, in the channel of the stream, the same shall be removed under the direction of the Water Commissioner, and the expense thereof paid as he or the State Engineer may assess the same.

7. All the water rights hereinbefore specified shall be deemed and held to be vested rights, acquired by valid appropriation and beneficial use prior to March 1, 1905, and by continued, uninterrupted use since said date, and shall be considered as equal in rank, without one having any priority over any other. This stipulation shall apply to and include whatever rights are held or possessed by the Muddy Valley Irrigation Company under the certificates of appropriation issued to the plaintiff, Nevada Land and Live Stock Company, as set forth in paragraph twelve of the Complaint herein.

8. All abnormal losses from the flow of said stream shall be pro rated and shared among the parties hereto. Abnormal losses shall include such as any substantial loss from the permanent flow of the stream, caused by some cataclysm of nature, as a cloud-burst, destroying or obstructing the channel thereof, or as the opening up of a fissure in the bed of the stream, or in one of the courses of supply, and the disappearance therein of a substantial amount of the waters, thereby causing a substantial diminution in the flow available for appropriation by any of the parties. Any diversion of water by the Indian Reservation, or the inhabitants thereof, in excess of the 1.25 cubic foot per second, specified in paragraph 3, or any award by the State Engineer to or for the lands of the Indian Reservation in excess of said 1.25 cubic foot per second, and any water in excess of such amount, which in any suit or action may be awarded or decreed to or for the lands on said Indian Reservation, or any water which in the final adjudication of this action or any other may be awarded or decreed to any party not a party to this action, shall also be deemed an abnormal loss from the stream.

If any such abnormal loss occur at any time the pro-rata share of such loss to be borne by each party shall be as follows:

The defendants Baldwin and wife shall bear 16/3169 of such loss.

The defendant, Moapa and Salt Lake Produce Company, 155/3169 thereof.

The defendants, Livingston and Smith, 160/3169 thereof.

The defendants, Perkins and wife, 30/3169 thereof.

The defendants Holmes and Knox 95/3169 thereof.

The defendants, Cox and wife, 10/3169 thereof.

The defendants, Powers and wife, 29/3169 thereof.

The defendant, Sadie George, 2/3169 thereof.

And the Plaintiff, Muddy Valley Irrigation Company 2672/3169 of such loss.

9. An order may be entered by the Court referring this suit to the State Engineer for an adjudication of the water rights on the Muddy River, in accordance with the provision of Chapter 140 of the Statutes of Nevada, of 1913, approved March 22, 1913, and all acts amendatory thereof. The order shall direct that said State Engineer in making such adjudication shall as between the parties to this Stipulation, and in determining their relative rights as between themselves, be bound by and give effect to the terms and conditions of this Stipulation, and the division of the waters which said parties have made between themselves.

And the parties further stipulate and agree that any final Decree entered herein shall, in determining the relative rights of the parties hereto, follow and give effect to the terms and conditions of this Stipulation.

10. Pending the final adjudication of said River, and final Decree in this action, and the legal organization of a Water District embracing the Muddy River Valley, and the legal appointment of a Water Commissioner, therefor, the parties themselves shall select and employ a Water Commissioner to act under the terms of this

Stipulation, subject to the supervision of the State Engineer, and such rules and regulations as he may prescribe not inconsistent with this Stipulation. Said Water Commissioner shall be selected by a representative of the Muddy Valley Irrigation Company and a representative chosen by a majority in interest of the defendants, and if such representatives cannot agree then the State Engineer shall have the selection and appointment of the Water Commissioner. The salary and expenses of such Water Commissioner shall be borne by the parties hereto in the same proportion as fixed in paragraph eight hereof for the sharing of losses. The representatives of the respective parties who are to select the Water Commissioner shall agree on the time and manner and person through whom each party shall pay his share of such salary and expenses, and such agreement shall be binding on each party and become a legal obligation.

11. An Order shall also be entered, binding on all of the parties hereto, modifying the terms of the temporary injunction heretofore made and granted, in accordance with the terms of this Stipulation, so that during the pendency of this action and until the final adjudication and final Decree each party shall be enjoined from interfering with or impairing any right given by this Stipulation to any other party and from violating any of the terms and conditions and agreements of this Stipulation, or any part thereof.

12. Each party shall pay its or his own costs in this action, but the costs and expenses of the adjudication of the State Engineer, including any surveys or maps made by him, shall be borne by the respective parties, in accordance with the Statutes of this State. But in determining the Water Right and acreage against which such expense shall be assessed the numerators in the fractions in paragraph eight shall as between these parties be deemed to be the number of acres to be irrigated by the respective parties.

Dated this 23rd day of April, A. D., 1919.

A. S. Henderson,
Brown & Belford
Attorneys for Plaintiffs.

F. R. McNamee and
Leo A. McNamee
Attorneys for all defendants, except W. J. Powers and Mary Powers.

C. D. Breeze
Attorney for Defendants,
W. J. Powers and Mary Powers.

That on the said 23rd day of April, 1919, an order was made and entered by the Court in the above entitled action referring to the State Engineer of the State of Nevada the said action for an adjudication of the wat er rights of the Muddy River, its head waters and tributaries and providing that the said State Engineer in making such adjudicat ion should, as between the parties to said Stipulation, in determining their relative rights, as between themselves, be bound by, and give affect to, the terms and conditions of said stipulation and the division of the waters which said parties have made between themselves. That a copy of said Order of reference, duly certified, was delivered to said State Engineer and thereupon the said State Engineer proceeded in accordance with said order and with the provisions of the Statutes of the State of Nevada to make an adjudication of said Muddy River; that the various notices as required by Statute were given by said State Engineer and that claims were filed by various claimants for the use of water on said river and proofs taken and used by said State Engineer in accordance with the provisions of said Statute. That thereafter and on the 21st day of January 1920, said State Engineer made his order of determination entitled "In the matter of the determination of the relative rights in and to the waters of the Muddy River and its tributaries in Clark County, State of Nevada."

That on the 26th day of January, 1920, a copy of the said Order of Determination, duly certified by the State Engineer was filed with the Clerk of the above entitled court and an order made and entered by the Judge of said Court appointing the 10th day of March, 1920, 10 o'clock A.M. of said day, as the time for hearing the matter of said determination and that a certified copy of such order and a notice of such hearing was duly published and served as required by law and that thereafter, and within the time provided by law, various parties to the above entitled action, claimants of water rights in said Muddy River, duly filed with the clerk of said court and served upon the State Engineer their exceptions to the said order of determination.

That on the 10th day of March, 1920, the defendant Jacob Bioedel, a claimant of a water right on said river who had not theretobefore been a party to said action, was by stipulation made a party defendant thereto and duly appeared by his attorneys and it was stipulated that he should be deemed to have made a claim for water right in said Muddy River without further pleading; and also on said date it was stipulated that the defendants Isaiah Cox and Anna Cox his wife, who appeared to the satisfaction of the court to have become the owners of and entitled to land and water rights of J. H. Mitchell, should be deemed to have made a claim in said action for the water rights for said land so acquired by them without further pleading. That on the said 10th day of March, 1920 there was made and filed in said action a stipulation supplemental to said stipulation of April 23rd, 1919 which said stipulation after the entitlement of the court and cause is in words and figures following, to-wit:

STIPULATION SUPPLEMENTAL TO STIPULATION OF APRIL 23, 1919.

WHEREAS, since the making and filing of a stipulation by all of the parties to the above entitled action, who has then appeared therein under date of April 23rd, 1919, Jacob Bioedel has been made a party defendant to said action and has duly appeared therein by F. R. McNamee and Leo A. McNamee, his attorneys;

AND, WHEREAS, since the making of said stipulation the rights of J. H. Mitchell, and the lands belonging to him have been sold and conveyed to Isaiah Cox and Annie M. Cox, his wife, two of said defendants, and whereas a stipulation has been filed herein providing and allowing water rights in behalf of the land so sold by Mitchell to Cox and wife, and providing that the same may be considered as having been made in this action without further pleading,

AND WHEREAS, in view of the foregoing premises it is deemed desirable to supplement and amend the said stipulation of April 23rd, 1919.

The parties to the above entitled action by their respective attorneys do hereby agree and stipulate as follows:

1. The said defendant, Jacob Bloedel, and the said defendants, Isaiah Cox and Anna M. Cox, his wife, in behalf of the land and water rights so acquired from Mitchell, do hereby assent to and make themselves parties in all respects to the said stipulation of April 23rd, 1919, except as the same is changed and amended hereinafter.

2. The said defendant, Jacob Bloedel, his grantors and predecessors in interest have diverted and appropriated from the Muddy River, its headwaters, sources of supply and tributaries, and the said defendant, Bloedel, is entitled to divert from said river 2/70 of one cubic foot of water per second, for use upon the NE 1/4 of the NE 1/4 of Sec. 21, T. 14 S. R. 65 E. M. D. B. & M.

The defendants, Isaiah Cox and Anna M. Cox, his wife, their grantors and predecessors in interest have diverted and appropriated from the said Muddy River, its headwaters, tributaries and sources of supply and are entitled to divert, in addition to the quantity of water described in the said original stipulation of April 23rd, 1919, 3/70 of one cubic foot of water per second for use upon said land in the N W1/4 of the NE 1/4 of the N. E. 1/4 of Section 16 T. 14 S. R. 65 E. M. D. B. & M., the same being the land acquired by said defendants Cox and wife from J. H. Mitchell.

3. Paragraph 3 of said stipulation of April 23rd, 1919, is amended to read as follows:

""the Indian Reservation, situate above Moapa, and the inhabitants thereof, are entitled to divert from the waters of said Muddy River, and to use upon said land on said Reservation 1.242 of a cubic foot of water per second, and no more, measured at the place of diversion, or such place as the State Engineer or Water Commissioner, may select."

4. That portion of Paragraph 8 of said stipulation of April 23rd, 1919, fixing the pro rata share of any abnormal loss to be borne by each party, is amended to read as follows:

"If any such abnormal loss occurs at any time the pro-rata share of such loss to be borne by each party shall be as follows:

The defendants, Baldwin and Wife, shall bear 16/3169 of such loss;

The defendant Moapa and Salt Lake Produce Company 155/3169 thereof;

The defendants Livingston & Smith 160/3169 thereof;

The defendants Perkins and wife 30/3169 thereof;

The defendants Knox and Holmes 95/3169 thereof;

The defendants Cox and wife 13/3169 thereof;

The defendants Powers and wife 29/3169 thereof;

The defendant Sadie George 2/3169 thereof;

The defendant Jacob Bloedel 2/3169 thereof; and

The Plaintiff Muddy Valley Irrigation Company 2667/3169 thereof."

5. In Paragraph 8 of said stipulation of April 23rd, 1919, is amended, so that the definition of abnormal losses from the flow of said stream wherever the figures 1.25 occur, the same shall be struck out and the figures 1.242 substituted therefor. The parties hereto do not admit or recognize any rights to the use of the

Muddy River by or for the Indian Reservation and the inhabitants thereof, except the amount awarded and found to belong to such reservation by the State Engineer. The parties have included in their definition of abnormal losses a possible diversion of a greater amount by said reservation or possible acquisition of an increase right, only as a measure of security against a possible contingency which might arise through the uncertainty of litigation.

6. Paragraph 7 of said stipulation of April 23rd, 1919, is amended to read as follows:

"All of the water rights hereinbefore specified shall be deemed and held to be vested rights acquired by valid appropriation and beneficial use prior to March 1, 1905, and by continued and uninterrupted use since said date, and shall be considered as equal in right, without one having any priority over any other. This stipulation shall apply to and include whatever rights are held or possessed by the Muddy Valley Irrigation Company under the certificates of appropriation issued to the plaintiff Nevada Land & Live Stock Company as set forth in paragraph twelve of the amended complaint herein and under any certificate of appropriation which may be issued to the Muddy Valley Irrigation Company under its application to the State Engineer numbered 1611.

7. The amount of water awarded in the said stipulation of April 23rd, 1919, and in this stipulation to the respective parties shall be deemed a continuous right during the entire year, it being understood that the minimum duty of water during the summer season shall be one cubic foot per second for 70 acres of land; during the winter season, one cubic foot per second for 100 acres of land, and that by the summer season is meant the period between and including the first day of May of each year up to and including the 30th day of September of each year, and by the winter season is meant the period from and including the 1st day of October to and including the following 30th day of April.

8. It is understood and agreed that the amounts of water awarded by this stipulation to the respective parties and to the Indian Reservation absorbs and exhausts all of the flow of the said stream, its sources of supply, headwaters and tributaries during the entire year.

9. The order of determination of the State Engineer and any further or supplemental order of determination made by him under order of the court shall give effect to the terms and conditions of said stipulation of April 23rd, 1919 and of this supplemental stipulation as said order of determination may define or effect the rights of the parties to the above entitled action and any final decree entered herein shall, in determining the relative rights of the parties hereto follow and give effect to the terms of the said new stipulation.

DATED this 10th day of March, 1920.

A. S. Henderson
Brown & Belford
Attorneys for Plaintiff

F. R. McNamee &
Leo A. McNamee
Attorneys for Defendants other than W. J. and Mary Powers.

C. D. Breeze
Attorney for W. J. and Mary Powers.

That the said exceptions of the respective parties to the order of determination came regularly on for hearing on said 10th day of March, 1920 and witnesses were sworn and testified for and on behalf of the said excepting parties and documentary and other evidence was introduced in support of said exceptions and thereupon the court made and entered an order requiring the State Engineer to make a further determination of the waters of the said Muddy River and its tributaries, subject to instructions of the court which were embodied in such order; and thereafter, to-wit, on the 11th day of March, 1920 said State Engineer did make and file in his office a further and supplemental order of determination and has filed a duly certified copy thereof with the Clerk of this Court.

And the above entitled action and the above entitled matter and the said original and said further and supplemental order of determination of the State Engineer in said matter having now come on for hearing and the Court having considered the pleadings of the parties, the oral and documentay evidence heretofore taken herein, and the stipulations of the parties filed herein, and written findings having been waived by attorneys for the respective parties, thereupon, upon motion of the attorneys for plaintiffs and defendants,

It is by the Court ORDERED, ADJUDGED AND DECREED as follows:

First: That the said order of determination of the State Engineer in the matter of the determination of the relative rights in and to the waters of the Muddy River and tributaries in Clark County, State of Nevada, as amended and modified by the said further and supplemental order of determination, and the said further and supplemental order of determination be and the same hereby are affirmed and confirmed. Wherever the said further and supplemental order of determination differs from, changes, modifies, or is in conflict with the original order of determination, the said original order of determination is and shall be deemed to be modified by the said further and supplemental order of determination and by the order and decree of this court and the same as so modified is hereby affirmed. A copy of said original order of determination marked "Exhibit "A" and a copy of said further and supplemental order of determination marked "Exhibit 'B" are annexed to this decree and are made parts hereof as if set forth at length herein. Hereinafter in this decree whenever the order of determination is referred to it shall, unless otherwise specified, be understood to include both the original order of determination and the further and supplemental order of determination and the former as amended, changed and modified by the latter. Said order of determination shall and does define the rights of the parties named therein except as hereinafter in this decree provided.

Second: That the parties to the above entitled action, their grantors and predecessors in interest have diverted and appropriated from the Muddy River, its headwaters, sources of supply and tributaries for use upon the lands described in their several answers and specifically described in the order of determination and the said parties are respectively entitled to divert to said lands for use in the irrigation thereof, the respective amounts of water herein setforth:

The defendants George Baldwin and Aletha Baldwin his wife, .2286 of one cubic foot of water per second.

The defendant Moapa and Salt Lake Produce Company 2.215 cubic feet per second.

The defendants D. H. Livingston and Richard Smith, 2.286 cubic feet per second.

The defendants Joseph Perkins and Kathyrn Perkins, his wife, .428 cubic feet per second.

The defendants G. S. Holmes and Julia May Knox, 1.357 cubic feet per second.

The defendants Isaiah Cox and Anna Cox his wife for use on 10 acres of land described in their separate answer .143 of a cubic foot per second.

The defendants Isaiah Cox and Anna Cox his wife for use upon the lands formerly belonging to J. H. Mitchell, described in the order of determination .043 of a cubic foot per second.

The defendants, W. J. Powers and Mary Powers his wife, .4143 of a cubic foot per second.

The defendant, Sadie George for use on the land described in the order of determination, .03 of a cubic foot per second.

The defendant, Los Angeles & Salt Lake Railroad Company for the use specified in the order of determination, .04646 of a cubic foot per second.

The defendant, Jacob Bloedel for use upon the land described in the order of determination, .0286 of a cubic foot per second.

The plaintiff, John F. Perkins, .0286 of a cubic foot per second.

The plaintiff, Muddy Valley Irrigation Company, for use during the summer season, as hereinafter defined and as defined in said order of determination, upon the lands described in said order of determination, 36.2588 cubic feet per second, which said amount includes the amount of water for summer use allowed by State Engineer's certificate No. 59. Said company is also the owner of the right to and entitled to divert during the winter season for use upon the lands described in said order of determination and in State Engineer's Certificate Nos. 58, 59 and 60, and also upon the lands described in any certificate or permit granted or issued by said State Engineer upon said Company's application No. 1611 - the several amounts of water allowed by said certificate or permits for winter use.

Third: That the Moapa Indian Reservation has diverted and appropriated from the said Muddy River for use upon the lands of said reservation and is entitled to divert upon said lands for use thereon 1.242 cubic feet per second during the summer season and .87 of a cubic foot per second during the winter season.

Fourth: That all of the defendants to the above entitled action and the plaintiff John F. Perkins are and shall be entitled to use the several amounts of water which they have appropriated as aforesaid during both the summer and winter seasons.

Fifth: That the duty of water allowed for all land in the Muddy Valley except on the Moapa Indian Reservation shall be one cubic foot per second of flow to 70 acres for the summer irrigation season which is defined as extending from May 1st to October 1st, and one cubic foot per second flow to 100 acres for the winter irrigation season which is defined as extending from October 1st to May 1st. On said Indian Reservation the duty of water allowed is 1 cubic foot per second flow to 70 acres for the summer irrigation season which is defined as from April 1st to October 1st, and one cubic foot per second flow to 100 acres for the winter irrigation season which is defined as from October 1st to April 1st.

The volumes or amounts of water awarded and allotted by this decree to the parties hereinbefore named and to which they are entitled shall be understood to include and define the amount of all the waters now or heretofore rightfully used on the lands given in the tabulation in the original order of determination whether diverted directly from said Muddy River or from its tributaries, springs, head waters or other sources of supply, including waters claimed to have been developed heretofore by any of the said parties. All measurements of amounts to which the said several parties are entitled except that awarded to the Moapa Indian Reservation shall be made at the places of diversion or as near thereto as practicable or convenient, as the State Engineer or Water Commissioner may select or approve. On said Indian Reservation all measurements of amounts diverted are to be made at the point where the main ditch enters or becomes adjacent to the land irrigated or as near thereto as practicable as the State Engineer or Water Commissioner may select or approve.

Sixth: That the waters now and heretofore used by the defendants George Baldwin and Aletha Baldwin his wife, upon the lands described in their original separate answer, and which are the waters of what is known as the George Baldwin Spring, the maximum flow of which is found to be .8298 of a cubic foot per second of water are waters which have been developed and appropriated by said defendants in the manner and by the means alleged in their said answer; and that such development and use has not and does not diminish the flow or volume of the Muddy River or interfere with the rights of any of the other parties to the above entitled action or the Moapa Indian Reservation.

Seventh: That, as between the parties to the above entitled action, the Muddy Valley Irrigation Company is declared and decreed to have acquired by valid appropriations and beneficial use and to be entitled to divert and use upon the lands described in the amended complaint and more particularly described in the order of determination, all the waters of said Muddy River, its head waters, sources of supply and tributaries, save and except the several amounts and rights hereinbefore specified and described as awarded and decreed to the other parties to this action and to the Moapa Indian Reservation, and said Company is to divert said waters, convey and distribute the same to its present stockholders and to its future stockholders and to other persons who have acquired or who may hereafter acquire temporary or permanent rights from said Company, for the various purposes described in the complaint and upon the lands situated as stated in the complaint and specifically designated in the order of determination and that the stock holders of said Company are the equitable owners of rights to use said waters in this decree and by the order of determination allotted and decreed to said Company, in accordance with its articles and amended articles of incorporation, or its by-laws or the accepted uses and practices of said corporation.

Eighth: As between the parties to this action and except against the rights awarded the Indian Reservation and the Inhabitants thereof, all of the water rights enumerated as belonging to the parties to the action shall be deemed and held to be and are hereby decreed to be vested rights acquired by valid appropriation and beneficial use prior to March 1st, 1905, and by continued uninterrupted use since said date and shall be considered as equal in rank without anyone having any priority over another and that this shall apply to and include the rights held by the Muddy Valley Irrigation Company as grantee or assignee of Nevada Land & Live Stock Company under the State Engineer's certificates, 58, 59 and 60, and under such permit or certificate as may hereafter be granted by the State Engineer to the Muddy Valley Irrigation Company under its application No. 1611. That, as against the water right granted and allotted to the said Indian Reservation, the water rights held by the Muddy Valley Irrigation Company under said certificates or permits shall be deemed to be subsequent to the water rights allotted and decreed the said Indian Reservation. The water right allotted and decreed the Indian Reservation shall be deemed and held to be vested rights acquired by valid appropriation prior to March 1st, 1905 and by uninterrupted use thereafter and shall, to the extent decreed and allotted, rank, as equal in priority with all the other rights, allotted, awarded and decreed to the said several parties, except those granted by the said certificates or permits.

Ninth: That the defendants in said action shall not be required to take or use the waters in said river in continuous flow, but may cumulate the same or any part thereof in rotation and turn periods, with the approval of the Water Commissioner, and subject to his control and direction and under such rules and regulations as may be prescribed by the State Engineer and the statutes of the State of Nevada. That the whole amount of water diverted from said river at any one time by all of the defendants shall not exceed in the aggregate the total of the amounts of water awarded to the said defendants. Below the lowest diversion of the defendants Holmes and Knox, the flow in the stream shall be maintained substantially constant, subject to seasonal variations, only, however, in so far as the defendants can be held to be responsible for the fluctuations of the stream. The whole of said river system shall be under the supervision, rules and regulations of the State Engineer, and the direction and control of the water commissioner to be appointed as provided by law, as a fully adjudicated stream; but it is the intention hereof, and it is hereby decreed that, so far as practicable, the stream shall be treated as divided into two parts, that above and that below the lowest diversion on the ranch now belonging to Knox and Holmes. The Muddy Valley Irrigation Company, although under the supervision and control of the state engineer and water commissioner, shall, subject to said supervision and general control, distribute and control the distribution of the waters diverted and conveyed by its works to its stockholders and other persons obtaining water by means thereof. Substantial headgates, weirs or other measuring devices and sand boxes, as the State Engineer, through the water commissioner may direct or require, shall be installed and maintained in good order by all who divert or use the waters of said stream system.

Tenth: That the owners of land on the upper part of said river as in the last paragraph defined, and defined in the said order of determination, as that part of said river above the "narrows", shall keep the channel through their respective lands cleared, of all ordinary obstructions, but in case of extraordinary obstructions, such as the formation of lime beds or deposits in the channel of the stream, the same shall be removed under the direction of the water commissioner and the expenses thereof paid pro rata by all parties to the determination in proportion to the acreage owned or controlled by them as defined in said order of determination.

Eleventh: That all abnormal losses from the flow of the stream shall be pro rated and shared among the parties holding water rights on the stream, but as between the parties to the above entitled action, abnormal losses shall be defined as in paragraph 8 of said stipulation of April 23rd, 1919, as amended by paragraph 5 of the stipulation supplemental thereto, and, as between the parties to said action, such abnormal losses shall be borne by the parties to said action, pro rata in the proportions named and set forth in paragraph 4 of said supplemental stipulation.

Twelfth: That the aggregate volume of the several amounts and quantities of water awarded and allotted to the parties named in said order of determination, which include all of the parties to said action and the said Moapa Indian Reservation, is the total available flow of the said Muddy River and consumes and exhausts all of the available flow of the said Muddy River, its head waters, sources of supply and tributaries.

Thirteenth: That the salary and the expenses of any water commissioner, who may be appointed to supervise, control and regulate the distribution of the waters of said Muddy River in accordance with the provisions of said order of determination and this decree, shall be paid pro-rata by the parties to the said stipulation supplemental to the stipulation of April 23rd, 1919, in the same proportion as for the sharing of abnormal losses set forth in paragraph 4 of said supplemental stipulation. If in the opinion of the State Engineer a suitable and competent water commissioner cannot be employed at the salary fixed by statute, the State Engineer is authorized to fix the salary of the Water Commissioner in such amount as he may determine to be reasonable, subject, in case of objection by any of the water users, to the approval of the Judge of the above entitled Court. The State Engineer may also allow such expenses of such water commissioner as he may deem necessary or proper to be incurred in the performance of the duties of such water commissioner, subject, also, in case of objection, to the approval of the Judge of said Court.

That any money due or which may hereafter become due from any party for his, her or its pro rata share of such salary or such expenses of the water commissioner shall be paid by the party at the time and in the manner provided by law for the payment of the salary of the water commissioner, and any neglect or failure of any party to make any such payment shall be deemed a violation of this decree and a contempt of Court, and shall be punished accordingly, or the same may be deemed a debt and collected by civil process.

Fourteenth: That each of the parties to this action his, her or its grantees and successors in interest and every person acting under his, her or its direction or control be and hereby is perpetually restrained and enjoined from in any way interfering with or in any way impairing any right given or awarded or decreed by this decree to any other party and from violating any of the provisions of this decree, and is also perpetually restrained and enjoined from opening, closing, changing or interfering with any headgate or water box established by or under the order of the State Engineer or Water Commissioner without the authority of said State Engineer or Water Commissioner, and also from using water or conducting water into or through his, her or its ditch which has not been awarded to such party by this decree.

Fifteenth: Each party shall pay his or its own costs in this action, but the costs and expenses of the adjudication by the State Engineer, including any surveys or maps made by him, shall be borne by the respective parties in accordance with the Statutes of this State. But in determining the water right and acreage, against which said expense shall be assessed the numerators in the fractions in said paragraph 4 of said supplemental stipulation, shall, as between said parties, be deemed to be the number of acres to be irrigated by the said respective parties.

Done in open Court this 12th day of March, A. D. 1920.

/s/ Wm. E. Orr
District Judge.

EXHIBIT "A"

STATE OF NEVADA

ORDER OF DETERMINATION OF RELATIVE RIGHTS

TO THE

Waters of the Muddy River and Its Tributaries

J. G. SCRUGHAM, State Engineer

CARSON CITY, NEVADA
STATE PRINTING OFFICE . . . JOE FARNSWORTH, SUPERINTENDENT
1920

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ORDER OF DETERMINATION

In the Matter of the Determination of the Relative Rights in and to the Waters of the Muddy River and its Tributaries in Clark County, State of Nevada.

In accordance with stipulated agreement entered into by the Muddy Valley Irrigation Company, et al., v. Moapa and Salt Lake Produce Company, et al., on the 23d day of April, 1919, an order was entered in the Tenth Judicial District Court of the State of Nevada referring the above-entitled action to the State Engineer for an adjudication of the water rights on the Muddy River stream-system as provided for in Chapter 140, Statutes of 1913, and all Acts amendatory thereof.

The tabulation of the allotments of the waters of the Muddy River stream-system, as attached hereto, covers all claims filed in the office of the State Engineer as provided for by law, and also an allotment to the Moapa Indian Reservation. Although duly notified of the pending adjudication proceedings in the statutory manner, the United States Indian Service authorities did not file a claim and state that they refuse to recognize the authority of the State of Nevada to determine the water rights of the Moapa Indian Reservation. In the absence of any showing on part of the United States Indian Service, the State Engineer has based the Moapa Indian Reservation allotment on the official investigations and reports made in the year 1906 by Henry Thurtell, at that time State Engineer of Nevada. These reports gave the Moapa Indian Reservation an allotment of water sufficient to properly irrigate an area of 87 acres, which was found to be the full area on the Reservation entitled to a vested water right under the law of the State.

(a) *Duty and point of diversion defined.*

The duty of water allowed for all land in the Muddy River Valley shall be 1 c.f.s. flow to 70 acres for the summer irrigation season from April 1 to October 1 and 1 c.f.s. flow to 100 acres for the winter irrigation season from October 1 to April 1.

The volumes or amounts of water allotted and to which it is agreed the respective parties are entitled shall be understood to include and define the amount of all the waters now or heretofore rightfully used on the lands given in the tabulation whether diverted directly from said Muddy River or from its tributaries, springs, headwaters or other sources of supply, including water claimed to have been developed heretofore by any of the said parties. All measurements of amounts diverted are to be made at the point where the main ditch enters or becomes adjacent to the land to be irrigated or as near thereto as practicable, as the State Engineer or water commissioner may select or approve.

(b) *Baldwin Spring flow defined.*

The maximum flow of .8298 c.f.s. of water of the George Baldwin Spring now and heretofore used by George Baldwin and Aletha L. Baldwin, his wife, is water which has been developed by said parties.

c.f.s. signifies cubic foot per second.

Such development and use of this amount of water has not and does not diminish the flow or volume of the Muddy River, or interfere with the rights of any other water users on the stream-system. No further development of water on the head of the Muddy River stream-system shall be made which in any way diminishes the flow of the waters of the Muddy River or impairs rights defined and referred to in this order.

(c) *Method of use.*

The parties named in this order shall not be required to take or use the water of said river in continuous flow, but may cumulate same or any part thereof in rotation and in periodic turn, with the approval of the water commissioner, subject to his control and direction and under such rules and regulations as are prescribed by the State Engineer and the statutes of the State of Nevada.

The whole amount of water diverted from the river at any one time by all the parties allotted water for use above the "narrows" is not to exceed in the aggregate the total amount of water allotted to the several parties resident in the Upper Muddy Valley. Below the lowest diversion of Knox and Holmes the flow in the stream shall be maintained substantially constant subject to seasonal variation. The whole of said river system shall be under supervision of the rules and regulations of the State Engineer and the direction and control of the water commissioner, to be appointed as provided by law. Substantial headgates, weirs, and sand-boxes, as the State Engineer through the water commissioner may order, shall be installed and maintained in good order by all who divert or use the waters of said stream-system.

(d) *Channel upkeep, responsibility for.*

The owners of land on that part of said river above the "narrows" shall keep the channel through their respective lands cleared of all ordinary obstructions, but in case of extraordinary obstruction, such as the formation of lime deposits in the channel of the stream, the same shall be removed under the direction of the water commissioner and the expenses thereof paid pro rata by all parties to this determination in proportion to the acreage owned or controlled by them as defined in this order.

(e) *Priority—Vested and granted rights.*

All the water rights enumerated in this order of determination, except those held under permit from the State Engineer's office, shall be deemed and held to be vested rights acquired by valid appropriation and beneficial use prior to March 1, 1905, and by continued uninterrupted use since said date and shall be considered as equal in rank without having any priority over one another.

Permits Nos. 31 and 1372, which are the basis for certificates Nos. 58, 59, and 60, granted by the State Engineer, cover certain water rights which are enumerated in the appended tabulation of allotments. These granted rights are next in priority to the vested rights on the Muddy River stream-system.

(f) *Losses, apportionment of.*

All abnormal losses from the flow of said stream shall be pro-rated and shared among the parties holding water rights on the stream. Abnormal losses shall include any substantial loss from the permanent flow of the stream, such as a cloudburst destroying or obstructing the channel thereof or an opening up of a fissure in the bed of the stream or in one of the sources of supply and the disappearance therein of a substantial amount of the waters, thereby causing a diminution in the available flow.

If any such abnormal loss occurs at any time, the pro-rata share of such loss to be borne by each party to this order shall be as follows:

George Baldwin and Aletha Baldwin, his wife	18/2839
Moapa & Salt Lake Produce Co.	155/2839
Livingston & Smith	160/2830
Joseph Perkins and wife	30/2830
Knox and Holmes	95/2839
Isaiah Cox and wife	10/2839
W. J. Powers and wife	20/2830
Sadie George	2.1/2830
Jacob Bloedel	2/2830
J. H. Mitchell	3/2830
U. S. Indian Service, Moapa Reservation	87/2830
John F. Perkins	2/2830
Muddy Valley Irrigation Co.	2244.80/2839

(g) *Expense of commissioner.*

The salary and expenses of the water commissioner shall be paid pro rata by all parties to this adjudication in the proportion of acreage owned and controlled by them as defined in this order.

SUMMARY OF ALLOTMENTS AND CERTIFICATES

Claimant	Acreage	C.F.S. flow Summer	C.F.S. flow Winter
Jacob Bloedel	2	.0280	.02
Moapa & Salt Lake Produce Co.	155	2.215	0
Isaiah Cox and wife	10	.143	0
J. H. Mitchell	3	.043	0
George Baldwin	16	.2280	0
Sadie George	2.1	.0300	0
John F. Perkins	2	.0280	.02
Los Angeles & Salt Lake Ry.		.04040	.04646
Livingston and Smith	160	2.280	0
Knox and Holmes	96	1.357	0
W. J. Powers	29	.4143	.29
Muddy Valley Irr. Co.	2244.80	32.0068	22.448
Muddy Valley Irr. Co. (Cert. 58)	808.11	———	8.08
Muddy Valley Irr. Co. (Cert. 59)	425.2	4.252	———
	840.0	———	8.400
Muddy Valley Irr. Co. (Cert. 60)	80	———	.8
Joseph Perkins	30	.428	0
Moapa Indian Reservation	87	1.242	.87

Appropriator—Jacob Bloedel.

Source—Muddy River Tributary (Bloedel Spring).

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
Morris & Jones Ditches	1896		2.00	21	NE¼NE¼	14	65

Domestic use allowed.
2/70 c.f.s. allowed for irrigation.

Appropriator—Moapa and Salt Lake Produce Co.

Source—Muddy River and Tributaries.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
Big Spring, Jones Spring, High Springs, and Rock Cabin Spring Ditches.				14	W½SW¼	14	65
				15	S½	14	65
				15	S½N½NW¼	14	65
				16	S½N½	14	65
				16	NE¼	14	65
				16	E½SE¼	14	65
Excepting and excluding from the above description the				16	NE¼ NW¼NE¼	14	65
				26	NW¼ NE¼NE¼	14	65

Domestic use allowed.
Total acreage allotted water, 155 acres.
2 and 15/70 c.f.s. allowed for irrigation.

Appropriator—Isaiah Cox and Anna Cox, His Wife.

Source—Muddy River and Tributaries.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
Cox Ditch and Cox Spring Ditch			10.00	16	NE¼ NW¼NE¼	14	65

Domestic use allowed.
10/70 c.f.s. allowed for irrigation.

Appropriator—J. H. Mitchell.

Source—Muddy River.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
Mowry & Mitchell or Cox Ditch			8.00	16	NW¼ NE¼NE¼	14	65

Domestic use allowed.
8/70 c.f.s. allowed for irrigation.

Appropriator—U. S. Indian Service (Moapa Indian Reservation).

Source—Muddy River.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
Indian Ditches			87.00	36		14	65
				25		14	65
				31		14	66
				1		15	65
				6		15	66
Total			87.00				

This allotment is based on the Thurtell findings as covered in Certificate No. 472, issued by Henry Thurtell on March 30, 1907.

Domestic use allowed.
87/70 c.f.s. allowed for irrigation.

SE ROA 33799

Appropriator—George Baldwin.

Source—Muddy River and Tributaries.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
George A. Davis and Dry Ditch...			16.00	25	SE¼SW¼	14	65
				25	SW¼SE¼	14	65
				36	Lots 2 and 3 NE¼	14	65

Domestic use allowed.
16/70 c.f.s. allowed for irrigation.

Appropriator—Sadie George.

Source—Muddy River and Tributaries.

Indian Ditch...			2.10	1	SE¼NE¼	15	65

Domestic use allowed.
21/700 c.f.s. allowed for irrigation.

Appropriator—Joseph Parkins.

Source—Muddy River and Tributaries.

Barnes & Harris Ditch and Bradfute Ditch.			30.00	6	Lots 4 and 5 NW¼	15	66
				6	Lot 6 SW¼	15	66
				6	SE¼NE¼	15	66
				6	SW¼NE¼	15	66
				6	Lots 2 and 3	15	66

Domestic use allowed.
30/70 c.f.s. allowed for irrigation.

Appropriator—Los Angeles and Salt Lake Ry. Co.

Source—Muddy River.

Pipe Line...			equiv. to .0333	32	NE¼	14	66

Note—Water used for locomotives, cars, depot, stock yards, and town supply.
.04848 c.f.s. allowed.

Appropriator—D. H. Livingston and Richard Smith.

Source—Muddy River and Tributaries.

White, Livingston, and Crosby Ditches.				5	S½SE¼	15	66
				5	N½NE¼	15	66
				9	N½NW¼	15	66
				9	NW¼NE¼	15	66
				4	SW¼SE¼	15	66
				4	SE¼SW¼	15	66
			20.00	4	N½SE¼	15	66
				9	NE¼NE¼	15	66
				4	SE¼SE¼	15	66
				3	W½SW¼	15	66
				3	N½NW¼	15	66
				5	S½SW¼	15	66
All that portion of...				6	S½SE¼ situated east of the R. R. track		
Total...			140.00				

Domestic use allowed.
2 and 20/70 c.f.s. allowed for irrigation.

SE ROA 33800

Appropriator—G. S. Holmes and Julia May Knox.
Source—Muddy River and Tributaries.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
Weiser Ditch			95.00	1	S½NW¼SW¼	15	66
				1	S½SW¼	15	66
				1	S½SE¼	15	66
				12	NE¼	15	66
				12	NE¼SE¼	15	66
				7	SW¼NW¼	15	67
				7	NE¼SW¼	15	67
				7	Frac. ½SW¼	15	67

Domestic use allowed.
1 and 25/70 c.f.s. allowed for irrigation.

Appropriator—W. J. Powers.
Source—Muddy River.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
Cook Ditch			29.00	4	NW¼SE¼	15	66
				4	NE¼SE¼	15	66
				4	NW¼SE¼&		
					NE¼SW¼	15	66
				4	NE¼SE¼	15	66
				4	SE¼NE¼	15	66
				5	NW¼SW¼	15	66

Domestic use allowed.
29/70 c.f.s. allowed for irrigation.

Appropriator—Muddy Valley Irrigation Co.
Source—Muddy River.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
St. Joe Ditch			20.00	15	SE¼SW¼		
			14.00	15	SW¼SW¼		
			34.00	15		15	67
			20.00	21	SE¼NE¼		
			7.25	21	NE¼NE¼		
			27.25	21		15	67
			20.00	22	NE¼NW¼		
			24.00	22	SE¼NW¼		
			14.00	22	NW¼NW¼		
			14.00	22	SW¼NW¼		
			14.00	22	NW¼SW¼		
			14.00	22	NE¼SW¼		
			15.00	22	SW¼SW¼		
			20.00	22	NW¼NE¼		
			20.00	22	SW¼NE¼		
			15.00	22	NW¼SE¼		
			14.00	22	SE¼SW¼		
			184.00	22		15	67
			14.00	27	NE¼NW¼		
			14.00	27	NW¼NE¼		
			16.50	27	SW¼NE¼		
			30.00	27	SE¼NE¼		
			26.00	27	NE¼SE¼		
			10.00	27	SE¼SE¼		
			110.50	27		15	67
			2.60	26	SW¼NW¼		
			24.40	26	NW¼SW¼		
			3.00	26	SW¼SW¼		
			30.00	26		15	67
			17.50	35	SE¼NW¼		
			40.00	35	NW¼NW¼		
			20.00	35	NE¼NW¼		
Total			77.50	35		15	67
			463.25				

46325/1000 c.f.s. allowed for irrigation.

Appropriator—Muddy Valley Irrigation Co.

Source—Muddy River.

Ditch Title	*Date when construction commenced*	*Date when land first irrigated*	*Number of acres irrigated*	*Sec.*	*Subdivision*	*Tp.S.*	*R.E.*
Sprole-Averitt			22.25	27	NW¼NW¼		
			25.00	27	SW¼NW¼		
			10.00	27	SE¼NW¼		
			35.50	27	NE¼SW¼		
			22.50	27	SE¼SW¼		
			28.00	27	SW¼SE¼		
			143.25	27		16	67
			6.00	34	NE¼NW¼		
			15.00	34	SE¼NW¼		
			17.75	34	NE¼NE¼		
			40.00	34	NE¼NE¼		
			13.75	34	SW¼NE¼		
			6.50	34	SE¼SE¼		
			99.00	34		16	67
Total			242.25				

24225/7000 c.f.s. allowed for irrigation.

Appropriator—Muddy Valley Irrigation Co.

Source—Muddy River.

Kapalapa Ditch			10.00	2	NW¼NW¼		
			20.00	2	NE¼NW¼		
			20.00	2	SE¼NW¼		
			20.00	2	NW¼NE¼		
			7.50	2	NE¼NE¼		
			20.00	2	SE¼NE¼		
			20.00	2	SW¼NE¼		
			20.00	2	NW¼SE¼		
			20.00	2	NE¼SW¼		
Total			157.50	2		16	67

15750/7000 c.f.s. allowed for irrigation.

Appropriator—Muddy Valley Irrigation Co.

Source—Muddy River.

Stringtown Ditch			17.80	12	NE¼NW¼		
			12.50	12	SW¼NW¼		
			12.50	12	SE¼NW¼		
			7.50	12	SW¼NE¼		
			12.00	12	NE¼SE¼		
			30.00	12	NW¼SE¼		
			30.20	12	SW¼SE¼		
			24.10	12	SE¼SE¼		
			7.80	12	NE¼SW¼		
			15.00	12	SE¼SW¼		
			8.00	12	SW¼SW¼		
			182.60	12		16	67
			21.40	13	NW¼NE¼		
			25.80	13	NE¼NE¼		
			47.20	13		16	67
			5.00	18	SW¼NW¼		
			5.00	18	NW¼NW¼		
			10.00	18		16	68
Total			239.80				

23980/7000 c.f.s. allowed for irrigation.

Appropriator—Muddy Valley Irrigation Co.
Source—Muddy River.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
Sparks Canal			13.00	1	SE¼SW¼	16	67
			21.80	7	SW¼SW¼		
			1.20	7	NW¼SW¼		
			23.00	7		16	68
			1.80	12	NE¼SE¼		
			8.20	12	SE¼SE¼		
			10.00	12		16	67
Total			46.00				

46/70 c.f.s. allowed for irrigation.

Appropriator—Muddy Valley Irrigation Co.
Source—Muddy River.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
Overton Canal			18.00	2	SW¼SE¼		
			20.00	2	SE¼SW¼		
			12.00	2	SW¼SW¼		
			50.00	2		16	67
			7.00	3	SE¼SE¼	16	67
			6.00	10	NE¼NE¼	16	67
			10.00	11	NW¼NW¼		
			20.00	11	NE¼NW¼		
			20.00	11	NW¼NE¼		
			13.475	11	NE¼NE¼		
			7.50	11	SE¼NE¼		
			7.40	11	SW¼NE¼		
			10.00	11	NE¼SE¼		
			10.00	11	NW¼SE¼		
			27.625	11	SE¼SE¼		
			126.00	11		16	67
			12.00	13	NW¼NW¼		
			5.00	13	NE¼NW¼		
			20.00	13	SW¼NW¼		
			16.00	13	SE¼NW¼		
			4.50	13	SW¼NE¼		
			7.50	13	SE¼NE¼		
			24.50	13	NW¼SE¼		
			22.75	13	NE¼SE¼		
			26.40	13	SE¼SE¼		
			31.35	13	SW¼SE¼		
			24.50	13	NE¼SW¼		
			12.00	13	SE¼SW¼		
			216.50	13		16	67
			7.50	14	NE¼NE¼	16	67
			5.00	18	SW¼SW¼	16	68
			3.00	18	SW¼SE¼		
			6.00	19	NE¼SW¼		
			5.00	19	SE¼SW¼		
			14.00	19		16	68
			3.00	24	NW¼NE¼		
			20.00	24	NE¼NE¼		
			5.00	24	SW¼NE¼		
			4.00	24	SE¼NE¼		
			32.00	24		16	67
			2.00	20	NW¼NE¼	16	68
Total			466.00				

466/70 c.f.s. allowed for irrigation.

Appropriator—Muddy Valley Irrigation Co.

Source—Muddy River.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp. S	R. E.
Kaolin Ditch			28.00	19	SE¼SE¼	16	68
			20.00	20	SW¼NE¼		
			20.00	20	NW¼SE¼		
			7.00	20	NE¼NE¼		
			47.00	20		16	68
			20.00	32	NE¼SE¼		
			20.00	32	NW¼SE¼		
			40.00	32		16	68
			4.00	29	NE¼NW¼	16	68
Total			119.00				

119/70 c.f.s. allowed for irrigation.

Appropriator—Muddy Valley Irrigation Co.

Source—Muddy River.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp. S	R. E.
St. Thomas Ditch			15.00	10	SE¼NW¼		
			20.05	10	NW¼NE¼		
			10.00	10	NE¼NE¼		
			21.00	10	SW¼NE¼		
			18.50	10	SE¼NE¼		
			17.25	10	NE¼SE¼		
			2.50	10	SE¼SE¼		
			110.20	10		17	68
			5.00	11	NW¼NW¼		
			28.00	11	SW¼NW¼		
			30.25	11	NW¼SW¼		
			20.25	11	NE¼SW¼		
			34.00	11	SW¼SW¼		
			37.75	11	SE¼SW¼		
			20.00	11	SW¼SE¼		
			178.05	11		17	68
			17.30	14	NW¼NW¼		
			37.00	14	NE¼NW¼		
			25.20	14	NW¼NE¼		
			21.20	14	NE¼NE¼		
			10.60	14	SW¼NE¼		
			19.40	14	SE¼NE¼		
			134.10	14		17	68
Total			420.45				

42045/7000 c.f.s. allowed for irrigation.

Appropriator—Muddy Valley Irrigation Co.

Source—Muddy River.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp. S	R. E.
East St. Thomas Ditch			4.00	2	SW¼SW¼	17	68
			17.00	3	SE¼SE¼		
			7.00	3	NE¼SE¼		
			24.00	3		17	68
			18.55	11	NW¼NW¼		
			16.10	11	NE¼NW¼		
			8.00	11	SW¼NW¼		
			12.00	11	SE¼NW¼		
			10.00	11	NW¼SE¼		
			62.65	11		17	68
Total			90.65				

Domestic use allowed from all Muddy Valley Irrigation Company Ditches.

9065/7000 c.f.s. allowed for irrigation.

Appropriator—John F. Perkins.

Source—Muddy River.

Ditch Title	Date when construction commenced	Date when land first irrigated	Number of acres irrigated	Sec.	Subdivision	Tp.S.	R.E.
St. Thomas Ditch			2.00	10	E part of NE¼SE¼		
				11	W part of NW¼SW¼	17	68

Domestic use allowed.

2/70 c.f.s. allowed for irrigation.

Appropriator—Muddy Valley Irrigation Co., Assignee of Nevada Land and Livestock Co., Under Certificate No. 58.

Source—Muddy River.

Overton Canal	20.00	2	W½ NW¼NW¼		
	6.00	2	SW¼SE¼ and SE¼SE¼		
	118.00	11	NE¼NE¼ and SE¼		
	40.00	12	W½SW¼		
	25.00	12	E½SW¼		
	40.00	13	NW¼NW¼		
	6.60	13	NW¼SW¼		
	25.10	12	NW¼		
	7.09	13	NW¼SE¼		
	16.00	14	NE¼NE¼	15	67
	27.11	19	SW¼		
	24.00	20	SW¼NE¼		
	20.00	30	N½SE¼		
	16.20	30	SE¼SE¼	16	68
Total	398.11				

2.80 c.f.s. allowed for irrigation.

The use of this water is determined as a winter use; diversion to commence October 1 of each year and to extend to April 1 of the year following. The use is limited to irrigation, stockwatering, and domestic purposes.

Appropriator—Muddy Valley Irrigation Co., Assignee of Nevada Land and Livestock Co., Under Certificate No. 69.

Source—Muddy River.

Keefe Ditch	**Winter Use**				
	40.00	20	SW¼SW¼	16	68
	160.00	29	SW¼	16	68
	310.00	32	N½	16	68
	56.20	32	N½SW¼	16	68
	111.01	32	SE¼	16	68
	70.00	33	S½SW¼	16	68
	36.38	33	NW¼SW¼	16	68
	34.42	31	E½NE¼	16	68
	82.10	3	W½SW¼	17	68
		4	SE¼	17	68
	10.35	4	NE¼NW¼	17	68
	Summer Use				
	140.00	29	SW¼	16	68
	250.00	32	N½	16	68
	36.28	32	N½SW¼	16	68
Total summer use	423.28				
Total winter use	846.65				

Summer use—4.282 c.f.s.

Winter use—8.466 c.f.s.

The use is limited to irrigation, stockwatering, and domestic purposes.

Appropriator—Muddy Valley Irrigation Co., Assignee of Nevada Land and Livestock Co., Under Certificate No. 60.

Source—Muddy River.

Ditch Title	*Date when construction commenced*	*Date when land first irrigated*	*Number of acres irrigated*	*Sec.*	*Subdivision*	*Tp.S.*	*R.E.*
St. Joe or Logan Ditch			20.00	26	SE¼SW¼		
			20.00	35	E½NE¼		
			40.00	35	SE¼NW¼	15	67
Total			80.00				

The use of this water is determined as a winter use: diversion to commence October 1 of each year, and to extend to April 1 of the year following. Use limited to irrigation, stock-watering and domestic purposes.

0.8 c.f.s. allowed for irrigation.

STATE OF NEVADA
STATE ENGINEER'S OFFICE

I, J. G. Scrugham, State Engineer of the State of Nevada, duly appointed and qualified, having charge of the records and files of the office of the State Engineer, do hereby certify that the foregoing is a full, complete and true copy of the Order of Determination of the Relative Rights in and to the Waters of Muddy River and its Tributaries in Clark County, Nevada, prepared and filed in said office on the 21st day of January, 1920, as appears by the records and files of the office of the State Engineer of Nevada, and nothing more or less.

In Witness Whereof, I have hereunto set my hand and affixed my seal of office at the City of Carson, State of Nevada, this 21st day of January, A. D. 1920.

J. G. SCRUGHAM,
State Engineer.

[SEAL]

EXHIBIT "B"

IN THE MATTER OF THE DETERMINATION OF THE RELATIVE RIGHTS IN AND TO THE WATERS OF THE MUDDY RIVER AND ITS TRIBUTARIES IN CLARK COUNTY, STATE OF NEVADA.

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FURTHER AND SUPPLEMENTAL ORDER OF DETERMINATION.

In accordance with a stipulated agreement entered into by the parties in the suit of Muddy Valley Irrigation Company, et al, Vs. Moapa and Salt Lake Produce Company, et al, on the 23rd day of April, 1919, an order was entered in the Tenth Judicial District Court of the State of Nevada, in and for the County of Clark referring the above entitled action to the State Engineer for an adjudication of the water rights on the Muddy River stream system as provided for in Chapter 140, Statutes of 1913, and all Acts amendatory thereof.

On the 10th day of March, 1920, the matter having come on for hearing before the Court upon exceptions duly filed with the Clerk of the Court and served as required by law on the State Engineer, said exceptions having been filed by various parties to the said suit of Muddy Valley Irrigation Company et al. Vs. Moapa and Salt Lake Produce Company, et al., and the Court having heard said exceptions and proofs adduced by and on behalf of the excepting parties, the Court made and entered an order requiring the State Engineer to make a further determination of the waters of the said Muddy River and its tributaries subject to the Court's instructions which were set forth in said order, the said order being made by said District Court and entered in said suit.

In accordance with the said order of said Court and the said instructions the State Engineer makes the following:

FURTHER AND SUPPLEMENTAL ORDER OF DETERMINATION.

The tabulation of the allotments of the waters of the Muddy River stream system as set forth in the original order of determination with the changes herein made in this order, cover all claims filed in the office of the State Engineer as provided by law, and also an allotment to the Moapa Indian Reservation. Although duly notified of the pending adjudication proceedings in the statutory manner, the United States Indian Service authorities, did not file a claim and state that they refuse to recognize the authority of the State of Nevada to determine the water rights of the Moapa Indian Reservation. In the absence of any showing on the part of the United States Indian Service, the State Engineer has based the Moapa Indian Reservation allotment on the official investigations and reports made in the year 1906 by Henry Thurtell, at that time State Engineer of Nevada. These reports gave the Moapa Indian Reservation an allotment of water sufficient to properly irrigate an area of 87 acres, which was found to be the full area on the Reservation entitled to a vested water right under the law of this State.

(a) <u>DUTY AND POINT OF DIVERSION DEFINED.</u>

The duty of water allowed for all lands in the Muddy Valley, except on the Indian Reservation, shall be 1 c.f.s. flow to 70 acres for the summer irrigation season from May 1st to October 1st, and 1 c.f.s. flow to 100 acres for the winter irrigation season from October 1st to May 1st. On the Reservation, the duty of water allowed shall be 1 c.f.s. flow to 70 acres for the summer irrigation season from April 1st to October 1st, and 1 c.f.s. flow to 100 acres for the winter irrigation season from October 1st to April 1st.

The volumes or amounts of water alloted and to which it is agreed the respective parties are entitled shall be understood to include and define the amount of all the waters now or heretofore rightfully used on the lands given in the tabulation in the original order of determination whether diverted directly from said Muddy River or from its tributaries, springs, head-waters or other sources of supply, including waters claimed to have been developed heretofore by any of the said parties. All measurements of amounts except that awarded to the Indian Reservation shall be made at the places of diversion or as near thereto as practicable or convenient as the State Engineer or Water Commissioner may select or approve. On the Indian Reservation, all measurements of amounts diverted are to be made at the point where the main ditch enters or becomes adjacent to the land irrigated or as near thereto as practicable, as the State Engineer or Water Commissioner may select or approve.

(b) BALDWIN SPRING FLOW DEFINED.

The maximum flow of .8298 c. f. s. of water of the George Baldwin Spring now and heretofore used by George Baldwin and Aletha L. Baldwin, his wife, is water which has been developed by said parties. Such development and use of this amount of water has not and does not diminish the flow or volume of the Muddy River, or interfere with the rights of any other water users on the stream system. No further development of water on the head of the Muddy River stream system shall be made which in any way diminishes the flow of waters of the Muddy River or impairs rights defined and referred to in this order.

(c) METHOD OF USE.

The Muddy Valley Irrigation Company, subject to the supervision and general control of the State Engineer or Water Commissioner, shall distribute and control the distribution of the water alloted to it, and diverted and conveyed by its work to its stockholders and other persons obtaining water by means thereof.

All other parties named in this order shall not be required to take or use the water of said River in continuous flow but may cumulate the same or any part thereof in rotation and in periodic turn, with the approval of the water commissioner, subject to his control and direction and under such rules and regulations as are prescribed by the State Engineer and the statutes of the State of Nevada.

The whole amount of water diverted from the river at any one time by all the parties alloted water for use above the "narrows" is not to exceed in the aggregate the total amount of water alloted to the several parties resident in the Upper Muddy Valley. Below the lowest diversion of Knox and Holmes the flow in the stream shall be maintained substantially constant subject to seasonal variation. The whole of said river system shall be under the supervision and the rules and regulations of the State Engineer and the direction and control of the Water Commissioner, to be appointed as provided by law, except as hereinbefore specified as to the Muddy Valley Irrigation Company. Substantial headgates, weirs and sand-boxes, as the State Engineer through the Water Commissioner may order, shall be installed and maintained in good order by all who divert or use the waters of said stream system.

(d) <u>Channel upkeep, responsibility for.</u>

The owners of land on that part of said river above the "narrows" shall keep the channel through their respective lands cleared of all ordinary obstructions, but in case of extraordinary obstruction, such as the formation of lime deposits in the channel of the stream, the same shall be removed under the direction of the water commissioner and the expenses thereof paid pro rata by all parties to this determination in proportion to the acreage owned or controlled by them as defined in this order.

(e) <u>Priority, vested and granted rights.</u>

As between the parties to the above entitled suit and except against the rights awarded the Indian Reservation and the inhabitants thereof, all of the water rights enumerated as belonging to the parties to the suit shall be deemed and held to be vested rights acquired by valid appropriation and beneficial use prior to March 1, 1905, and by continued uninterrupted use since said date and shall be considered as equal in rank without anyone having any priority over another; this shall apply to and include the rights held by the Muddy Valley Irrigation Company as grantee or assignee of Nevada Land & Live Stock Company under certificates Nos. 58, 59 and 60 and to such permit or certificate as may be granted by the State Engineer to the Muddy Valley Irrigation Company under its application No. 1611. Against the right granted and alloted to the Indian Reservation, the rights held by the Muddy Valley Irrigation Company, under said certificates or permits, shall be deemed to be subsequent to the right by this order alloted to said Indian Reservation. The right allowed the Indian Reservation shall be deemed and held to be a vested right acquired by valid appropriation prior to March 1st, 1905, and uninterrupted use thereafter and shall to the extent allowed rank as of equal priority with all the other rights alloted and awarded to the various parties except those granted by the said certificates or permits.

(f) Losses, apportionments of.

All abnormal losses from the flow of said stream shall be pro-rated and shared among the parties holding water rights on the stream. Abnormal losses shall include any substantial loss from the permanent flow of the stream, such as a cloudburst destroying or obstructing the channel thereof or an opening up of a fissure in the bed of the stream or in one of the sources of supply and the disappearance therein of a substantial amount of the waters, thereby causing a diminution in the available flow.

If and such abnormal loss occurs at any time, the prorata share of such loss to be borne by each party to this order shall be as follows:

George Baldwin and Aletha L. Baldwin, his wife	16/2839
Moapa & Salt Lake Produce Co.	155/2839
Livingston and Smith	160/2839
Joseph Perkins and wife	30/2839
Knox and Holmes	95/2839
Isaiah Cox and wife	10/2839
W. J. Powers and wife	29/2839
Sadie George	2.1/2839
Jacob Bloedel	2/2839

J. H. Mitchell	3/2839
U. S. Indian Service, Moapa Reservation	87/2839
John F. Perkins	2/2839
Muddy Valley Irrigation Company	2244.80/2839

As between the parties to the said suit the definition of abnormal losses shall be as contained in paragraph 8 of a stipulation filed in said court and suit on April 23rd, 1919, and the stipulation supplemental thereto filed in said court and suit and dated March 10th, 1920; and as between the parties to said suit the pro rata share of such abnormal losses shall be as set forth in paragraph 4 of the said stipulation supplemental to the stipulation of April 23rd, 1919.

(g) Expense of Commissioner.

The salary and expenses of the Water Commissioner shall be paid pro rata by the parties to the stipulation supplemented to the stipulation of April 23rd, 1919, made and filed in said suit March 10th, 1920, in the same proportion as for the sharing of abnormal losses set forth in paragraph 4 of said supplemental stipulation.

(h) All the waters of the stream system appropriated and alloted.

The aggregate volume of the several amounts and quantities of water awarded and alloted to the parties named in this order of determination which includes all the parties to said suit and the Indian Reservation is the total available flow of the said Muddy River and consumes and exhausts all of the available flow of the said Muddy River, its headwaters, sources of supply and tributaries.

(i) Water alloted to Muddy Valley Irrigation Company.

In accordance with the said stipulation and supplemental stipulation filed in said suit and the instructions of the Court requiring a further order of determination, as between the parties of the suit, the Muddy Valley Irrigation Company is hereby declared to be entitled to divert and use upon its lands all the waters of the said stream except the amounts specifically awarded and alloted to the other parties to said suit and to the Indian Reservation. In addition to the certificate rights belonging to the Muddy Valley Irrigation Company set forth in the original order of determination the Muddy Valley Irrigation Company is entitled to such rights as have accrued to it under its water application No. 1611 and which will be specifically defined in the certificate or permit to be issued by the State Engineer upon said application No. 1611, which said permit will be for approximately 10 C.F.S. of water (more or less) for use upon approximately 1000 acres of land (more or less) during the winter season.

<u>The summary of allotments and certificates</u>, contained in the original order of determination is amended so as to allow winter use of water to the parties hereinafter named and for the amounts hereinafter specified:

To	c.f.s. flow.
Moapa & Salt Lake Produce Company	2.215
Isaiah Cox and wife	.143
Isaiah Cox and wife (as grantees of J. H. Mitchell)	.043
George Baldwin	.2286
Sadie George	.03
John F. Perkins	.0286
Livingston and Smith	2.286
Knox and Holmes	1.357
Joseph Perkins	.428
W. J. Powers and wife	.4143

The amount allowed for winter use is allowed under a duty of water of 1 c. f. s. for 100 acres.

There is also the additional allotment to the Muddy Valley Irrigation Company for winter use under its application No. 1611. Except as hereinbefore changed the summary of allotments and certificates shall be as stated in the original order of determination.

The names of the respective appropriators, the sources of their appropriation, the titles of the ditches, the number of acres irrigated and the description of the land to which the water is appurtenant, the uses allowed and the amounts of water allowed for irrigation shall be as set forth in the original order of determination, except that it is understood that the rights of J. H. Mitchell have been acquired by and conveyed to Isaiah Cox and Anna M. Cox, his wife, and except that the periods of winter and summer use, as between the parties to said suit, shall be as hereinbefore defined in this further and supplemental order of determination.

/s/ J. G. Scrugham
State Engineer.

STATE OF NEVADA

STATE ENGINEER'S OFFICE.

I, J. G. SCRUGHAM, State Engineer of the State of Nevada, duly appointed and qualified, having charge of the records and files of the office of the State Engineer, do hereby certify that the foregoing is a full, complete and true copy of the further and supplemental order of determination of the relative rights in and to the waters of Muddy River and its tributaries in Clark County, Nevada, made under order of the Tenth Judicial District Court of the State of Nevada in and for the County of Clark, and in accordance with the instructions of said Court and filed in said office on the 11th day of March, 1920, as appears by the records and files of the office of the State Engineer of Nevada, and nothing more or less.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal of office this 11th day of March, A. D. 1920.

/s/ J. G. Scrugham
State Engineer.

SEAL

CERTIFICATION OF COPY

STATE OF NEVADA,)
) SS.
COUNTY OF CLARK,)

I, HARLEY A. HARMON, the duly elected, qualified and acting Clerk of Clark County, in the State of Nevada, and Ex-Officio Clerk of the District Court, do hereby certify that the foregoing is a true, full and correct copy of the original

JUDGMENT AND DECREE IN THE CASE ENTITLED
MUDDY VALLEY IRRIGATION COMPANY ET AL.,
Plaintiffs
vs.
MOAPA & SALT LAKE PRODUCE COMPANY, ET AL.
Defendants,
and
IN THE MATTER OF THE DETERMINATION OF THE RELATIVE RIGHTS IN AND TO THE WATERS OF THE MUDDY RIVER AND ITS TRIBUTARIES IN CLARK COUNTY, STATE OF NEVADA.

now on file and of record in this office.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the Seal of the Court at my office, Las Vegas, Nevada, the 12th day of March, A. D. 19 20.

(SEAL)

/s/ Harley A. Harmon
CLERK.

/s/ Margaret Ireland
DEPUTY CLERK.

STATE OF NEVADA)
) ss.
COUNTY OF CLARK)

I, Helen Scott Reed, the duly elected, qualified and acting County Clerk of the County of Clark, State of Nevada, and ex-officio Clerk of the District Court of the Eighth Judicial District of the State of Nevada, in and for the County of Clark, do hereby certify and attest the foregoing to be a full, true and correct copy of the original: "JUDGMENT AND DECREE" in the action entitled; MUDDY VALLEY IRRIGATION COMPANY, a corporation, NEVADA LAND & LIVESTOCK COMPANY, a corporation, SAMUEL H. WELLS, JOHN F. PERKINS and ELLEN C. PERKINS, his wife, Plaintiffs Vs. MOAPA & SALT LAKE PRODUCE COMPANY, a corporation, GEORGE BALDWIN and ALETHA L. BALDWIN, his wife, ISAIAH COX and ANNA M. COX, his wife, JOSEPH PERKINS and KATHRYN PERKINS, his wife, D.H. LIVINGSTON and RICHARD SMITH, G. S. HOLMES and JULIA MAY KNOX, W. J. POWERS and MARY A. POWERS, his wife, SADIE GEORGE, LOS ANGELES & SALT LAKE RAILROAD COMPANY, a corporation, and WALKER D. HINES, as Director General of Railroads, and JACOB BLOEDEL, Defendants: and IN THE MATTER OF THE DETERMINATION OF THE RELATIVE RIGHTS IN AND TO THE WATERS OF THE MUDDY RIVER AND ITS TRIBUTARIES IN CLARK COUNTY, STATE OF NEVADA"

Case No. 377

together with the endorsements thereon, now on file in my office, and that I have carefully compared the same with the original.

IN WITNESS WHEREOF, I have hereunto set my hand and annexed the Seal of the District Court of the Eighth Judicial District of the State of Nevada, in and for the County of Clark, this 16th day of May, 19 56

Helen Scott Reed

COUNTY CLERK OF THE COUNTY OF CLARK, STATE OF NEVADA, AND EX-OFFICIO CLERK OF THE DISTRICT COURT OF THE EIGHTH JUDICIAL DISTRICT OF THE STATE OF NEVADA, IN AND FOR THE COUNTY OF CLARK.

STATE OF NEVADA)
) ss.
COUNTY OF CLARK)

I, Frank McNamee, Judge of the District Court of the Eighth Judicial District of the State of Nevada, in and for the County of Clark, do hereby certify that Helen Scott Reed is County Clerk of the County of Clark, State of Nevada, and ex-officio Clerk of the District Court of the Eighth Judicial District of the State of Nevada, in and for the County of Clark (which Court is a Court of Record having a seal); that the signature to the foregoing certificate and attestation is the genuine signature of the said Helen Scott Reed, as such officer; that the seal annexed thereto is the seal of said District Court; that said Helen Scott Reed, as such clerk, is the proper officer to execute the said certificate of attestation, and that such attestation is in due form according to the laws of the State of Nevada.

IN WITNESS WHEREOF, I have hereunto set my hand in my official character as such Judge, at the City of Las Vegas, County and State aforesaid, this 16th day of May, A. D. 19 56

Frank McNamee

JUDGE OF THE DISTRICT COURT OF THE EIGHTH JUDICIAL DISTRICT OF THE STATE OF NEVADA, IN AND FOR THE COUNTY OF CLARK.

STATE OF NEVADA)
) ss.
COUNTY OF CLARK)

I, Helen Scott Reed, County Clerk of the County of Clark, State of Nevada, and ex-officio Clerk of the District Court of the Eighth Judicial District of the State of Nevada, in and for the County of Clark (which Court is a Court of Record, having a seal, which is annexed hereto) do hereby certify that Frank McNamee, whose name is subscribed to the foregoing certificate of due attestation was, at the time of signing the same, Judge of the District Court aforesaid, and was duly commissioned, qualified and authorized by law to execute said certificate. And I do further certify that the signature of the Judge above named to the said certificate of due attestation is genuine.

IN WITNESS WHEREOF, I have hereunto set my hand and annexed the Seal of the District Court of the Eighth Judicial District of the State of Nevada, in and for the County of Clark, this 16th day of May, 19 56

Helen Scott Reed

COUNTY CLERK OF THE COUNTY OF CLARK, STATE OF NEVADA, AND EX-OFFICIO CLERK OF THE DISTRICT COURT OF THE EIGHTH JUDICIAL DISTRICT OF THE STATE OF NEVADA, IN AND FOR THE COUNTY OF CLARK.

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is "due to barriers to flow created by normal (extensional) faults that impede groundwater flow in the east-west direction" (Id.) is incorrect. The wells in question lie north of the pumping so barrier to east-west flow would have no effect. Myers (2019) explained the decreasing response with distance north of MX-5 as being due to the higher ground level and to the aquifer becoming less transmissive to the north, not due to an impedance to east-west flow.

Stetson claims pumping at CSI-2 did not affect Warm Springs West (WSW) flow during the last three quarters of 2018 (Stetson 2019, p 52) and references its Figure 21. That figure also shows that MRSA pumping has decreased, which affects water levels at EH-4 which the spring discharge correlates with. Also, Stetson Figure 21 does show a minor flow decrease but the measurements are reported only at 0.1 cfs intervals and Stetson's scale goes way beyond the bounds that the flow data is reported. In more detail, Myers (2019) Figure 14 shows a substantial fluctuation, but flows that are mostly less than 3.4 cfs, a decrease from levels exceeding 3.4 cfs subsequent to the aquifer test. In other words, Myers' figure shows that spring discharge has been decreasing ever since it recovered from the pump test.

Stetson (2019) argues in its section 3 that Kane Springs Valley (KSV) should not be part of the LWRFS, but provides evidence that clearly supports KSV's inclusion and fails to present evidence showing there is no connection. The hydrogeology map presented by Stetson as Figure 8 shows that volcanic rock forms the boundary of KSV (206) and CSV and that carbonate rock forms the boundary between CSV and KSV. Also, at no point did Stetson consider groundwater levels between CSV and KSV or whether drawdown in CSV would draw water from KSV. Myers (2019) showed the groundwater elevation difference between valleys was minimal.

In section 4, Stetson (2019) develops water budgets for LWRFS and CSV. First, Stetson estimates recharge for CSV using three recharge methods, (Maxey and Eakin 1949, Nichols 2000, and Epstein 2004). The Nichols and Epstein methods are based on methodology of Maxey and Eakin (1949) in that recharge is estimated as a coefficient applied to a precipitation interval within the basin. Stetson's application of the methods is incorrect and shows a misunderstanding of the methodology.

Maxey and Eakin (1949) assumed that outflow from a basin, including groundwater evapotranspiration (GWET), spring flow, and interbasin outflow, would equal recharge and interbasin inflow to that basin. They analyzed 13 basins for which they could estimate the outflow because GWET is easier to estimate than any other flux in the method and for which they could assume interbasin outflow was minimal. They estimated precipitation by elevation using a precipitation map developed by Hardman (1936). The precipitation estimates were by zone, as Stetson shows in its Table 2 (precipitation zones <8 in/y, 8 to 12 in/y, 12 to 15 in/y, 15 to 20 in/y, and >20 in/y). Maxey and Eakin developed the coefficients shown in Stetson Table 2

Johnson/Mifflin discuss a regional hydraulic-head gradient and flow between a Steptoe MX well and Tule Springs Pond (p 20), but do not provide evidence of a connection or discuss the flow path. This claim begins a paragraph that seems to be a series of unconnected sentences that together are almost impossible to review. The second sentence references an unpublished report (Mifflin and Johnson 2013) to claim there is a 2832 m^2/day transmissivity across the width of California Wash. Without a figure showing the cross-section, this cannot be considered. They determine the width of California Wash that would be necessary, based on the assumed transmissivity, to pass 33,771 m^3/day, a hypothetical flow (equal to 10,000 af/y) (p 19).

In sum, the Johnson/Mifflin report is riddled with unsupported claims and its conclusions should not be relied on.

Rebuttal to Vidler/Lincoln County Report

The report submitted by Lincoln County and Vidler Water Company in response to interim order #1303 primarily argues that the northern portion of CSV should not be administered as part of the LWRFS and that KSV should not be added to the LWRFS for administration. However, the data and analysis presented by Lincoln County et al (2019) actually supports adding KSV to the LWRFS and certainly does not support removing the northern portion of CSV from the LWRFS.

Lincoln County et al (2019) cited the NSE Ruling #6254 in support of allowing appropriation of groundwater that is hundreds of years upgradient (p 2-3). However, there was no evidence presented in the hearing or the order #6254 that KSV is hundreds of years upgradient from LWRFS. The hearing concerned Delamar, Dry Lake and Cave Valley which some argued is that far upgradient from CSV and Las Vegas Valley and therefore water could be appropriated, although that aspect of Order #6254 has been reversed by the Judge Esty order[1]. The Lincoln County et al assertion that KSV is hundreds of years upgradient from CSV and LWRFS is not supported.

Lincoln County et al invoke NSE Ruling # 5712 as claiming that there is "not substantial evidence" that pumping in KSV will affect the flow at Muddy River Springs, Rogers Spring or Blue Point Springs. That ruling predates the Order 1169 pump and that conclusion has been challenged by Myers (2019). Lincoln County et al also reference Ruling #5712 as suggesting the difference in groundwater levels (1875 ft amsl near KSV and less than 1825 ft amsl near MX-5 and the MRSA) as being due to low transmissivity between the areas. Myers (2019) and FWS (2019) acknowledged the transmissivity is lower than in the larger very high transmissivity zone affected by the Order #1169 pump test, but also noted that the gradient through the lower

[1]White Pine County and Consolidate Cases, Et al, v Jason King, P.E., Nevada State Engineer, State of Nevada Division of Water Resources. In the Seventh Judicial District Court of the State of Nevada in and for the County of White Pine. Case No. CV1204049.

Rebuttal to Southern Nevada Water Authority Report

SNWA in its abstract claims that "[I]f the conflicts with senior water-right holders are adequately addressed, the annual groundwater production from the carbonate aquifer should be managed between 4,000 – 6,000 afy over the long-term" (SNWA 2019, p ix). This conclusion however violates all of the findings SNWA makes throughout its report. The most important finding that does not support the conclusion is "(c) the data indicated that groundwater production from the MRSA alluvial reservoir or the carbonate aquifer simply cannot occur over the long-term without depleting spring and streamflows and conflicting with senior surface-water rights" (Id.). This rebuttal reviews SNWA (2019) and discusses additional points as to why the ultimate conclusion is faulty.

SNWA shows there have not been any significant climatic trends or shifts in the area since 1895 (SNWA, p 5-1). SNWA Figure 4-2 shows a slight, non-significant upward trend which is likely due to the very high precipitation in 2005.

SNWA notes that since 2016, heads in the carbonate aquifer and discharge measured at Pederson Spring and WSW have declined (SNWA, p 6-2). It notes that a significant increase in pumping as occurred during the aquifer test would increase the rate of decline. The only way to recover groundwater levels to pre-test levels would be for a pulse recharge event like in 2004-2005 (Id.). Stopping pumping is not sufficient. It further elaborates:

> In the long-term, it is expected that any **groundwater production from the carbonate system with in the LWRFS will ultimately capture discharge to the MRSA** (e.g., spring discharge, subsurface inflow the o the alluvial reservoir and, consequently, Muddy River streamflow) because of the high aquifer diffusivity and hydraulic connectivity throughout the flow system and because the MRSA constitutes the majority, if not all, of the discharge from the flow system" (Id., emphasis added).

Moving the pumping center will not help in the long term either, but may just take longer (Id.). SNWA presents four important conclusions:

- groundwater production from the carbonate aquifer in the LWRFS has impacted discharge to the MRSA and, consequently, senior surface-water rights associated with the 1920 Muddy River Decree
- impacts due to groundwater production within areas directly upgradient of the MRSA occur relatively quickly, and the magnitude of the impacts depends upon the pumping rates and durations
- **additional appropriations** that increase groundwater production from the carbonate aquifer within the LWRFS **will accelerate the timing and magnitude of impacts**

InterFlow Hydrology, Inc.
Hydrogeology and Water Resources Consulting

Technical MEMORANDUM

To: Mr. Randall E. DeVaul, PE, City of North Las Vegas, Director of Utilities
Mr. Robert A. McLaughlin, PE, City of North Las Vegas, Manager, Development & Flood Control

Date: July 2, 2019

RE: Garnet Valley Groundwater Pumping Review for APEX Industrial Complex, City of North Las Vegas, Clark County, Nevada

From: Dwight L. Smith, PE, PG, Principal Hydrogeologist
Alexa Terrell, MSc., Hydrogeologist

A.T.

PROFESSIONAL ENGINEER - STATE OF NEVADA
DWIGHT L. SMITH
GEOLOGICAL
EXP. 6/30/20
No. 11808

Executive Summary

Garnet Valley is situated in the southern end of the Lower White River Flow System, which is a collection of 6 hydrographic basins that have groundwater connection through the regional carbonate aquifer. The Lower White River Flow System (LWRFS) encompasses Coyote Spring Valley (210), Muddy River Springs Area (219), Hidden Valley (217), California Wash (218), Garnet Valley (216), and a smaller northwestern portion of the Black Mountains Area (215). State Engineer Interim Order 1303 was issued on January 11, 2019 designating the basins as one collective administrative area. This is the first designation of this type in the State of Nevada.

Most groundwater flow in the LWRFS basins discharges at the Muddy River Springs. Some groundwater appears to travel south to Garnet Valley based on water level elevations. As presently understood, the quantity of flow to Garnet Valley is small. Data are not sufficient to quantify an exact amount. Test modeling conducted in this study estimates groundwater inflow to northern Garnet Valley from southern Coyote Spring Valley and/or northern Hidden Valley at approximately 450 AF/yr. A unique finding of this study is that there appears to be groundwater flow from Las Vegas Valley (212) into southern Garnet Valley. Modeling suggests the magnitude may be about 700 AF/yr, but there is considerable uncertainty, and the gradient from Las Vegas Valley to Garnet Valley has not been clearly defined. This potential inflow needs to be investigated further by measuring water level elevations near the boundary between the basins, which will likely necessitate drilling and installation of two or more water level monitoring wells.

Along with the estimated in-basin recharge by precipitation falling in the Las Vegas Range, the groundwater inflows support existing pumping in Garnet Valley, which has historically been around 1500 AF/yr. There is little evidence of a significant magnitude of groundwater outflow from Garnet Valley to California Wash. It is interpreted in this study that the basin is in a state near to equilibrium with the magnitude of current groundwater pumping. There is a long-term declining water trend in Garnet Valley of approximately 0.3 ft per year, but this trend is observed throughout the LWRFS at similar magnitudes, and is interpreted to be a regional background

Conceptual Review of Groundwater Yield in Garnet Valley

Sources of groundwater to Garnet Valley include locally derived recharge (~400 AF/yr), and based on the boundary test modeling, subsurface inflow from southern Coyote Spring Valley and/or northern Hidden Valley through the Arrow Canyon Range (~450 AF/yr), and subsurface inflow from northeastern Las Vegas Valley to southern Garnet Valley (~700 AF/yr). These estimates carry notable uncertainty, as data are limited for model calibration.

The model reflects a simple uniform hydraulic conductivity over the entire model area, and only the upper 1000 ft of saturated thickness of the carbonate aquifer. Higher transmissivities and greater thicknesses would accommodate greater flows. However, the ability to capture the deeper groundwater by wells has practical limitations. Data on aquifer transmissivity is sparse in portions of Garnet Valley, particularly the northern portion. The represented transmissivity in the model is however consistent with the available information and produces a reasonable model calibration to observed water level elevations.

In-basin recharge from precipitation is estimated on a reconnaissance level at 400 AF/yr by Rush (1968). This recharge supports a portion of pumping from APEX wells. What appears potentially unaccounted for is precipitation recharge occurring in Hidden Valley, which is estimated by Rush (1968) to also be 400 AF/yr. This recharge would be expected to discharge via subsurface outflow to southern or central Garnet Valley. The boundary testing did not suggest significant inflow from southern Hidden Valley to Garnet Valley is required to produce adequate model calibration. The lack of quantification of outflow could however be due in large part to the lack of the available data in Hidden Valley. Additional monitoring wells in Hidden Valley would aid in understanding gradients and refining interpretations, to possibly account for the Hidden Valley recharge.

There is a long-term declining water level trend in Garnet Valley, but this trend mimics water level trends throughout much of the LWRFS (Figure 24). In Garnet Valley, the declining trend is about 0.3 ft/yr, and has been observed since the beginning of groundwater monitoring in 2000, but was interrupted by a high recharge year in 2005. After the wet period, the declining water level trend resumed. The Order 1169 pumping interrupted the trend in 2011-2014, during the pumping and recovery periods (Figure 25). Otherwise the declining trend has been present throughout the period of record from 2000-2018 in Garnet Valley and from 1998 to present at other LWRFS locations (Figure 24).

The pumping responses in the Order 1169 testing were observed to spread rapidly in the system (SNWA, 2013), being identified within a couple months, including in Garnet Valley, due to high transmissivity and the confined nature of the aquifer. The rapid propagation of drawdown also produced a similarly rapid commencement of spring discharge capture, at Pederson Spring. This observation supports the interpretation that the LWRFS responds rapidly to pumping by reduced spring discharge, and pumping capture of spring discharge is not a highly delayed. This important characteristic of the carbonate aquifer leads to the conclusion that the long-term uniform declining trends in water levels throughout the LWRFS are likely due to other stresses on the system, presumably long-term climate, rather than a delayed response to pumping.

In years 2016 and 2017, pumping from APEX wells increased to ~2,000 AF/yr due to highway and Faraday Future construction activities. A noticeable response to this increase in pumping, however, is not visible in the Garnet Valley water level hydrographs. Conversely, water levels near the Muddy River Springs showed some indication of leveling (note EH-4, Figure 25). It may be that the increase in pumping was not sufficient to have caused a large amount of aquifer storage depletion. A controlled long-term aquifer test, possibly integrated with pumping in APEX to bridge the gap in time for APEX pipeline construction, would be beneficial to understanding the system and potential thresholds for pumping. For example, pumping from the City's Playa and Kapex wells might be increased in increments between 500 AF/yr to 1000 AF/yr, while responses are monitored. Should pumping results indicate unacceptable drawdown, then the proposed artificial recharge (AR) as reviewed in Interflow (2019) can be implemented, and/or a conversion from groundwater use to Colorado

River water supply can take place. Ideally some test pumping would occur prior to implementation of an AR program, to simplify interpretations.

The above observations suggest that partitioning of climate and pumping responses needs to continue to be reviewed and considered when interpreting water level trends in the LWRFS, and in Garnet Valley. Smith et al (2004), and others, have reviewed the importance of differentiating climate versus pumping trends.

In summary, it appears that pumping at 1500 AF/yr and possibly up to 2000 AF/yr in the APEX area has not caused detrimental water level declines. As a water development and management strategy for APEX, a controlled pumping test with increased pumping from the Playa and Kapex wells up to 1000 AF/yr could reveal more information, from which a sustainable pumping volume in the APEX area may be determined. Additional monitoring wells should complement the pumping, especially in Hidden Valley. Under the City's water supply strategy of using both groundwater and imported Colorado River water to provide a conjunctive water supply, along with artificial recharge to help manage groundwater pumping drawdown and potentially return treated wastewater to the beneficial use (Interflow, 2019), there will be ample flexibility and a backstop to manage use of groundwater resources, and to accommodate short-term increased pumping to determine a sustainable groundwater pumping volume in the basin.

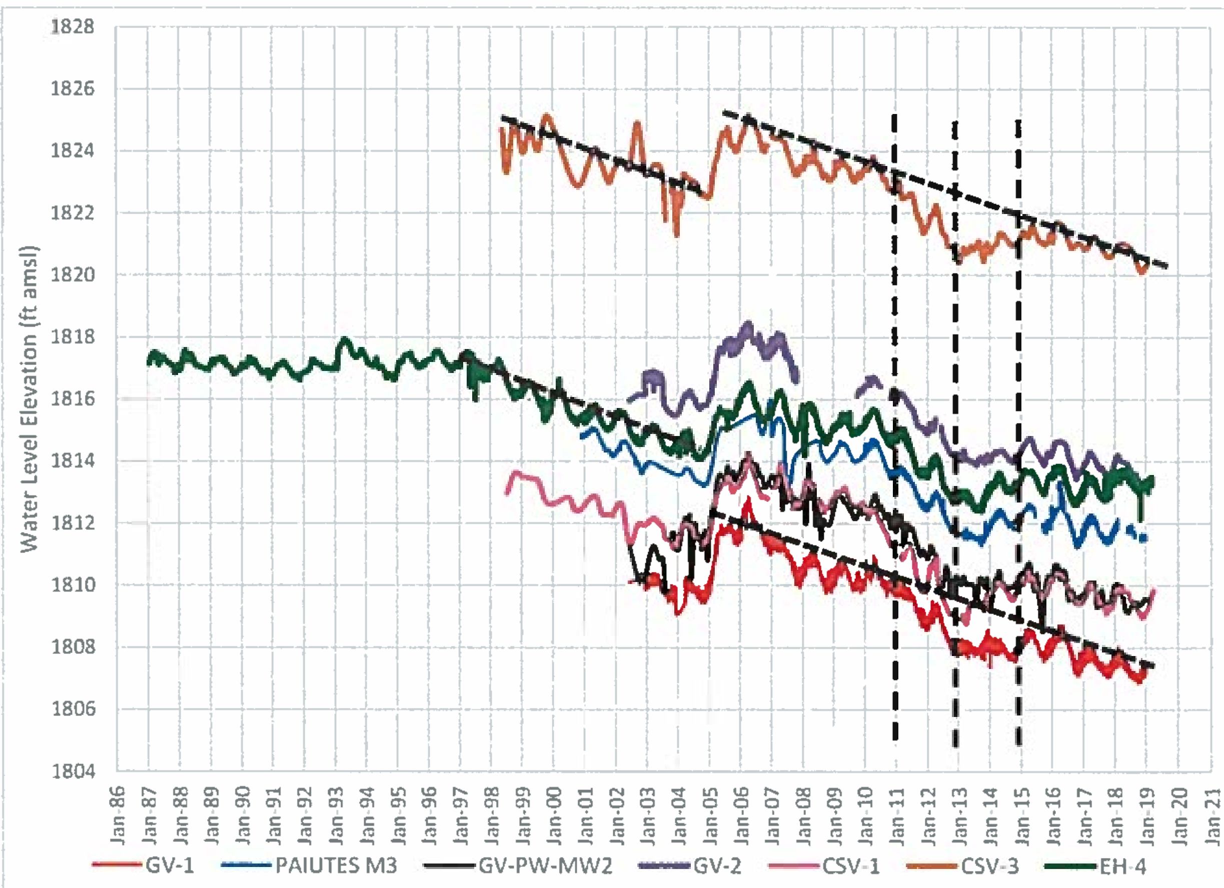
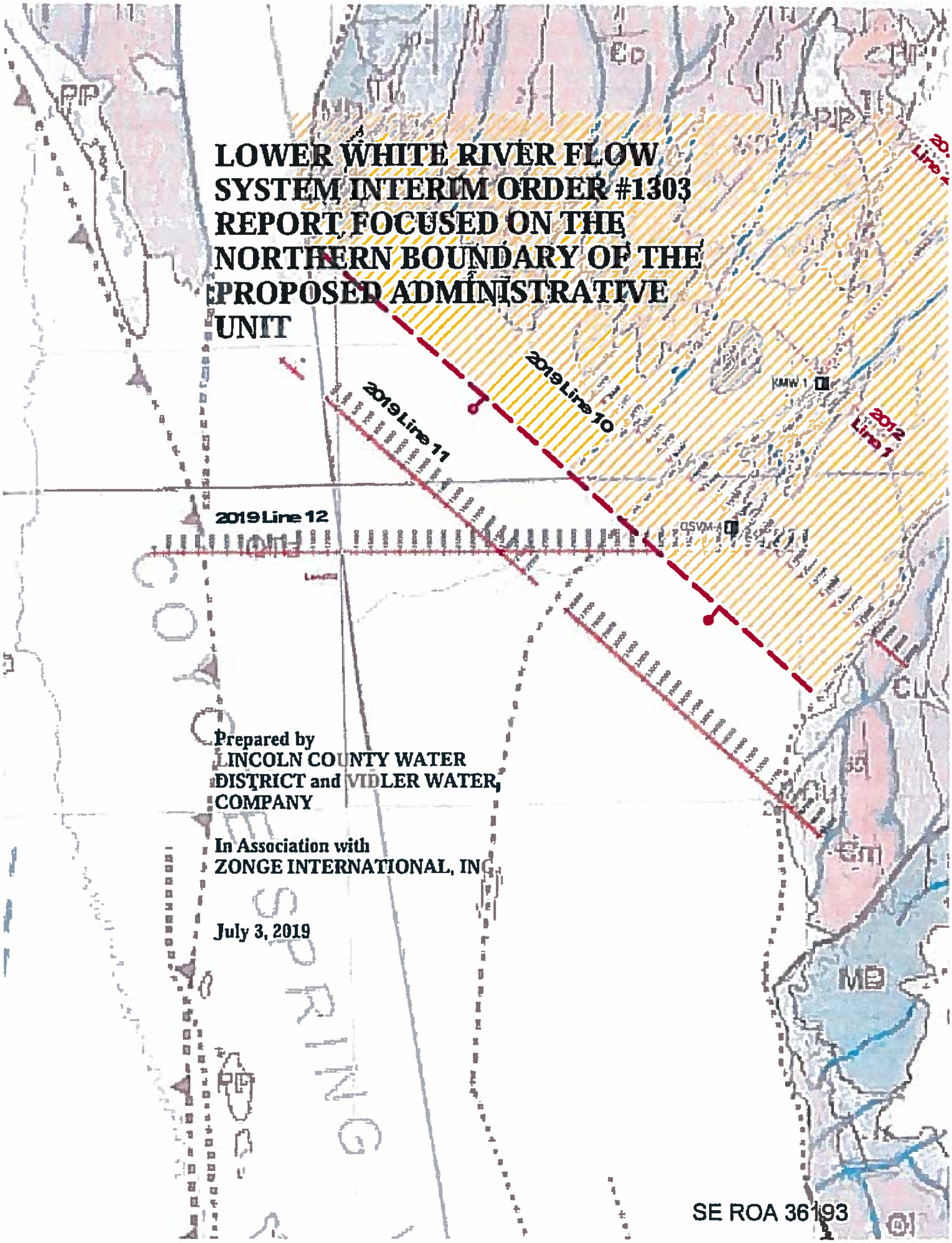


Figure 24 – Hydrograph Comparison of Garnet Valley Water Level Trends with other LWRFS Locations



LOWER WHITE RIVER FLOW SYSTEM INTERIM ORDER #1303 REPORT FOCUSED ON THE NORTHERN BOUNDARY OF THE PROPOSED ADMINISTRATIVE UNIT

Prepared by
LINCOLN COUNTY WATER DISTRICT and VIDLER WATER COMPANY

In Association with
ZONGE INTERNATIONAL, INC.

July 3, 2019

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LOWER WHITE RIVER FLOW SYSTEM
INTERIM ORDER #1303 REPORT
FOCUSED ON THE NORTHERN BOUNDARY OF THE PROPOSED ADMINISTRATIVE UNIT

Prepared for:

Nevada State Engineer
Division of Water Resources
Department of Conservation and Natural Resources
901 S. Stewart St., Suite 2002
Carson City, Nevada 89701

Prepared by:

Lincoln County Water District
1005 Main Street, Suite 103
P.O. Box 936
Panaca, Nevada 89042

Vidler Water Company
3480 GS Richards Blvd., Suite 101
Carson City, Nevada 89703

And

Zonge International, Inc.
3322 East Fort Lowell Road
Tucson, Arizona 85716

July 3, 2019

AMERICAN INSTITUTE OF HYDROLOGY
125
Greg Bushner

Expires January 15, 2020

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ac-ft	acre-feet
ac-ft/yr	acre-feet per year

amsl	above mean sea level
CEMP	Community Monitoring Environmental Program
COOP	Cooperative Observer Network
CSAMT	Controlled Source Audio Frequency Magneto Telluric
CSV	Coyote Spring Valley
°F	Degrees Fahrenheit
Ds	Devonian Simonson Dolomite
IO	Interim Order
KSV	Kane Springs Valley
KSW	Kane Springs Wash
LVVWD	Las Vegas Valley Water District
Lincoln/Vidler	Lincoln County Water District and Vidler Water Company
LMVW	Lower Meadow Valley Wash
LWRFS	Lower White River Flow System
Mg/L	milli-grams per liter
MRSA	Muddy River Springs Area
NSE	Nevada State Engineer
NW-SE	northwest—southeast
pmc	percent modern carbon
RDCA	Regional Deep Carbonate Aquifer
RAWS	Remote Automated Weather Station
SNWA	Southern Nevada Water Authority
TDSS	Total Dissolved Solids Sum
WRFS	White River Flow System
Zonge	Zonge International, Inc

1.0 EXECUTIVE SUMMARY

The Nevada State Engineer (NSE) through Rulings #5712 (NSE 2007) and #6254 (NSE 2014) has made several findings about Kane Springs Valley (KSV), the impacts from KSV and the effects of pumping from KSV on springs in the Lower White River Flow System (LWRFS) and further south of the LWRFS. The NSE has historically supported and affirmed the exclusion of KSV from the LWRFS since the Order No. 1169 requirements, including the Order No. 1169 aquifer test (NSE 2002) and since the hearing on by Lincoln County Water District and Vidler Water Company (Lincoln/Vidler) groundwater rights in 2006 (NSE 2007).

In this report, groundwater elevation data from wells in KSV and in the LWRFS groundwater basins[1], precipitation and recharge data, and groundwater chemistry and temperature data are used to illustrate the hydrologic differences between KSV and the basins of the LWRFS. Using the groundwater level data, which can be found on the NSE's website: *http://www.nv.gov/WaterLevelData.aspx*, Lincoln/Vidler identified a distinct "break" in water levels in the regional hydraulic gradient, including several distinct breaks in water levels from wells throughout the LWRFS. These "breaks" in gradient can mostly be attributed to geologic structures in the Regional Deep Carbonate Aquifer (RDCA). As a general statement, wells within the LWRFS exhibit very consistent groundwater levels that are indicative of high transmissivity values across this area. However, in KSV the gradient between well KPW-1 and down-basin wells is much steeper, which again implies some type of impediment to groundwater flow near the mouth of KSV.

There was an exceptional precipitation event that occurred in 2005 that overwhelmed the hydrologic system in KSV as identified in monitor wells KMW-1 and CSVM-4 groundwater levels. This event obscured the overall regional trend in groundwater levels in this region making identification of a response to the Order No. 1169 aquifer test not relevant neither appropriate. The

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[1] The "joint administrative unit" includes the following hydrographic basins: Coyote Spring Valley (210), a portion of the Black Mountains Area (215), Garnet Valley (216), Hidden Valley (217), California Wash (218), and the Muddy River Springs Area (AKA Upper Moapa Valley) basin (219).

finding that water levels in KSV did not response to the Order No. 1169 aquifer test is supported by the lack of response or correlation of groundwater levels in well KMW-1 to groundwater pumping from Coyote Spring Valley (CSV).

Lincoln/Vidler have been collecting groundwater recharge data for over a decade in order to better understand and quantify the actual recharge that is occurring in the KSV hydrographic basin. These data have been submitted to the NSE and interested parties in the form of quarterly reports. A preliminary analysis of these data indicates in-basin groundwater recharge values that range from 4,700 acre-feet per year (ac-ft/yr) to 11,000 ac-ft/yr (T. Umstot, Daniel B. Stephens & Associates (DBS&A), unpublished data and analysis, 2019).

A comprehensive analysis of the regional geochemistry data including stable isotopes, temperature, and carbon-14 data was presented during the Lincoln/Vidler groundwater rights hearing in 2006. That analysis found that the groundwater pumped from KSV could not be identified in the source water for the Big Muddy Springs, nor other springs farther south and outside the geographic boundaries of the LWRFS. This means that groundwater pumped from production well KPW-1 is on a different groundwater flow path from the springs, which is again consistent with the differences in hydraulic gradients, groundwater levels, and the existing and recently collected geophysical data that documents the structural changes between KSV/northern CSV and the rest of the LWRFS groundwater basins.

The combined existing and new geophysical data collected in and around KSV allows the recognition of significant geologic structures in southern KSV and northern CSV that explain why groundwater level elevations in this area are different in KSV and northern CSV, than in the LWRFS groundwater basins to the south. The geophysical data identified significant changes in resistivities between the Delamar Mountains, southern KSV, and northern CSV. These changes are consistent and correlate well with the distribution of existing geochemistry and groundwater temperature data that can be used to identify different groundwater flow paths. The extensive faulting that occurs in southern KSV and northern CSV, explained by the interpretation of the geophysical data forms the basis for the exclusion of KSV from the LWRFS administrative basin.

As will be shown later in this report, virtually all of the reduction in flows of the Muddy River and its associated springs over the past several years can be explained by the amount of groundwater pumping within the documented declines in the Muddy River Springs Area (MRSA). This provides a road map for the NSE in administering rights in this area with the intent of mitigating impacts to these springs. Focus should first be placed on both the carbonate and alluvial pumping in the MRSA. Secondly, since there is approximately 8,000 acre-feet of groundwater inflow from Lower Meadow Valley Wash (LMVW) to the MRSA, more research should be done to identify and quantify this inflow into the MRSA as it lies adjacent to and directly down-gradient of LMVW.

Lincoln/Vidler are not a party to, nor have ever been a participant of the Order No. 1169 aquifer test proceedings. The NSE never requested that Lincoln/Vidler provide a report on the outcome of the Order No. 1169 aquifer test results; hence none was ever developed.

In conclusion, KSV should remain excluded from the LWRFS administrative unit. Any revisions to the current LWRFS administrative unit boundary should also exclude northern CSV.

2.0 INTRODUCTION

The purpose of this report is to provide additional data and documentation that demonstrates KSV is hydrologically and geologically-structurally separate from the area defined by the NSE as the "joint administrative unit" known as the LWRFS, see Figure 2-1. This report is submitted by Lincoln/Vidler as owner of water rights, in addition to pending applications Nos. 74147, 74148, 74149, and 74150 in KSV.

Consideration of water rights in KSV fits squarely in the administrative boundaries of Nevada Water Law for the appropriation of groundwater from a hydrographic basin. This is based on a basin-by-basin analysis of perennial yield and is very dis-similar from what the NSE proposes for the LWRFS, which is as a managed unit. The basis of this report is new data collected to support the NSE in their determination of the proposed boundary of the LWRFS. Review of the relevant administrative policy that affects groundwater appropriations in Nevada and specific to KSV is provided below (Section 2.1). This is followed by a review of the matters requested to be addressed by the NSE in Interim Order (IO) #1303 (NSE 2019; Section 2.2). The remainder of the report provides hydrologic, geochemical, and geophysical data that supports the conclusion that KSV is not and should not be, included as part of the LWRFS administrative unit.

2.1 RELEVANT ADMINISTRATIVE POLICY

The NSE defines the perennial yield of a groundwater reservoir or basin as the maximum amount of groundwater that can be salvaged each year over the long term without depleting the groundwater reservoir. Perennial yield is ultimately limited to the maximum amount of natural discharge that can be salvaged for beneficial use. The perennial yield cannot be more than the *natural recharge* to a groundwater basin and in some cases is less.

The NSE's application of the groundwater appropriation system is based on a basin-by-basin analysis. This would change if KSV were to be included in the LWRFS and result in setting the precedent to include many other groundwater basins as part of the LWRFS. For instance, Cave, Dry Lake, and Delamar Valley basins have groundwater flow components that connect them together, and to CSV, and to KSV. Tacking on Cave, Dry Lake, Delamar, and KSV to the LWRFS administrative unit due solely to shared groundwater flows between them would override the historic basin-by-basin perennial yield analysis used by the NSE to administratively manage basins required by law, and instead in essence would create what would look strikingly like a "pachinko game" wherein if you had priority groundwater rights in the last basin downgradient you would get to withdraw the collective flow. This means that no water would be available from upgradient groundwater basins and the counties where these basins occur would not have the ability to utilize water for economic development in their county.

2.1.1 Previous Determinations by the Nevada State Engineer Regarding Kane Springs Valley

The NSE has already ruled on the issue of whether the appropriation of groundwater from KSV would affect the MRSA, or for that matter other springs of interest. This was documented in Nevada State Engineer Ruling #5712 (2007), on page 20 where it is stated:

> "The State Engineer finds there is not substantial evidence that the appropriation of the limited quantity [of water] being granted under this ruling will likely impair the flow at Muddy River Springs, Rogers Springs or Blue Point Springs."[2]

New geophysical data provided in this report and collected in response to IO #1303 (NSE 2019), provides strong evidence of faulting and fracturing of the regional carbonate system in southern KSV and northern CSV. Specifically, these data explain why there are differences in water levels in wells located in southern KSV and northern CSV versus the rest of the proposed LWRFS. These geophysical and water level data show why groundwater withdrawn based on the perennial yield of KSV would not likely impair flow at Muddy River Springs, not to mention Rogers or Blue Point Springs. Therefore, these data support the exclusion of KSV, and for that matter, exclusion of northern CSV (north of the major fault structures) from the LWRFS.

The NSE's determination that there would be no impairment from pumping in KSV was affirmed seven years later in Ruling #6254 issued in 2014. In Ruling #6254 (NSE 2014), the NSE

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[2] No party appealed the NSE's determinations in Ruling #5712.

concluded and found that where no significant impact would be felt for hundreds of years, the upgradient groundwater could be appropriated. KSV groundwater can be developed because there will be no significant impact, if any, from appropriation of the groundwater for hundreds of years. Specifically, NSE (2014) Ruling #6254 at page 23 states:

> "...the State Engineer found that where no significant effects would be felt for hundreds of years, the upgradient water could be appropriated."

The NSE speaks explicitly to the difference between KSV and the Order 1169 groundwater basins (see footnote 1) further in Ruling #5712 (NSE 2007) by stating at page 21:

> "...carbonate water levels near the boundary between Kane Springs Valley and Coyote Spring Valley are approximately 1,875 feet in elevation, and in southern Coyote Spring Valley and throughout most of the other basins covered under Order No. 1169, carbonate-rock aquifer water levels are mostly between 1,800 feet and 1,825 feet. This marked difference in head supports the probability of a low-permeability structure or change in lithology between Kane Springs Valley and the southern part of Coyote Spring Valley."

The veracity and reliability of this statement by the NSE is confirmed by the extensive, new geophysical data Lincoln/Vidler has collected. As will be shown from these new data, there is a significant change in the continuity of lithology that occurs near the mouth of KSV and the end of the Delamar Mountains in northern CSV.

The NSE in Ruling #5712 (2007) further concluded on page 21:

> "The State Engineer finds there is not substantial evidence that the appropriation of a limited quantity of water in Kane Springs Valley Hydrographic Basin will have any measurable impact on Muddy River Springs that warrants the inclusion of Kane Springs Valley in Order No. 1169."

That finding was not challenged by any of the Order No. 1169 (NSE 2002) participants, including Southern Nevada Water Authority (SNWA) or Las Vegas Valley Water District (LVVWD).

Subsequently, neither SNWA or LVVWD provided any information or data in their October 5, 2018 (SNWA and LVVWD 2018) letter that indicate that appropriation of water in KSV will impact any of the springs in the MRSA.

2.2 REQUIREMENTS BY THE NEVADA STATE ENGINEER FOR THE INTERIM REPORT

In IO #1303 (NSE 2019), the NSE requested that the reports submitted address the following matters.

> "a. The geographic boundary of the hydrologically connected groundwater and surface water systems comprising the Lower White River Flow System;
>
> b. The information obtained from the Order 1169 aquifer test and subsequent to the aquifer test and Muddy River headwater spring flow as it relates to aquifer recovery since the completion of the aquifer test;
>
> c. The long-term annual quantity of groundwater that may be pumped from the Lower White River Flow System, including the relationships between the location of pumping on discharge to the Muddy River Springs, and the capture of Muddy River flow;
>
> d. The effects of movement of water rights between alluvial wells and carbonate wells on deliveries of senior decreed rights to the Muddy River; and,
>
> e. Any other matter believed to be relevant to the State Engineer's analysis."

The direct response to each of these items is specifically addressed in Section 6.0 under Key Findings and Conclusions. Lincoln/Vidler's response is focused on the northern boundary of the administrative unit. However, Lincoln/Vidler do provide information, data, and/or opinion on other issues that would be beneficial and helpful to the NSE in his decision-making process related to IO #1303 (NSE 2019). Indeed, clear evidence of the primary factors that have historically reduced Muddy River flows and headwater springs flows is presented and offers a road map for the NSE's technical deliberations supporting a LWRFS administrative unit.

3.0 REVIEW OF EXISTING DATA

This report includes a discussion and submission of existing data that includes: (a) groundwater elevation data from existing wells, including wells from KSV and CSV, (b) data collection activities that include analysis of water recharged in the KSV groundwater basin, (c) geochemistry, including whole water chemistry and stable isotopic age dating data, and (d) groundwater temperature data.

3.1 GROUNDWATER LEVEL DATA FROM WELLS IN KANE SPRINGS VALLEY AND NORTHERN COYOTE SPRING VALLEY

Groundwater elevation data have been collected throughout the LWRFS for over two decades. Figure 3-1 shows the location of the wells throughout the area of interest including KSV, CSV, and the MRSA. Hydrographs of these wells are provided in Appendix A, and the supporting data can be found at: *http://water.nv.gov/WaterLevelData.aspx*.

Lincoln/Vidler have been measuring water levels in monitor well KMW-1 quarterly since April 2007 (Figure 3-2). This well, located at the mouth of KSV and near northern CSV, encountered the Willow Springs Fault, which is a western bounding fault of the KSW Fault Zone (Figure 3-3). KMW-1 and associated production well KPW-1 are both completed in carbonate rocks that are considered part of the RDCA system of eastern Nevada. Wells KMW-1 and KPW-1 were constructed within 100 yards of each other and have the same well completion.

3.1.1 Regional Water Level Data in the Lower White River Flow System

During the administrative hearing for groundwater rights in KSV in 2006, Lincoln/Vidler identified the differences in hydraulic heads between wells drilled in the LWRFS versus wells drilled in KSV and northern CSV. A "break," or local increase, in the regional hydraulic gradient was shown between KSV/northern CSV and the LWRFS administrative unit (see footnote 1) groundwater basins. Groundwater elevation data from wells completed in the RDCA in southern CSV are remarkably flat across the LWRFS groundwater basins, whereas water levels in KSV/northern CSV have a steeper gradient, as shown in Figure 3-4. In summary, a key finding is that groundwater levels in RDCA wells are very similar in elevation (pre-pumping or minimal pumping of Order 1169 [NSE 2002] groundwater basins) everywhere downgradient of the KSW Fault Zone (CH2M Hill 2006a). Figure 3-5 is an update to a subset of the data provided in Figure 3-4 using the most current water level measurements.

To further illustrate the differences in groundwater elevations, an excerpt from Figure 3-5, identified in the red box, is presented as Figure 3-6, illustrates the differences in heads between the northern CSV (monitor wells CSVM-4 and CE-VF-2) and the rest of the wells, further south in the LWRFS (CSVM-6, MX-5, CSVM-1, UMVM-1, CSVM-5, and MX-6). Since northern CSV is downgradient of KSV, the difference in water levels indicates that KSV is not directly connected to the LWRFS. Just as in the 2006 testimony before the NSE and after several thousands of acre-feet pumped from wells in the LWRFS, the same groundwater elevation pattern persists.

Another way to view the data is to plot all the groundwater elevations at the same scale for elevation and over time (Figure 3-7). The graph in Figure 3-7 shows the distribution of heads across the northern and central part of the LWRFS, and also KSV. What is striking about this presentation of the data is the consistency in water level elevations for the wells in groundwater basins in the central LWRFS at below elevation 1,825 feet. What's also notable is that when plotted at this scale groundwater pumping from groundwater basins in the LWRFS has very little impact on water levels across these groundwater basins illustrating how exceptionally stable water levels in this aquifer system are.

Bushner (2018) noted another significant difference in the response in groundwater levels from wells in southern CSV compared to the response of water levels in wells in northern CSV and KSV by stating:

> "...monitor wells in the southern portion of CSV responded immediately to the start and end of the [Order No. 1169] aquifer test. However, this is not what occurred in CSVM-4 ... which reflects a downward trend even after the end of the test. This is not reflective of recovery after an aquifer test especially given the significantly high hydraulic conductivities that exist south of the Kane Springs Wash Fault."

Given all these data and information, the NSE does have reason to view many of the basins in the LWRFS as a unit based on the remarkably consistent groundwater levels among wells completed in the RDCA (Figure 3-7). The NSE clearly noted this in Ruling #6254 (NSE 2014) at Page 12:

> "Changes in the potentiometric surface in any one of these basins [referring to the Order No. 1169 (NSE 2002) groundwater basins] occur in lockstep directly affecting the other basins, further demonstrating the regional nature of the aquifer across these basins."

Although Lincoln/Vidler concur with the effective administration of these basins collectively based on the hydrogeology, we disagree that the effects are all the same across the entire LWRFS administrative unit. In particular, northern CSV should be excluded from the LWRFS administrative unit as was done for most of the Black Mountains Area Hydrographic Basin. KSV should remain excluded from the proposed LWRFS administrative unit.

3.1.2 KMW-1 and CSVM-4 Groundwater Level Data

Detailed hydrographs of groundwater elevation data from monitor well KMW-1, located at the mouth of KSV, and CVSM-4, located in the north central portion of CSV (Figure 3-1) are provided in Figures 3-2 and 3-8, respectfully.

Groundwater elevations in monitor well KMW-1 declined approximately 2 feet from the time it was installed in early 2007 to early 2014 and then fluctuated over a range of approximately 1 foot. The actual groundwater elevations were at approximately 1,880 feet above mean sea level (amsl) in April 2007 (Figure 3-2) and approximately 1,878.4 feet amsl in April 2019.

The hydrograph from Well CSVM-4 is provided in Figure 3-8. Groundwater level elevations during the same time period, described in the previous paragraph concerning well KMW-1, in June 2007 was approximately 1,874.5 feet amsl, or approximately 5½ feet lower than at KMW-1. This difference of 5 ½ feet is larger than the gradient across much of the LWRFS and indicates a distinctly different situation in the RDCA. The period of record for well CSVM-4 started more than 3 years earlier than that of KMW-1 (July 2003) and measurement continues to the present.

The hydrographs for both KMW-1 and CSVM-4 are plotted with the same time and water-level elevation scale for their combined period of record in Figure 3-9. The difference in head between these wells is explained due to the presence of a fault that occurs between them based on the newly collected geophysical data (Section 4.0). What is also striking regarding the hydrographs from both these wells is the consistency in their trends, suggesting that they are related and again how KSV and northern CSV are isolated from the rest of the LWRFS. Without the groundwater elevation data from well CSVM-4, prior to the installation of well KMW-1, what would have been missed is the huge recharge precipitation event that occurred in 2005 that created a strong response of water levels in the hydrologic system in this area. This event took years to dissipate in the aquifer as manifested by the change in groundwater elevations. The precipitation event and data that supports it are discussed below in Section 3.2. If this recharge event is removed from the data set, then a long-term decline in groundwater levels over time is revealed as approximately 1-foot per decade (0.1 foot per year; Figure 3-9).

3.2 IN-BASIN RECHARGE AND PRECIPITATION

The basis for a groundwater appropriation under the Law of the State of Nevada within a hydrographic basin is to document the availability of water in that basin that can be withdrawn over the long term without (1) affecting existing water rights, and (2) causing excessive groundwater mining in the hydrographic basin. Lincoln/Vidler have been actively collecting and using recharge data to estimate recharge throughout KSV. These data provide a solid technical basis for determining the perennial yield within KSV, which in turn identifies the volume of water that can be withdrawn from this hydrographic basin. These data quantify additional precipitation and recharge in KSV and the available water that can be appropriated.

3.2.1 In-Basin Recharge Data Collection

In order to develop a solid technical foundation for determining the perennial yield value for KSV, Lincoln/Vidler, beginning over a decade ago in October 2007, have been collecting basin-specific data through the use of totalizing rain gages, tipping bucket rain gages, runoff event data loggers, and chloride collectors. We continue to collect and submit these data, to the NSE and interested parties, in an effort to better understand and quantify recharge occurring in KSV and to share that technical foundation transparently with others. Based on analysis of the ongoing basin-specific data collection effort, there is unappropriated water available in KSV. This is due to the fact that recharge values clearly show that there is more water available under Nevada State Law than has been appropriated. Much like Cave Valley, Dry Lake Valley, and Delamar Valley, groundwater appropriated in KSV is also recharged within the basin (NSE 2014). A copy of the second quarter 2019 quarterly recharge report that presents the runoff, precipitation, and chloride data collected to date, is provided in Appendix B. Based on a preliminary analysis of these data, estimates of in-basin recharge are approximately between 4,700 to 7,500 ac-ft/yr from the chloride mass balance analysis method and approximately 7,100 to 11,000 ac-ft/yr from the watershed model (T. Umstot (DBS&A), unpublished data and analysis, 2019).

Independently of the data Lincoln/Vidler have been collecting to support the recharge value in KSV, SNWA conducted an analysis of recharge for hydrographic basins in the White River Flow System (WRFS). SNWA derived an annual recharge value of 4,329 acre-feet for KSV (SNWA 2009, pages 9-13 and 9-14). This too, indicates that there is water available under Nevada State Law for appropriation within KSV.

In summary, groundwater recharge is documented to occur in KSV and does not contribute to the proposed local recharge of the LWRFS administrative unit, i.e., the recharge occurs within KSV and not in the LWRFS basins. This recharged water is available for appropriation in KSV, according to Nevada State Law, as the perennial yield based on a solid recharge data collection and analysis research program in KSV. Our research demonstrates that significant in-basin groundwater recharge occurs within the KSV, primarily in Delamar Mountains (Appendix B). However, local recharge in the Upper WRFS, which includes Cave, Dry Lake, and Delamar Valleys is not counted in the discharge of groundwater to the LWRFS, neither should local groundwater recharge that occurs within KSV be included in the LWRFS administrative unit.

3.2.2 Precipitation During Winter Water Year 2005

An extreme precipitation event occurred during water year 2005 (Figure 3-10 and Table 3-1) that resulted in clear groundwater responses across the hydrologic system in southeastern Nevada. Table 3-1 shows precipitation data from the Remote Automated Weather Station (RAWS) in KSV as well as five other stations in the surrounding area. Precipitation for that water year in KSV was approximately 26 inches. To put that in perspective, the average yearly precipitation for the RAWS in KSV is approximately 7½ inches per year (Figure 3-10). This event was 3.5 times larger than the average precipitation of other years in the area. The Elgin COOP Station, located at the north end of KSV, also had an extreme amount of precipitation during water year 2005 and in the amount of 30.69 inches (Table 3-1).

Table 3-1. Precipitation Date in Kane Springs Valley and Surrounding Areas for the 2005 Water Year

	Kane Springs RAWS	Alamo CEMP	Pahranagat Widlife Refuge	Hiko COOP	Elgin COOP	Caliente CEMP
Oct-04	4.93	2.30	1.76	3.38	5.18	4.73
Nov-04	1.04	1.14	1.27	1.25	2.48	1.74
Dec-04	2.91	1.02	0.84	0.23	2.66	1.50
Jan-05	5.54	2.44	3.13	2.94	6.49	2.26
Feb-05	3.15	2.07	1.93	2.72	3.31	1.60
Mar-05	1.56	0.99	1.03	0.84	2.38	2.05
Apr-05	1.85	1.06	0.88	0.85	1.75	1.83
May-05	0.31	0.36	0.57	0.45	0.24	0.28
Jun-05	0.32	0.25	0.13	0.80	0.58	1.08
Jul-05	0.43	0.43	0.50	0.11	0.65	0.23
Aug-05	3.79	1.93	2.03	2.52	4.95	2.54
Sep-05	0.09	0.57	0.68	0.64	0.02	0.28
	25.92	14.56	14.75	16.73	30.69	20.12

3.3 GEOCHEMISTRY AND GROUNDWATER TEMPERATURE DATA

There are some significant differences in the general groundwater chemistry data exhibited in monitor wells from southern KSV and northern CSV compared with the general chemistry of groundwater and surface water of the LWRFS. An extensive geochemistry investigation and analysis was made of KSV and surrounding groundwater basins from Pahranagat and Delamar Valleys through and including the LWRFS by Lincoln/Vidler during the 2006 hearing on their pending groundwater rights applications. The data and analysis still hold true as presented in CH2M Hill's 2006 report: *Hydrologic Assessment of Kane Springs Hydrographic Area (2006): Geochemical Framework,* which is provided in its entirety in Appendix C. The salient point of this report, based on the regional geochemistry, including stable isotopes, temperature, and carbon-14 data is that:

> "A comparison of these chemical and isotopic relationships with Big Muddy Springs and particularly Rogers Spring and Blue Point Spring indicates that the groundwater from KPW-1, assumed representative of the KSV groundwater, is too strongly attenuated with CSV to be identifiable in these springs." (Appendix C: CH2M Hill 2006b, Pages 12 and 13).

To further support this statement, Lincoln /Vidler provides the following a discussion of general chemistry data, groundwater and spring temperature data, and carbon-14 data.

3.3.1 General Chemistry Data

These data are used to illustrate the groundwater chemistry at samples analyzed from production well KPW-1 and monitor well CSVM-4, the closest monitor well to and down gradient of the KSV groundwater basin, and other wells and springs in the LWRFS and surrounding areas. An extensive database of water quality data is included in CH2M Hill (2006b) reproduced from Thomas, Calhoun, and Apambire (2001) and supplemented by other sources as noted in Appendix C. A discussion of Total Dissolved Solids Sums (TDSS) is presented first followed by a discussion of Carbon-14 data, and groundwater temperature data.

3.3.1.1 Total Dissolved Solids Sums

The TDSS is the summation of the concentrations of silica, calcium, magnesium, sodium, potassium, bicarbonate, sulfate, and chloride (CH2M Hill 2006b). The analysis from well KPW-1 is provided in Table 3-2. The TDSS from the groundwater produced from well KPW-1 is calculated to be 774 milli-grams per Liter (mg/L) and the TDSS for well CSVM-4 is calculated to be 682 mg/L (Table 3-2). Groundwater from well KPW-1 is either on a different groundwater flow path exiting the KSV hydrographic basin. or it comingles with groundwater in northern CSV that has a fresher source of water. This fresher source of water would need to be such that mixing with Kane Springs groundwater would be enough to reduce the Total Dissolved Solids by approximately 100 mg/L. One such source of groundwater mixing is from monitor well CSVM-7, installed in volcanic rocks to the northeast of CSVM-4 (Figure 3-1). In fact, the water chemistry, stable isotope data, and temperature at CSVM-4 can be simulated quite precisely by assuming approximately 74% KPW-1 groundwater and approximately 26% groundwater similar to that measured at CSVM-7. These data provide evidence that groundwater in southern KSV and northern CSV may commingle or have similar recharge sources. Furthermore, CH2H Hill (2006b) found that groundwater in KSV is chemically and isotopically "unique for the regional carbonate groundwater in this area," and greatly attenuated in CSV, and not likely present at Big Muddy Springs, nor Rogers Spring, and Blue Point Spring. The recently collected geophysical data provides the structural basis for why groundwater movement through southern KSV and northern CSV to the LWRFS is restricted and why it is unlikely related to spring flow at Big Muddy Springs, Rogers Spring, and Blue Point Spring.

Table 3-2. Total Dissolved Solids Sum for Selected Wells and Springs

	Parameter						
Water Source	Na + K	Ca	Mg	Cl	HCO3	SO4	TDSS
Big Muddy Spring	108	64	27	61	276	177	713
Pederson's Warm Spring	111	71	26	60	270	190	728
KPW-1	168	48	14	63	341	140	774
MX-5	96.3	48.7	21	35.7	294	93.1	588.8
CSVM-4	145	40	13	53	311	120	682

3.3.1.2 Carbon-14 Data

Carbon 14 data can be used to obtain the age of groundwater or in this case the apparent age of the groundwater. CH2MHill (2006b) provided a comprehensive analysis of carbon-14 data in their report which is reproduced here in its entirety below. In addition to the quote below, CH2M Hill (2006b) also provided a table of percent modern carbon analyzed from various wells and springs in and surrounding KSV. This table is reproduced for this report as Table 3-3 (which is labelled as Table 3 in the CH2M Hill (2006b) report). The following quote is from the CH2M Hill (2006b) report.

> "Table 3 lists a summary of carbon-14 data and the simple apparent age for hydrographic areas, KSV well KPW-1 as well as Big Muddy, Rogers and Blue Point Springs. Most of the apparent ages are in the 14,000 to 35,000 years before present range. The KSV well, KPW-1, has one of the oldest apparent ages at 29,900 years. Assuming that the apparent ages are somewhat true, and in this case may be, it is not probable that KSV groundwater represented by KPW-1 with this age could represent a significant contribution to the flow at Big Muddy Springs."

Table 3-3. Carbon - 14 percent modern carbon (pmc) values and apparent ages for hydrographic areas KSV well KPW-1, major springs in Pahranagat Valley as well as Big Muddy, Rogers, and Blue Point Springs

Hydrographic Area/Well/Spring	Carbon -14 (pmc)	Apparent Age (Years Before Present)
Pahranagat Valley, Major Springs	6.3-8.4	20,300-21,700
KPW-1	2.7	29,900
Coyote Springs Wells	4.2-17.9	14,200-26,200
Garnet Valley Wells	3	29,000
MRSA	8.4	20,500
Big Muddy Springs	7	22,000
Rogers Spring	1.6,2.4	30,900-34,200
Blue Point Spring	7.2,5.4	21,800-24,100

Note that the older age of KPW-1 can also be an indicator of deeper circulation of water compared to other sources in the area, which is supported by its higher water temperature as discussed below.

3.3.1.3 Temperature Data

Representative temperature data for groundwater and springs in the LWRFS and in KSV are provided in Figure 3-11. The data used to create Figure 3-11 are provided in Table 3-4. The local geothermal gradient can be used to estimate that expected temperature distribution due to a relatively uniform heating and allows identification of unusual values of groundwater temperature that indicate distinctive local groundwater flow processes. A typical geothermal gradient in this area is about 3.6 degrees Fahrenheit (°F) per 328 feet of depth beginning at approximately 96 feet (Nicholson 2007). Using the data from Table 3-4, the groundwater temperature data from wells completed in the RDCA center around two values of approximately 78°F and 99°F. The warm springs that occur in the MRSA are consistently centered around 89°F to 90°F, which is in the middle of this expected range. The production well drilled and tested in KSV (KPW-1) yielded a groundwater temperature of 136°F at the end of the seven-day aquifer test (URS 2006a), which is well above this expected range and suggests deep circulation of groundwater arriving at this location and/or a geothermal source. Using the typical geothermal gradient as noted above and applying it to the production well in KSV (Figure 3-3), the change in groundwater temperature based solely on the geothermal gradient would be approximately 19°F. Applying this value to either set of carbonate wells yields groundwater temperatures of 97°F to 118°F. None of these values are close to the 136°F of the groundwater found at KPW-1, which indicates local groundwater flow, distinct from any other groundwater data point in the LWRFS.

The differences in groundwater temperatures suggest distinctive groundwater flow paths through the RDCA in this area. Most importantly the difference in the temperature data from well KPW-1 versus that of the rest of the wells in the RDCA indicates a very different source for the groundwater flowing through KSV as compared to the rest of LWRFS. Figure 3-12 is the graphical representation of the data from Table 3-4 and from the map shown in Figure 3-11. It's evident from Figure 3-12 that there are several wells that can be connected based on temperature, as well as, wells that do not connect with any other data. The same colors on Figure 3-12 represent the same flow paths on Figure 3-11, and are typically north to south. These groundwater temperatures are consistent with the geophysics and the mapped geologic structures in the LWRFS. In summary, the groundwater temperature data from KPW-1 doesn't fit the groundwater temperature data from the other wells, with the exception of some mixing with well CSVM-4, and therefore indicate a flow path distinctive from that of wells in the LWRFS.

Table 3-4. Temperature Data from Selected Carbonate Sourced Groundwater Wells and Springs

Well/Spring Description	Temperature Range	Source
CSVM-2	99.87° - 99.82°	1
CSVM-3	78.02° - 77.04°	1
CSVM-4	106.56° - 107.89°	1
CSVM-5	75.69° - 76.11°	1
KPW-1	129.91° - 135.77°	2
Big Muddy Spring	89.78°	3
Pederson Warm Springs	89.96°	3
CSI-1	89°	3

References - Source of Data:

1. URS – 2006b CSV Monitor Well Sampling Report
2. URS – 2006a KSV Final Well Completion Report
3. CH2MHILL – 2006b Geochemistry Report

4.0 GEOPHYSICAL DATA

Lincoln/Vidler have collected extensive lines of geophysical data in both KSV and CSV. The Controlled Source Audio Frequency Magneto Telluric (CSAMT) method has been used for this work, an explanation of which is provided below. Lincoln/Vidler has applied CSAMT for characterization of the RDCA to thousands of feet below land surface over several decades and in several hydrographic basins with great success. For this discussion, existing geophysical data is considered to be that collected in KSV in 2012 by Zonge International, Inc. (Zonge). These existing data are discussed in the following section. New geophysical data were collected in February and March of 2019 for this report to the NSE to augment the existing geophysical data from KSV. The new geophysical data were collected in northern CSV and both sets of data are considered together for the purposes of this report.

A CSAMT geophysical survey is a high-resolution electromagnetic sounding technique that uses a fixed grounded dipole as a signal source (a dipole is a pair of equal and oppositely charged or magnetized poles separated by a distance). A complete, published, and peer-reviewed discussion of the CSAMT method can be found in Zonge and Hughes (1991) and Zonge (1992).

As applied here, the CSAMT geophysical survey method used a CSAMT transmitter signal source that usually consists of a grounded electric dipole 3,500 and 6,500 feet in length located three to six miles from the area where the measurements are to be made (Figure 4-1). At the receiver site, grounded dipoles detect the electric field and a magnetic field coil antenna detects the magnetic field (Figure 4-2). The electrical resistivity of the geologic formations can be determined from the combination of these electric and magnetic field measurements. Varying the frequencies of the observations controls the depth of investigation using the CSAMT method. Depth sections can be generated using the CSAMT method by measuring the electric and magnetic fields over a range of frequencies and using computer modeling to produce a cross-section of resistivity at different depths.

CSAMT data are usually shown as resistivity values in ohm-meters. Resistivity is essentially a measure of the ground's ability to conduct electrical current. Though the resistivity contour lines often at first glance appear to be indications of contacts between lithologic layers they are lines of equal resistivity and not necessarily boundaries between different lithologies. While different rock types do indeed often exhibit different resistivities, most rock types exhibit a range of resistivities, and the resistivity ranges for different rock types may overlap. The ranges in resistivity result from the fact that there are several factors that affect resistivity, including the amount of pore fluids, the type of pore fluids, mineralization, clay content, and the size and interconnectedness of the pore spaces, as examples. As a result of all these variables, in some cases two different lithologies may exhibit similar resistivity, and in other cases, a single lithologic unit may exhibit different resistivities in different areas.

This survey technique is a well-established method, commonly used primarily by the minerals, geothermal, and groundwater exploration industries, and has been in use since the early 1980's when CSAMT equipment was first commercialized. It is not a proprietary method so it can be, and has been, replicated or repeated by independent exploration geophysicists. Zonge is one of several manufacturers of CSAMT equipment whose systems have been purchased by and are in use by numerous government agencies including the US Geological Survey, universities, national laboratories, and private entities.

4.1 DISCUSSION ABOUT USE OF THE CSAMT GEOPHYSICAL METHOD

It is not unusual for faults or other geologic structures to not be apparent to non-geophysicists reviewing a CSAMT resistivity cross section. The following is provided to help explain how various structures are identified in these CSAMT cross sections. In resistivity plots, faults can be manifested in several different ways, since the data are showing an electrical property of the subsurface that may or may not be indicative of changes in lithology. Figure 4-3 provides two examples of the CSAMT geophysics plots that can be used to identify different fault structures. The fault on the left in Figure 4-3 looks like a vertical, narrow, low resistivity feature centered at station 350 (where the client drilled and accessed water). On the right-hand side of Figure 4-3 is a more traditional looking plot of faulting, with the left side of the section offset higher relative to the right part of the section, with the fault between stations -300 and -150. Both of these examples show how geologic structures can be identified in transects conducted through southern KSV and northern CSV using the CSAMT geophysical method.

4.2 GEOPHYSICAL DATA COLLECTED IN KANE SPRINGS VALLEY

An extensive geophysical survey using the CSAMT method was conducted by Zonge in 2012 to further refine potential well locations in KSV. Several geophysical transects were conducted perpendicular to the axis of the KSV basin (Figure 4-4). A transect was also conducted along the axis of the southern part of the basin. For the transects conducted in CSV, the same northwest-southeast (NW-SE) orientation as the KSV transects was used to assist in evaluating the geologic structures in this area.

To best understand the geologic structures in northern CSV, a review of the first geophysical transects, Lines 1 and 2, through the southern end of KSV is warranted. These transects in both southern KSV and northern CSV are plotted on an excerpt (Figure 4-4) of the most recent geologic map of this area by Rowley and others (2017).

4.2.1 CSAMT Transect Line 2 through Southern Kane Springs Valley

In order to track the geologic structures that occur in southern KSV into northern CSV, the northern-most transect used in this report is discussed below and provided as Figure 4-5. The view of the transect is looking to the northeast into the KSV basin.

Beginning on the right side (or east side) of Line 2 illustrated in Figure 4-5, the data exhibits a very highly resistive block essentially from land surface to final investigation depth. This demonstrates "ground-truthing" of the CSAMT method as this is an exposed block of RDCA. From station number (the station numbers are across the top of the transect) 15100 the high resistivity values occur adjacent to low resistivity values and are representative of faulting in this area as also interpreted at this location on the geologic base map. These values represent the eastern boundary of the Kane Springs Wash (KSW) Fault Zone (Figure 4-4).

Numerous other faults are represented on the Line 2 transect through southern KSV. This area ranges from approximately station number 8500 through station 15100. This area represents the KSW Fault Zone and is very consistent with the surficial geologic map by Rowley and others (2017).

The next significant feature shown on Figure 4-5 is the block of high resistivity that occurs between stations 7500 and 8500 with a top at an elevation of approximately 1,500 feet. This feature ties directly to the large carbonate rock outcrop mapped at the mouth of KSV (Figure 4-4, between Lines 1 and 10, labelled "Ds"). The northwest side of the transect of Line 2 (Figure 4-5) confirms the presence of the mapped Willow Springs Fault on the geologic map (Figure 4-4). This occurs between stations 500 to 700 (Figure 4-5).

4.2.2 CSAMT Line 1 through Southern Kane Springs Valley

Line 1 of the KSV CSAMT transect (closest to southwest end of KSV) is provided in Figure 4-6. This transect includes and is ground-truthed using both the down-hole geophysics and geologic log of wells KPW-1 and KMW-1. These wells were drilled adjacent to the exposed outcrops of Devonian Simonson Dolomite (Ds) illustrated in Figure 4-4. This well also intersects the Willow Springs Fault as shown on Figure 3-3. The geophysical transect confirmed the exposure of dolomite, the attitude (dip) of both geologic units, and the occurrence of the KSW Fault Zone. The ground-truthing of CSAMT across the exposed dolomite outcrop in the center of Line 1 is convincing.

Unlike Line 2 (Figure 4-5), the Line 1 (Figure 4-6) CSAMT transect does not extend to the exposed hard rock outcrops of either the Delamar Mountains or the Meadow Valley Mountains. Other important features shown on Line 1 include:

- Faulting within KSW Fault Zone at stations 8100 through the end of this transect (Figure 4-6).
- Faulting on west side of KPW-1 near boundary of outcrops at Station 2100.

4.3 GEOPHYSICAL DATA COLLECTED IN NORTHERN COYOTE SPRING VALLEY

New geophysical data were collected in February and March 2019 in northern CSV just south of the KSV basin boundary (Figure 4-4). These data were collected in direct response to the request from the NSE in IO #1303 (NSE 2019) calling for new data to be provided in order to assist him in addressing the issues identified in the Interim Order (see Section 1.2).

Two new CSAMT geophysical transects, in CSV, were conducted parallel to the previously collected Lines 1 and 2, in southern KSV. The southwestern-most transect in KSV, Line 1, includes wells KPW-1 and KMW-1. The new transects in CSV are labelled Lines 10 and 11 (Figure 4-7), with Line 10 being the most northerly transect closest to the mouth of KSV. Both of these transects are located in a NW-SE orientation, perpendicular to the known geologic structures identified on the geologic map of the area (Rowley and others 2017). A third transect, Line 12, was conducted in an east-west alignment in northern CSV and intersected both Lines 10 and 11 (Figure 4-4).

The following sections specifically discuss the new CSAMT data, and then discuss what this information means relative to the geology and associated controls on groundwater flow in southern KSV and northern CSV.

4.3.1 CSAMT Line 10 Northern Coyote Spring Valley

The northern most transect in CSV (Figure 4-7) is located just southwest of the exposed outcrop of dolomite (Ds) at the mouth of KSV (Figure 4-4). Monitor well CSVM-4 is also located to the southwest of station 13900 on Line 10.

There are several significant features that can be identified on CSAMT Line 10.

- The transect is dominated by high resistivity blocks.
- From the ground-truthing discussed previously for Lines 1 and 2, and on this line at its far southeast end, these high resistivity blocks are most likely RDCA.
- This transect also shows the down thrown nature of the boundary fault on the far southeastern end – stations 23900 to 24300. This fault occurs to the western side of the Meadow Valley Mountains and forms the eastern boundary of the Kane Springs West Fault Zone (Figures 4-4 and 4-7) which is consistent with the geologic map (Rowley and others 2017). This fault can be traced through these transects (Figures 4-4 and 4-7) from KSV into CSV (Rowley and others 2017).
- Well CSVM-4 was drilled near the highly resistive block of exposed dolomite in KSV. This block of dolomite is not exposed at the surface in CSV but can be traced from KSV through to the geophysical transect of Line 10 in northern CSV.

- The concealed Delamar Thrust Fault drawn on Rowley and others (2017) cannot be identified—or is not present—on CSAMT transect of Line 10. If present, it would be located at approximate station 4100.
- Faulting does occur from stations 8300 to 10500. This would agree with the concealed strike slip fault identified on Rowley and others (2017) along the northwest edge of the outcrop Ds at the mouth of KSV (Figure 4-4).
- The highly resistive block that outcrops as Ds at the mouth of KSV continues to occur beneath the surface as shown in Line 10. This occurs from stations 13500 to 16300.
- There are numerous faults that occur from station 16300 though station 24300, which is representative of the KSW Fault Zone.

4.3.2 CSAMT Line 11 in Northern Coyote Spring Valley

CSAMT Line 11 is located approximately 12,500 feet to the southwest of Line 10 (Figure 4-4). Monitor well CSVM-4 is located approximately 11,700 feet to the northeast of station 31100 of Line 11.

There are several significant features that can be identified on CSAMT Line 11.

- The most striking difference of Line 11 from Line 10 is the virtual lack of the highly resistive blocks that dominated the transect of Line 10. This constitutes over 2,800 feet or a half mile of thickness of highly resistive block not present just 12,500 feet or approximately two miles south of Line 10.
- This transect also shows the down-thrown nature of the southeastern boundary fault. This fault occurs to the western side of the Meadow Valley Mountains and forms the eastern boundary of the Kane Springs West Fault Zone (Figures 4-4 and 4-7, stations 45300 - 45700).
- Again, the southeastern boundary fault (or northwest exposed side of the Meadow Valley Mountains [Figures 4-4 and 4-7]) is identified by the geophysics and can be traced through this transect from KSV into CSV (Rowley and others 2017).

- Similar to Line 10, there are numerous faults throughout this transect and especially so on the southern half of this transect.
- There is no evidence of the Delamar Thrust Fault (that would be at station 21500) as extrapolated from the Delamar Mountains on the geologic map (Rowley and others 2017) from the geophysical transect of Line 11.
- The concealed strike-slip fault that forms the western boundary of the KSW Fault Zone, i.e.. the strike slip fault identified on Rowley and other (2017) along the northeast edge of the outcrop Ds at the mouth of KSV may be located at approximately station 26700 on Line 11 (Figure 4-7).
- The low resistivity zones may be the result of thicker volcanics versus higher resistivity carbonates, or it may just be different materials in the alluvial cover (i.e., more or less clays in some alluvial sediment layers than others, obviously much more in an overall sense than in the RDCA). Also, along some parts of the line, there are multiple low resistivity layers (stations 30000 to 38000, for example).
- Comparison of Line 10 to Line 11 suggests that the structural boundary between southern KSV/northern CSV and the rest of CSV to the south occurs between these two lines.

4.3.3 CSAMT Lines 12 East – West Line through Northern Coyote Spring Valley

CSAMT Line 12 (Figure 4-8) is an east-west transect that intersects both CSAMT Lines 10 and 11 at stations 42700 and 23800, respectively, at a 45-degree angle. There are several significant features that can be identified on this transect.

- The Gass Peak Thrust Fault (a very large, regional structural feature) appears to be present at station 1300 (Figure 4-8; Rowley and others 2017).
- Low resistivity values occur at the land surface on the western side of this transect. This is significant because it correlates with an area of surface vegetation which is an indication of a source of water supported by the low resistive materials.
- There is no real evidence of the regional normal fault mapped on the geologic map around station 13000 (Rowley and others 2017).
- Remnants of KSW Fault Zone, i.e., the strike slip fault identified on Rowley and others (2017) along the northwest edge of the outcrop Ds at the mouth of KSV, occur from

approximately station 30300 through 44100. Specifically, there is an obvious change between the layering of resistivities east and west of approximately station 30000.

- Well logs from monitor wells CSV3009 and CSV3011 confirm the presence of unconsolidated or alluvial materials, i.e., silts, clays, sands, and gravels to at least a depth of approximately 1,580 feet below land surface (Figures 3-1 and 4-4). There are no highly resistive (carbonate) rocks that occur on the western portion of Line 12 (Figure 4-8).

4.4 MAJOR POINTS IDENTIFIED AND DERIVED FROM THE GEOPHYSICAL DATA

The following major points can be made about the geophysical data from lower KSV and northern CSV.

- Geophysics validate many but not all of the concealed faulting extrapolated on the geologic map.
- It is reasonable to connect the highly resistive feature that extends from southern KSV (Line 2) through northern CSV (Line 10) and in exposed Devonian rock in southern KSV.
- The KSW Fault Zone is a massive geologic feature that extends from northern KSV where it transects the KSV Caldera Complex into northern CSV.
- Well KPW-1 was drilled near the confluence or intersection of the Willow Springs Fault and the western boundary fault of the KSW Fault Zone. In fact, the Willow Springs Fault Zone joins with, if it doesn't replace the western bounding fault of the KSW Fault Zone (Figures 4-4 through 4-7).
- The KSW Fault Zone expands from the southern part of KSV into northern CSV where it extends to approximately 18,500 feet across (Figure 4-7).
- The KSW Fault Zone in northern CSV is dissected by dozens of faults as shown in the geophysical transect of Line 11 (Figure 4-7). This area exhibits an "accommodation zone" pattern of faulting where numerous normal faults occur "en-echelon," or parallel to each other, throughout the area (Figure 4-7).
- Because of the potential for incorporating less permeable materials in the process at a regional scale, groundwater will flow easier along fault zones than across fault zones. Small sections of faults may certainly have enhanced permeability and focus groundwater flow

along their extents, but this is rarely maintained over miles of extent, which is the scale being considered here of hydrographic basins and their relation to the LWRFS.

- CSAMT geophysics run perpendicular to the axis of KSV and known faulting in northern CSV was captured by the geophysics and shows the structure quite clearly to depths of approximately 3,000 feet bls.
- The faulting that occurs in northern CSV (especially the difference between Lines 10 and 11 presented here) explains why the water levels in KMW-1 and CSVM-4 are distinctly higher than those found in the rest of the basin (Figures 3-4 through 3-9).
- These faults significantly impede the flow of groundwater from KSV and northern CSV (where monitor well CSVM-4 is located) into the southern portion of CSV, south of the transect of Line 11 (Figure 4-7).
- Comparison of Line 10 to Line 11 suggests that the structural boundary between southern KSV/northern CSV and the rest of CSV to the south occurs between these two transects (Figure 4-7).
- This extensive faulting provides a basis (along with other, associated hydrogeologic data) for excluding KSV from being included in the LWRFS. This extensive faulting provides an explanation as to why the water levels are different in the KMW-1 and CSVM-4 wells and at CSVM-3 and CSVM-7.

4.5 DISCUSSION OF GEOHPHYSICAL DATA AND HOW IT RELATES TO THE HYDROGEOLOGY AND BASIN WATER LEVEL DATA

The geophysical data combined with the known water level data provide an explanation of groundwater flow from KSV through northern CSV. Figure 4-9 illustrates the interpretation of what we're calling the Northern LWRFS Boundary Fault that has been identified by the new CSAMT geophysical data. The Northern LWRFS Boundary Fault is a very large structure at the end of the Delamar Mountains that provides an explanation of the abrupt end of the Delamar Mountains in this area. Groundwater flowing southwest out of KSV, and southwest out of the Delamar Mountains in the RDCA, would run directly into this large fault system. Since the highly resistive blocks occur in Line 10, interpreted to be the RDCA, and not in Line 11 (Figure 4-7), the Northern LWRFS Boundary Fault is interpreted to be down thrown to the southwest as shown on

Figure 4-9. This means that groundwater flowing out of the Delamar Mountains and KSV would run into lower permeability Tertiary basin fill materials, perhaps interbedded with Tertiary volcanics (as identified in Section 4.3.2). This would cause the water levels to build up on the upthrown side of the fault (to the northeast – Figure 4-9) until there is enough head built up (a few tens of feet) for groundwater to push through into northern CSV.

The geophysical data collected in northern CSV shows that there is approximately 3,000 plus or minus feet of remarkably flat Tertiary Basin fill, that is perhaps interbedded with volcanics, that are lithologically different or much more highly fractured and faulted en-echelon in a band against the Meadow Valley Mountains (see Section 4.4, above). The RDCA from the southern Delamar Mountains and KSV runs directly and unavoidably into these Tertiary basin fill sediments, which directly affects the flow of groundwater in this area as shown by the geophysical data and corroborating water level, groundwater chemistry, and temperature data.

A long-term aquifer test, approximately 25 ½ months, was conducted (Order No. 1169) to look at the effects of groundwater pumping on the MRSA, but there were no effects ascribable to the start and subsequent stop of a major pumping stress in monitor wells KMW-1 or CSVM-4. There are several reasons for this including the significant distance the cone-of-depression would have to extend out from the pumping well for the pumping and recovery effects to be identifiable in the monitor well in southern KSV. This is a distance of over 15 miles from the MX-5 well. It should be noted that the distance from the KPW-1 well to the springs in the MRSA is over 23 miles if measured by line-of-sight. Secondly, there is a very large sequence of carbonate rocks between the location of the Order No. 1169 pumping and KSV and northern CSV and that thick sequence likely has a very large transmissivity, which is indicated by the nearly flat-water level elevation in much of the LWRFS. For hydraulic head changes (drawdown and build-up/recovery) to travel through these thick sequences of carbonate rocks, they would also have to travel through much more restrictive structures such as the en-echelon faulting that was found farther north in the KSW Fault Zone. Finally, groundwater from KSV has to flow through the Northern LWRFS Boundary Fault where the geologic structure changes as demonstrated by the new geophysical data (Figure 4-9).

5.0 OTHER ISSUES OF THE NEVADA STATE ENGINEER'S REQUEST

There are four other matters the NSE requested be addressed in IO #1303 (NSE 2019) in addition to the request for information regarding the geographic boundary. The other four issues are:

- The information obtained from the Order No. 1169 aquifer test and subsequent to the aquifer test and Muddy River headwater spring flow as it related to aquifer recovery since the completion of the aquifer test;
- The long-term annual quantity of groundwater that may be pumped from the Lower White River Flow System, including the relationships between the location of pumping on discharge to the Muddy River Springs, and the capture of Muddy River flow;
- The effects of movement of water rights between alluvial wells and carbonate wells on deliveries of senior decreed rights to the Muddy River; and,
- Any other matter believed to be relevant to the State Engineer's analysis.

Lincoln/Vidler are responding to each issue below although it may not be germane to whether KSV is included in the LWRFS administrative unit.

5.1 ORDER 1169 AQUIFER TEST

As stated in Lincoln/Vidler's correspondence to Jason King, NSE, dated October 10, 2018 (Lincoln/Vidler 2018):

"Lincoln/Vidler have not been involved in any of the Order 1169 studies to date."

There was no indication at the time the Order No. 1169 aquifer test was completed and the NSE called for an analysis of the pumping test data, that KSV would be part of the LWRFS administrative unit. In fact, the NSE made this clear in his Ruling #5712 (NSE 2007) by stating at page 21:

"The State Engineer finds there is not substantial evidence that the appropriation of a limited quantity of water in Kane Springs Valley Hydrographic Basin will have any measurable impact on Muddy River Springs that warrants the inclusion of Kane Springs Valley in Order No. 1169. Therefore, the State Engineer denies the request to hold these applications in abeyance and include Kane Spring Valley within the provisions of Order No. 1169."

Because KSV was not included in Order No. 1169, Lincoln/Vidler were not noticed via Order 1169A (NSE 2012) requesting reports on the outcome of the Order No. 1169 aquifer test results (NSE 2002) to participate and provide their input in the Order No. 1169 proceedings. As stated in Lincoln/Vidler's correspondence dated October 10, 2018 (Lincoln/Vidler 2018), and we reiterate in this report:

> "Putting us [Lincoln/Vidler] into this Order now puts us at a great disadvantage as we have not been privy to or participated in any of the meetings, data collection activities, nor have we had the ability to analyze any of the collected data or, as would likely be the case, collect our own data and information relevant to the issue of Order 1169."

5.2 LONG-TERM ANNUAL QUANTITY OF GROUNDWATER PUMPING FROM THE LWRFS

Lincoln/Vidler provides no statement or analysis here as to the long-term annual quantity of groundwater that could be pumped from the LWRFS administrative unit. Lincoln/Vidler do however state that KSV can be part of the solution to the water issues affecting the LWRFS groundwater basins. There is unappropriated water within KSV that can be used as a source of supply for down-gradient groundwater basins with little reasonable likelihood of impacting or affecting the MSRA because of the large distances and complex geologic structures in between.

5.3 IMPACTS AND EFFECTS OF PUMPING FROM ALLUVIAL AND CARBONATE WELLS NEAR THE MRSA

Lincoln/Vidler have previously stated in a letter to the NSE (Bushner 2018) that all of the groundwater pumped from the Order No. 1169 aquifer test can be explained by data provided by SNWA. Figure 5-1 (reproduced from SNWA 2018) is very illustrative of what was stated at the beginning of Lincoln/Vidler's 2018 comment letter. This analysis benefits from considering the reliable data spanning over two decades, not just the duration of the Order No. 1169 Test.

First, SNWA normalized the flows of the Muddy River, where flood flows have been removed from the hydrograph and diversions from the Muddy River have been added back into the hydrograph. The red line on Figure 5-1 shows the calculated Muddy River flow deficit. Groundwater pumping over time is plotted from wells in the alluvium (tan colors) in the MRSA and groundwater pumping from wells in the carbonate rock aquifer (dark blue color) in the MRSA. The light blue bars represent groundwater pumping from carbonate wells in the CSV. What can be concluded from this chart and graphical representation of the Muddy River flow and groundwater pumpage is that the red line plots in between the dark blue (MRSA carbonate rock aquifer pumpage) and the light blue (CSV carbonate rock aquifer pumpage). This indicates that pumpage from the MRSA completely explains the reductions in flows of the Muddy River and associated springs. Groundwater pumpage from CSV (light blue bars) is not needed at all to explain the declines since the 1990s in the flows in the Muddy River.

5.4 ANY OTHER MATTER BELIEVED TO BE RELEVANT TO THE STATE ENGINEER'S ANALYSIS

With a clear understanding of the cause of reduced flows on the Muddy River and its headwater springs, the NSE can proceed directly to define how the LWRFS administrative unit will work and where the focus should be when trying to protect springs that are at issue in the MRSA. First and foremost, the impacts from groundwater pumping on the MRSA are within the MRSA itself, and therefore, the focus should be within the MRSA first. Secondly, CSV should be monitored, however, impacts from pumping in the CSV do not cause the biggest impacts to the springs. Finally, inflows to the MRSA from the Lower Meadow Valley Wash hydrographic area should be monitored and protected. Lincoln/Vidler also addressed this issue in the correspondence to the NSE (Bushner 2018) stating:

> "...as identified by SNWA through the Cave, Dry Lake, and Delamar Valleys hearing and associated reports, identifies 8,000 acre-feet of groundwater inflow from upgradient hydrographic basin Lower Meadow Valley Wash ... If one of the

goals to the LWRFS administrative unit determined by the NSE is to protect the springs in the MRSA then the Lower Meadow Valley Wash hydrographic basin and its groundwater inflow should not only be included as part of the LWRFS administrative unit but should also be the focus and the priority of the NSE."

6.0 KEY FINDINGS AND CONCLUSIONS

The following are the key findings and conclusions from this existing data and geophysical data documentation report.

6.1 KEY FINDINGS

- KSV is a perennial yield groundwater basin under the Laws of the State of Nevada.
- KSV is too distant and isolated due to geologic structures for pumping the perennial yield there to likely cause impairment of Muddy River Springs, Blue Point, or Rogers Springs.
- The effects of pumping from KSV would not be felt for over 100 years outside of KSV.
- The NSE did not include KSV in the Order No. 1169 aquifer test.
- Groundwater elevation data show distinctive differences in heads between KSV/northern CSV and the southern portion of CSV, which are confirmed by the geologic structures that occur in KSV and northern CSV.
- There is no discernable trend/pattern in water levels overtime between production well KPW-1 and pumping trends.
- There is no correspondence between the water level trends in wells in KSV/northern CSV, and wells located in southern CSV.
- Lincoln/Vidler have been collecting data for nearly over a decade to better quantify the volume of precipitation that occurs in KSV and that becomes local in-basin recharge.
- There was an over-arching precipitation event that occurred in southern Nevada in 2005 that had a major effect on water levels in wells throughout the area.
- The trend in water levels in both KMW-1 and CSVM-4 indicate water levels are still being affected by the 2005 precipitation event.
- The key finding of the geochemistry data is that "A comparison of these chemical and isotopic relationships with Big Muddy Springs and particularly Rogers Spring and Blue Point Spring indicates that the groundwater from KPW-1, assumed representative of the KSV groundwater, is too strongly attenuated with CSV to be identifiable in these springs." (Appendix C: CH2M Hill 2006b, Pages 12 and 13).

- Groundwater from KPW-1 and CSVM-4 are related and on similar groundwater flow paths based on the TDSS values and other geochemical data. This supports the existence of a significant fault in northern CSV corroborating the geophysical data.
- KPW-1 groundwater has one of the oldest apparent ages of 29,000 years. Assuming that the apparent ages are somewhat true, and in this case may be, it is not likely that KSV groundwater represented by KPW-1 with this age could contribute to the flow at Big Muddy Springs.
- Based on the groundwater temperature data, none of the other groundwater temperature data are close to the 136°F of the groundwater found at KPW-1, suggesting deep circulation of groundwater in KSV.
- Groundwater temperature data are consistent with the geophysical data and represent differing groundwater flow paths occurring in southern KSV and the northern most portion of CSV compared to groundwater flow paths elsewhere in CSV.

6.2 CONCLUSIONS

It is clear that a Management Order and presumably a conjunctive use element for that Management Order and the Order No. 1169 basins is appropriate. However, there is no evidence-based reason to impose that plan on basins outside of the Order No. 1169 geographic area. In fact, and on the contrary, there are science-based reasons to exclude KSV/northern CSV from the LWRFS as identified in this report.

While we appreciate the gravity of the issues before the NSE in managing the water resources of the State, frankly the record and science is clear relative to KSV: there is no likely impact to the Order No. 1169 basins.

7.0 RECOMMENDATIONS

Lincoln/Vidler submit the following recommendations as requested by IO #1303.

1. Continue to exclude KSV from the LWRFS administrative unit.

The scientific data supports excluding KSV from the LWRFS administrative unit. The most salient point is that the carbonate wells KPW-1 in southern KSV and CSVM-4 in northern CSV have different hydraulic heads than other heads further south in the LWRFS. This was explained by the new geophysical data that was collected from northern CSV which shows that there are several structural controls, including faults, that occur in the northern CSV and would represent impediments for groundwater flowing from KSV/northern CSV into the LWRFS groundwater basins.

There is no indication from the water level data of either KMW-1 or CSVM-4 that there were any noticeable effects from the Order No. 1169 aquifer test. What was observed and was significant was the dissipating effects of an over-arching precipitation event in 2005 that affected water levels in these wells for years.

2. Recommended boundary revisions.

Lincoln/Vidler recommend that in addition to KSV remaining excluded from the LWRFS administrative unit, the northern portion of CSV should also be excluded from the LWRFS administrative unit based upon the geophysical data and corroborated by groundwater level data, geochemistry data, and groundwater temperature data.

3. Additional recommendations:

Lincoln/Vidler recommend the NSE reduce or eliminate pumping adjacent to or near the springs in the MRSA, and also define and protect the up-gradient watershed of LMVW. The data provided by SNWA (2018) demonstrates that the depletions on the spring flows in the MRSA are completely explained by groundwater pumping from wells in the alluvial and carbonate rock aquifers within the MRSA hydrographic basin. Secondly, but much less impactful, is groundwater pumping from CSV. Thirdly, there is approximately 8,000 acre-feet of groundwater inflow from the LMVW. If one of the goals of the LWRFS administrative unit determined by the NSE is to protect the springs in the MRSA, then the LMVW hydrographic basin, where there is a dearth of data, and its groundwater inflow should not only be included as part of the LWRFS administrative unit but should also become a focus and the priority of the NSE.

Lincoln/Vidler concur the NSE has reason to view many of the basins in the LWRFS as hydraulically connected based on the remarkably consistent water levels among wells completed in the RDCA. Lincoln/Vidler identified this effect in 2006 during the initial KSV hearing before the NSE for applications for new groundwater appropriations in this basin. Although we concur with the effective administration of these basins collectively based on the hydrogeology, Lincoln/Vidler disagree that the effects are all the same across the entire LWRFS administrative unit.

We must reiterate what we stated previously in Lincoln/Vidler's letter to the NSE dated October 10, 2018:

> "While we appreciate the gravity to the issues before the State Engineer in managing the water resources of the State, frankly the record and the science is pretty clear relative to Kane Springs Valley and its lack of impact to the 1169 basins. While there are no easy tasks ahead for water solutions in much of Nevada, perhaps the focus should rest on viewing many of the existing water resources upgradient as pieces of the puzzle for solutions by willing participants not as "taking away" flow that some would improperly characterize as gratuitously "*belonging*" to the downgradient basin even if it is within the perennial yield of the upgradient basin. Our basin and range geography still allows for the appropriation of perennial yield within those upgradient basins."

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FIGURES

FIGURE 2-1. LOCATION MAP OF THE LOWER WHITE RIVER FLOW SYSTEM AND ADJACENT GROUNDWATER BASINS

Coyote Spring Valley, Muddy River Springs Area, Hidden Valley, Garnet Valley, California Wash, and a portion of Black Mountains Area

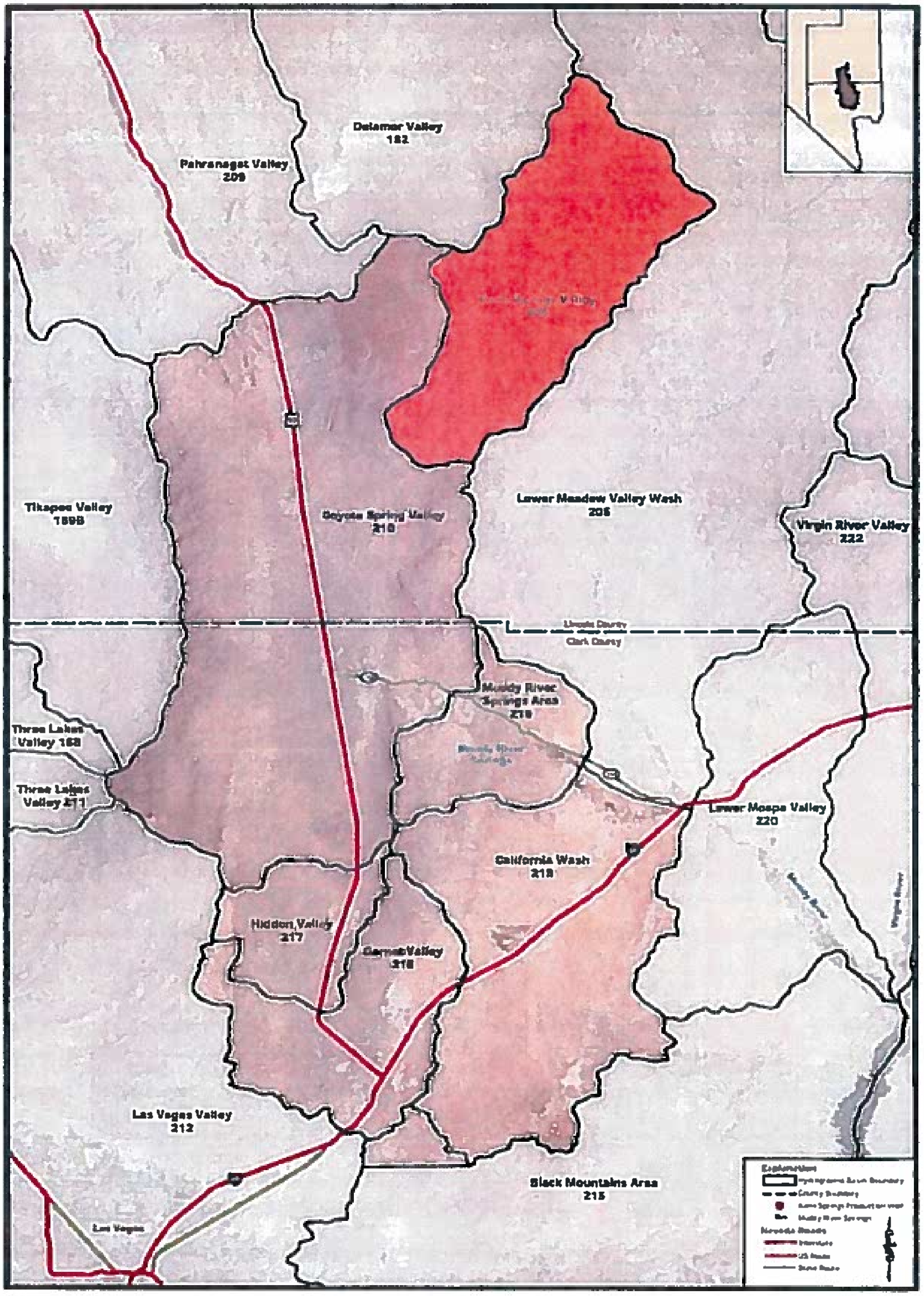
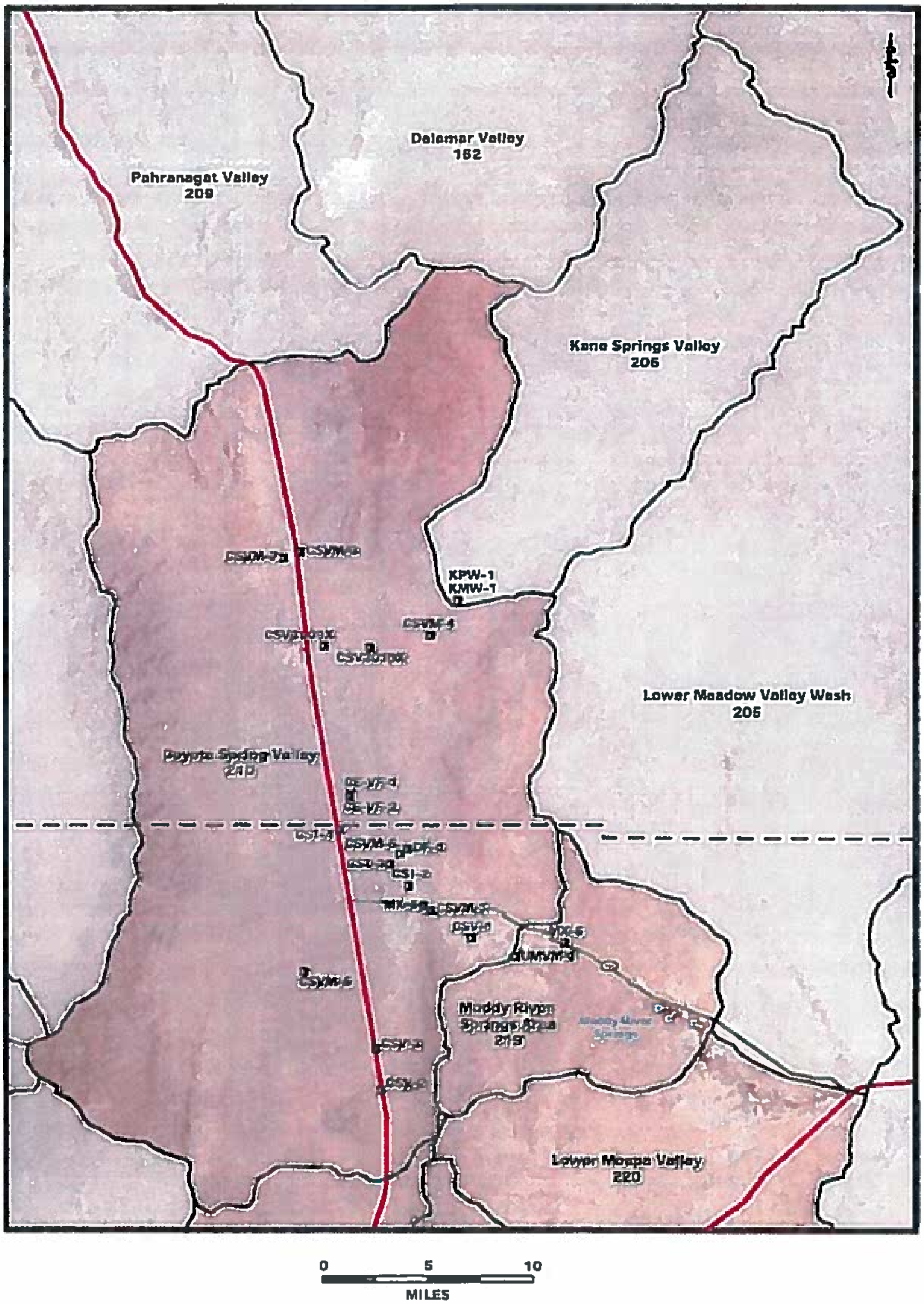


FIGURE 3-1. WELL LOCATION MAP



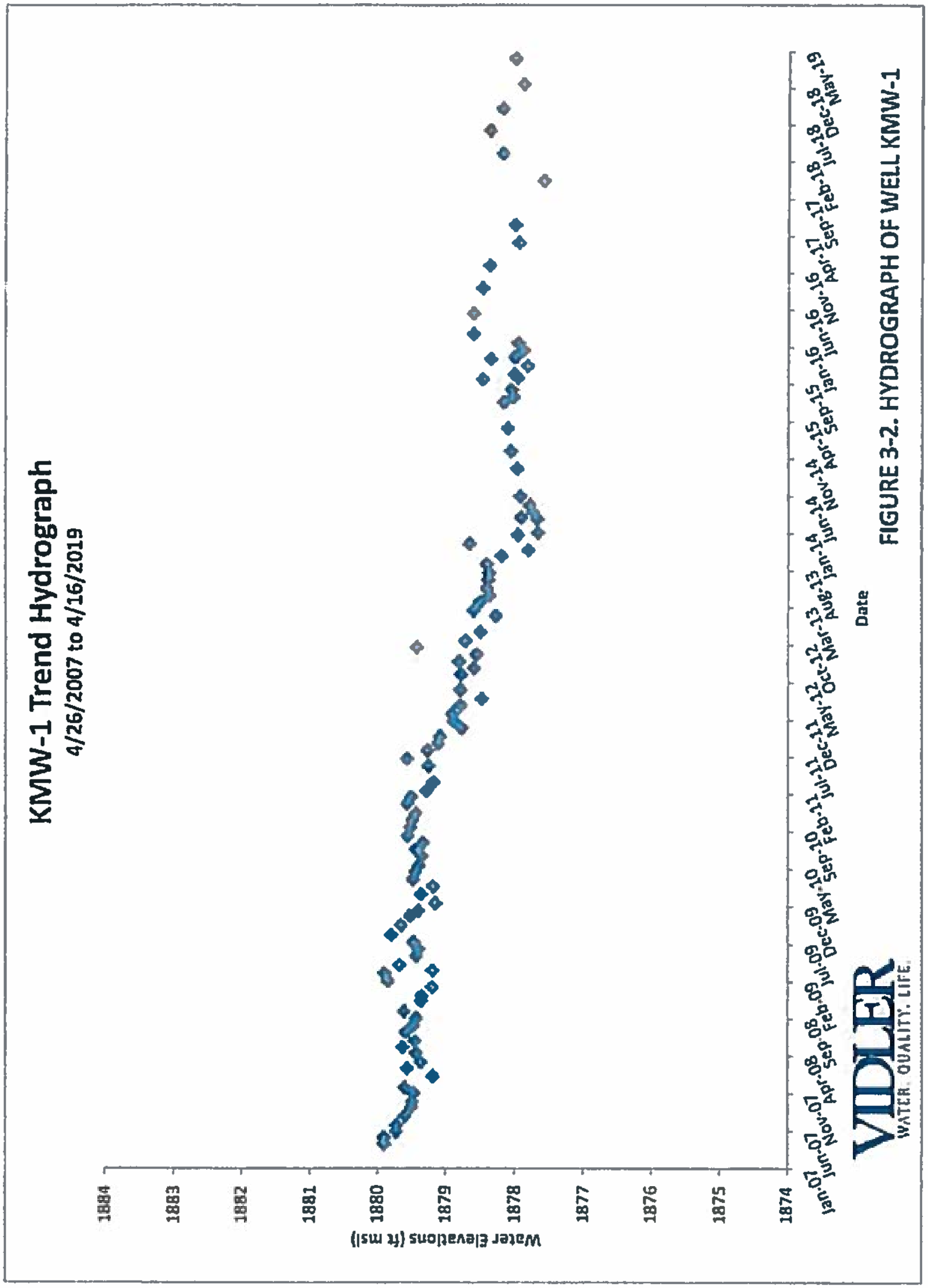


FIGURE 3-2. HYDROGRAPH OF WELL KMW-1

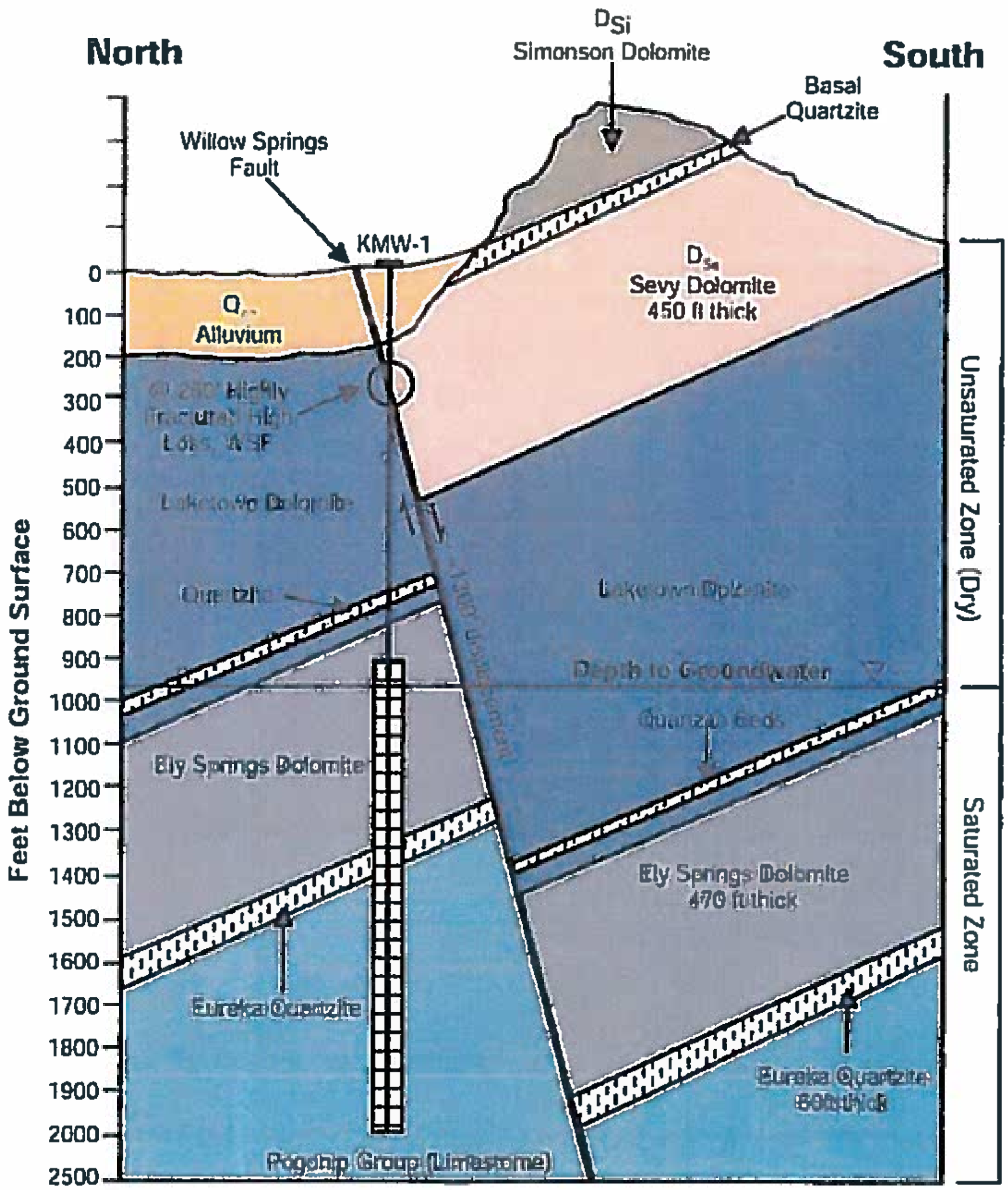
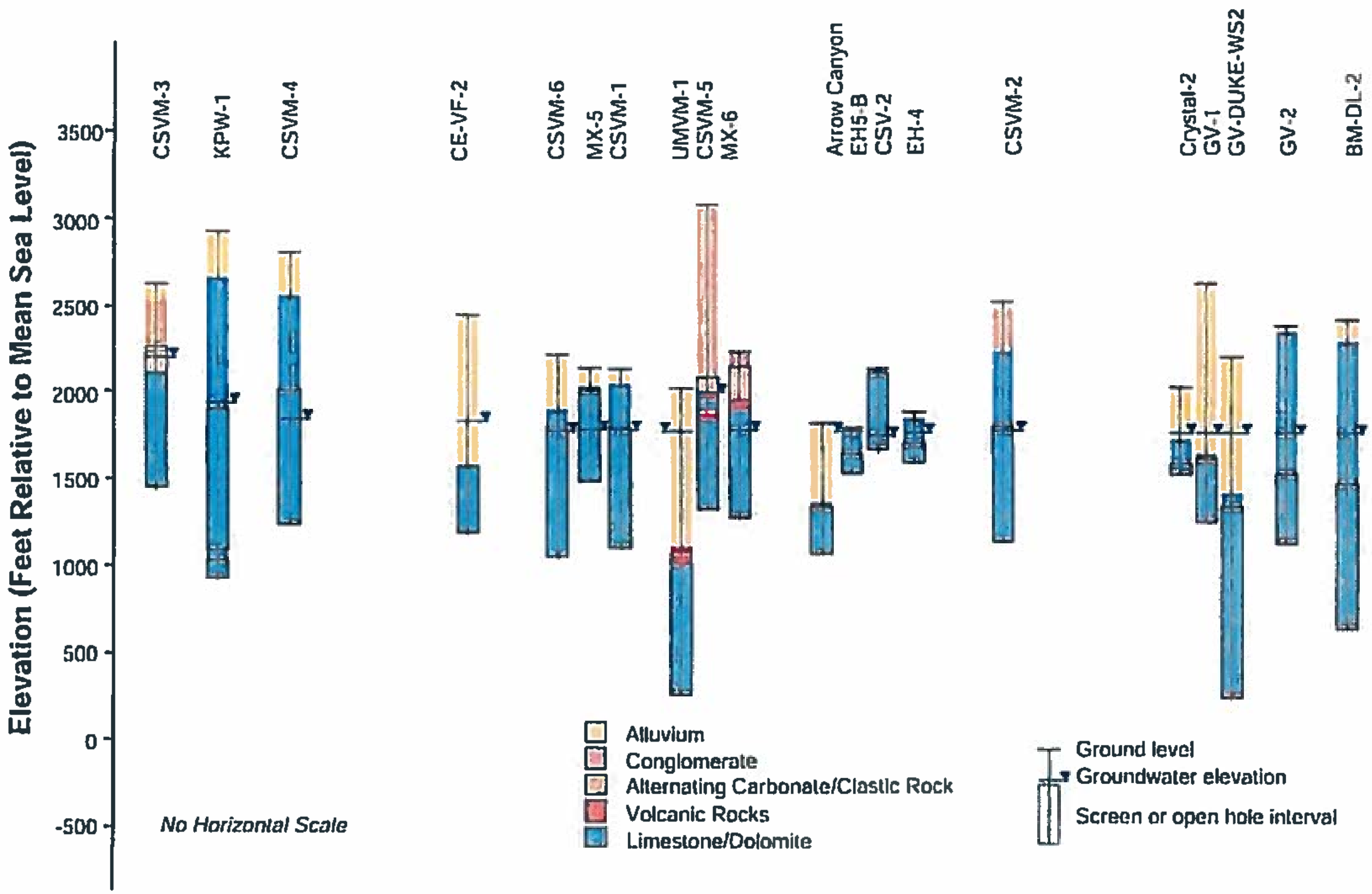


FIGURE 3-3 LOCALIZED CROSS SECTION THROUGH KMW-1, KANE SPRINGS VALLEY

Source: URS; Unpublished field notes taken during Drilling KMW-1 by Feast Geosciences

SE ROA 36245

FIGURE 3-4. VERTICAL PROFILE THROUGH SELECTED CARBONATE WELLS IN STUDY AREA



Source : CH_2MHill (2006)

SE ROA 36246

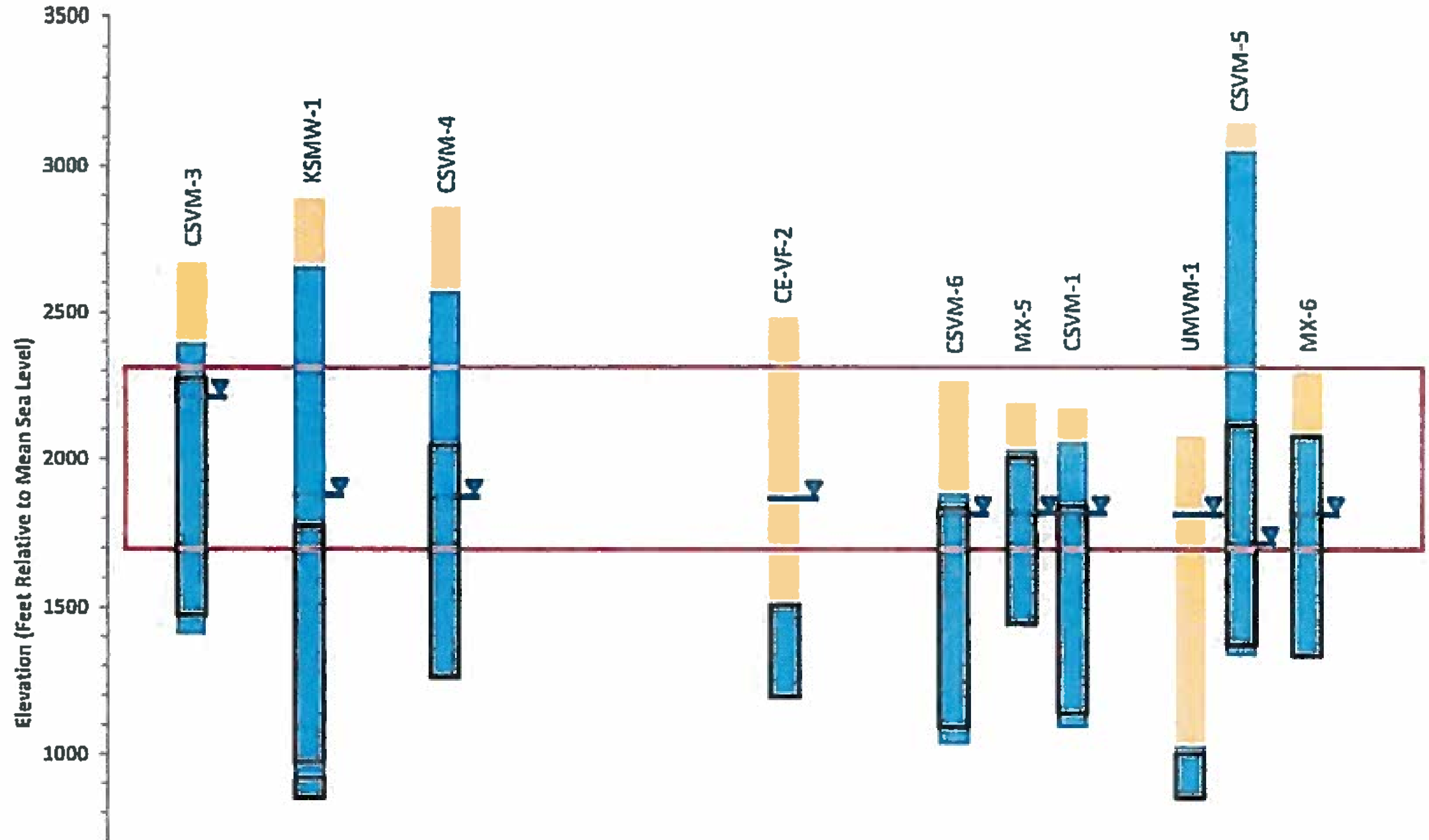


FIGURE 3-5. UPDATE TO THE VERTICAL PROFILE THROUGH SELECTED CARBONATE WELLS FROM THE APRIL 2006 KANE SPRINGS VALLEY GROUNDWATER RIGHTS HEARING

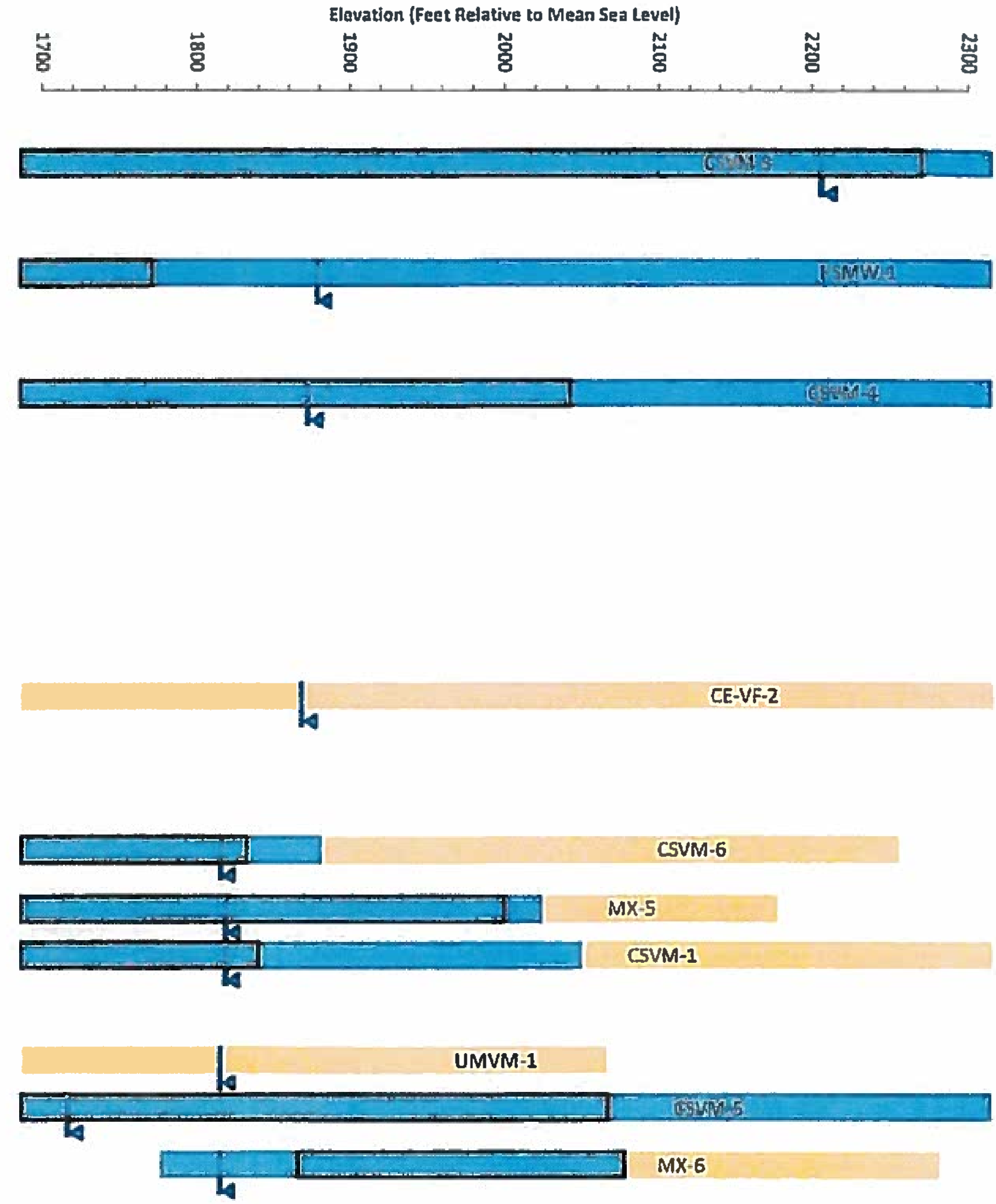


FIGURE 3-6. FOCUSED GROUNDWATER ELEVATIONS IN SELECTED CARBONATE WELLS IN KANE SPRINGS VALLEY AND NORTHERN COYOTE SPRING VALLEY

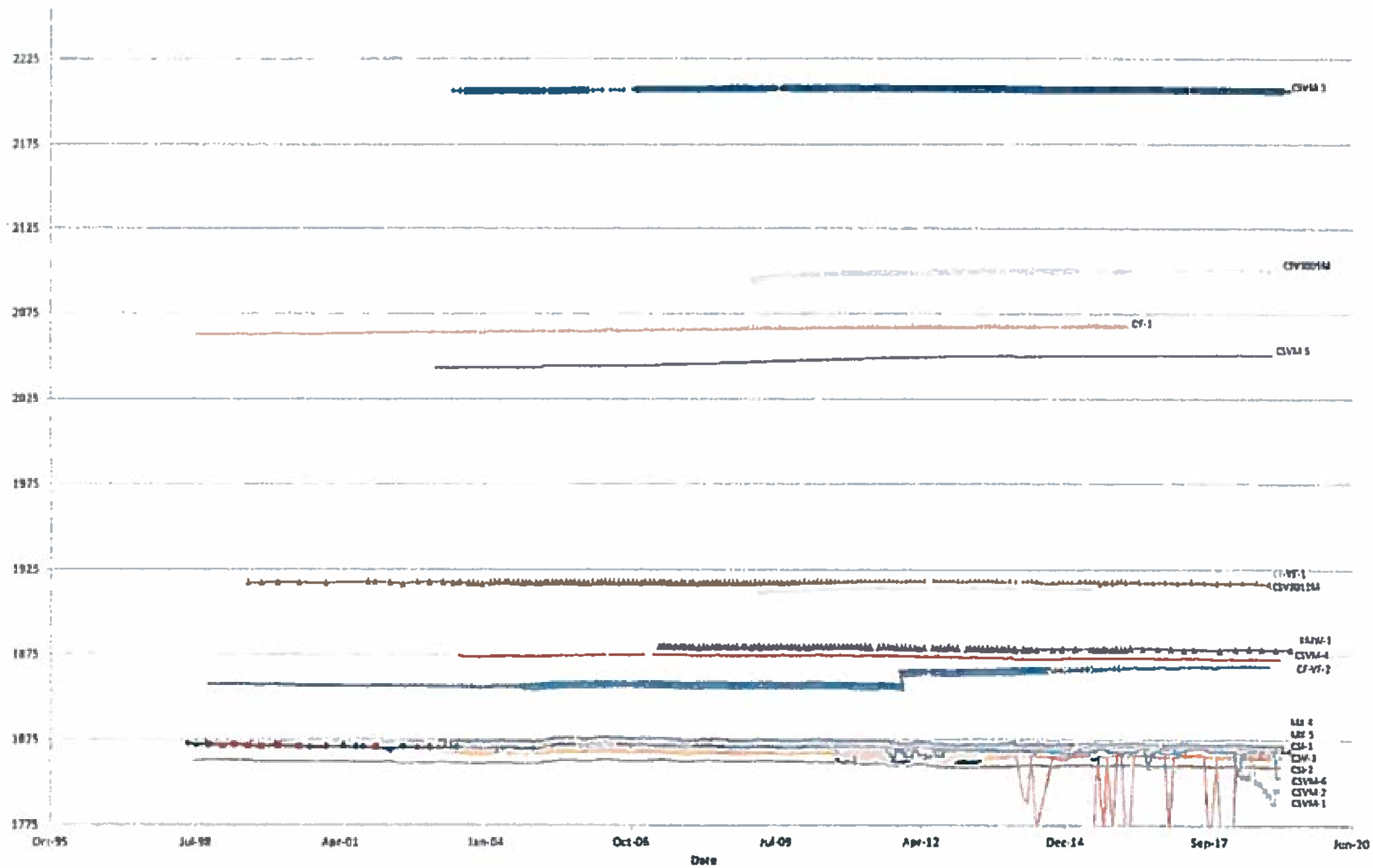


FIGURE 3-7. COMBINATION PLOT OF HYDROGRAPHS FOR WELLS THROUGHOUT THE NORTHERN PORTION OF THE LWRFS AND INCLUDING KANE SPRINGS VALLEY

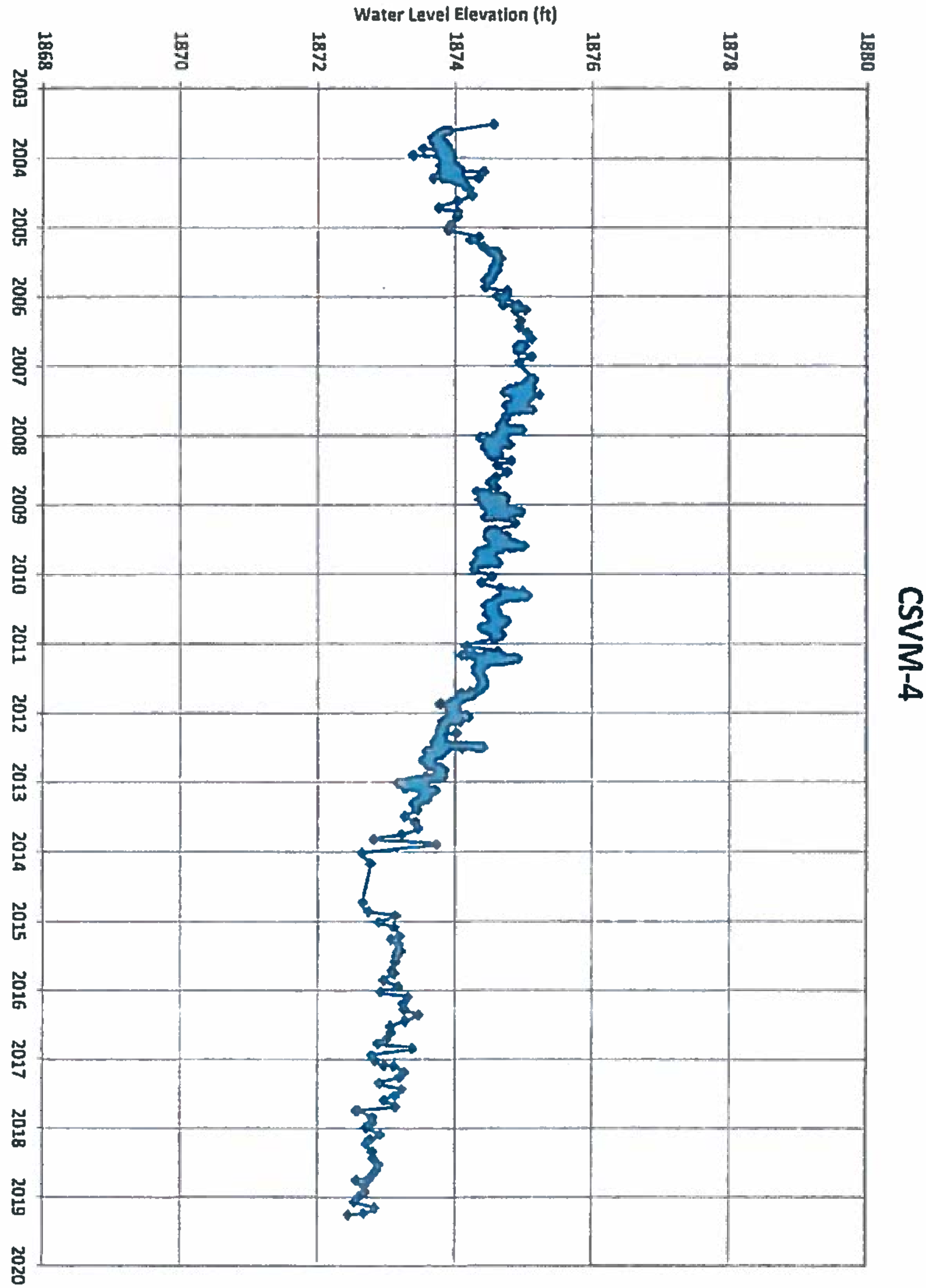


FIGURE 3-8. HYDROGRAPH OF WELL CSVM-4

SE ROA 36250

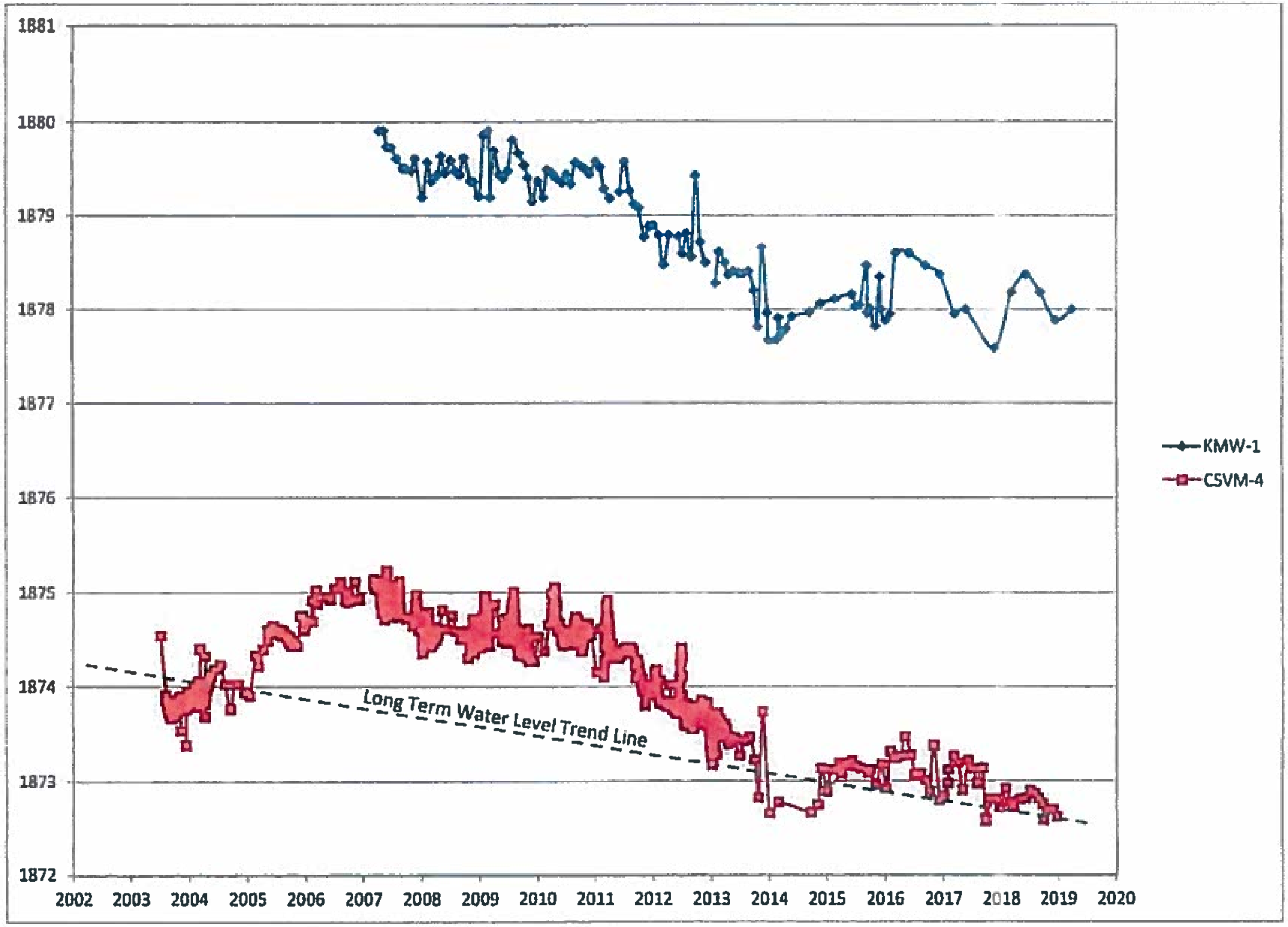


FIGURE 3-9. COMBINED HYDROGRAPHS OF WELLS KMW-1 AND CSVM-4

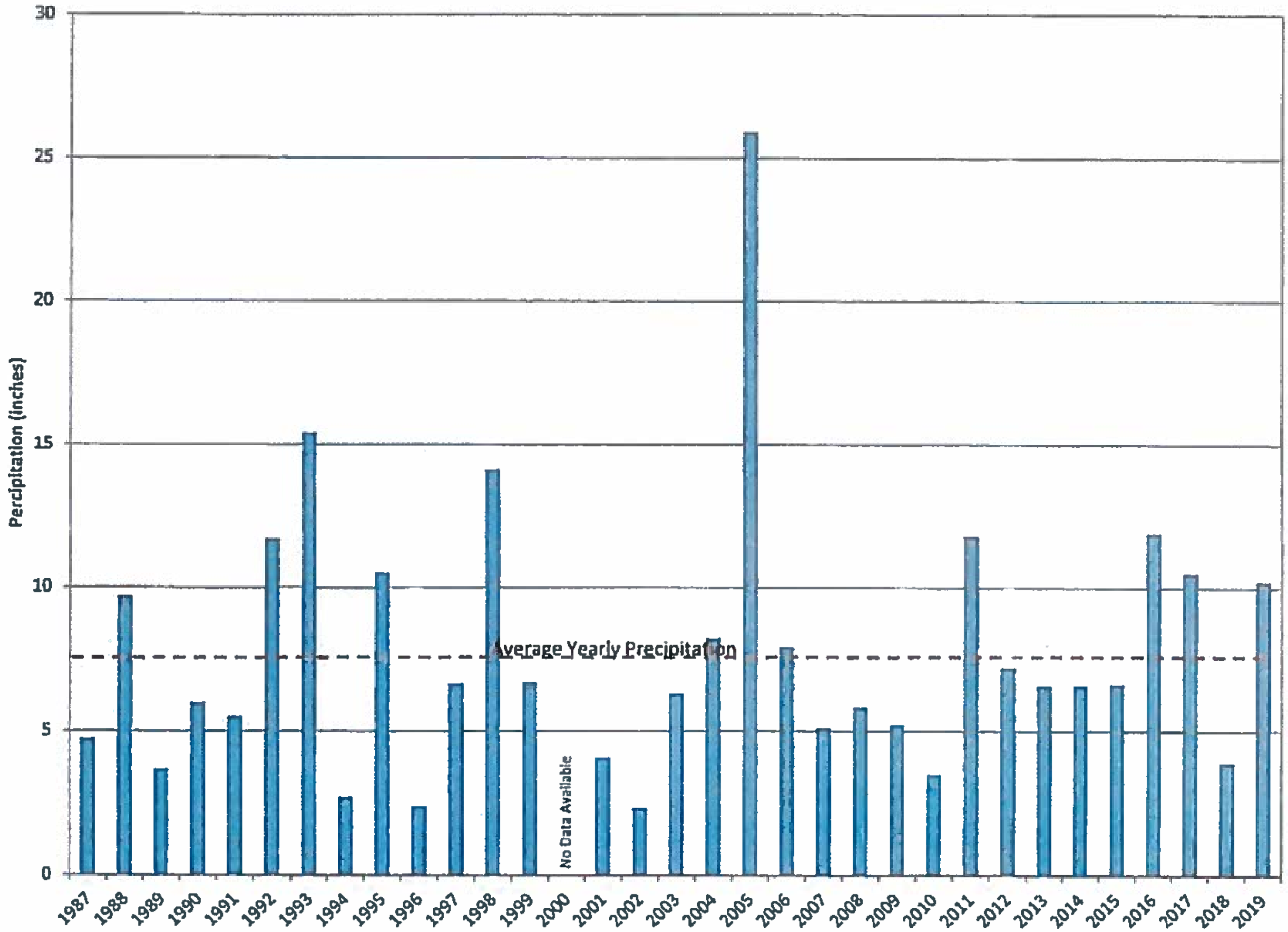


FIGURE 3-10. PRECITITATION DATA FROM THE KANE SPRINGS VALLEY REMOTE AUTOMATED WEATHER STATION

SE ROA 36253

FIGURE 3-11

Map of Temperature Data from Selected Groundwater Wells and Springs

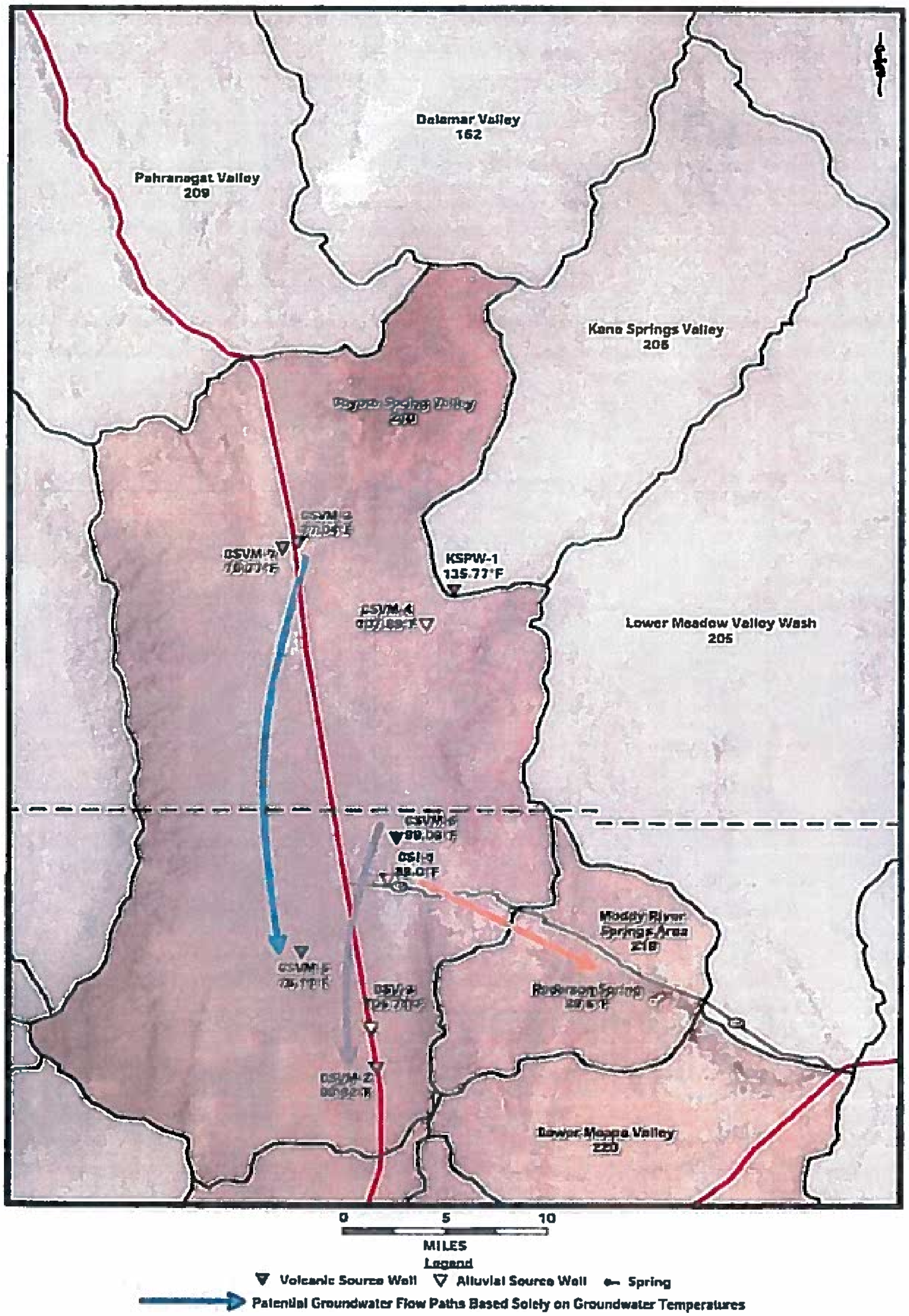
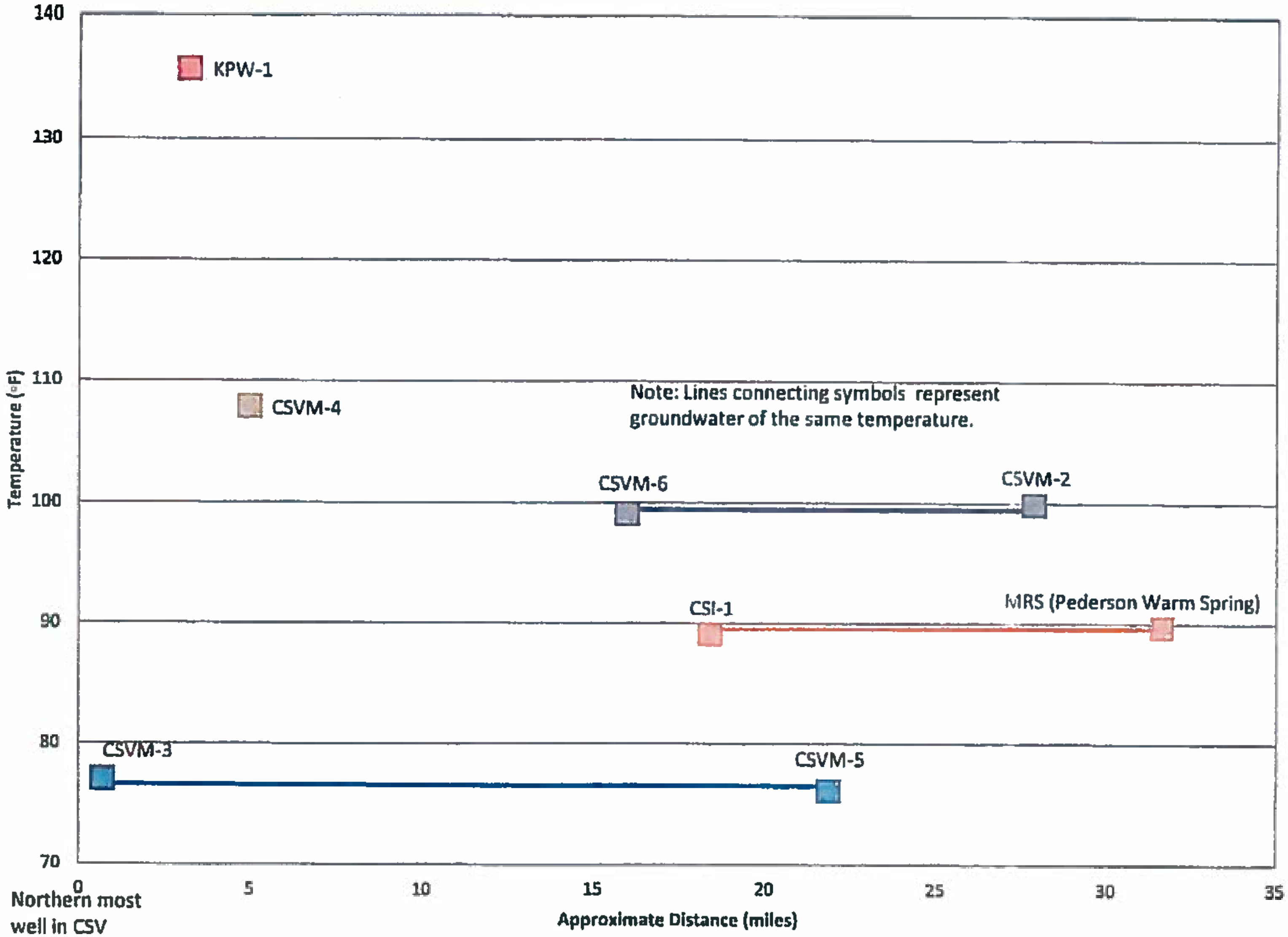


FIGURE 3-12. GROUNDWATER TEMPERATURE DATA FROM SELECTED CARBONATE WELL IN KANE SPRINGS VALLEY AND NORTHERN LWRFS



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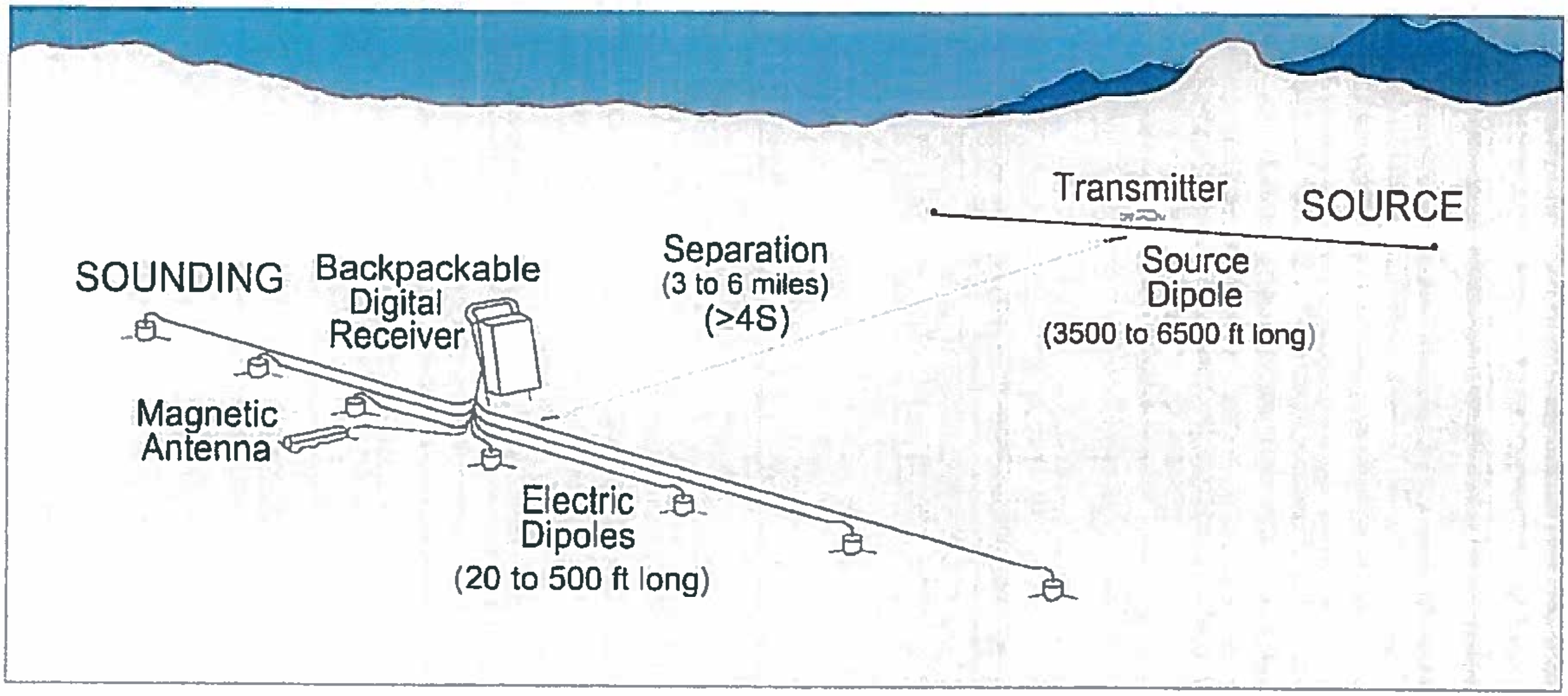

FIGURE 4-1: CSAMT FIELD SURVEY SET-UP SCHEMATIC (NOT-TO-SCALE)
SOURCE: ZONGE INTERNATIONAL MANUALS.

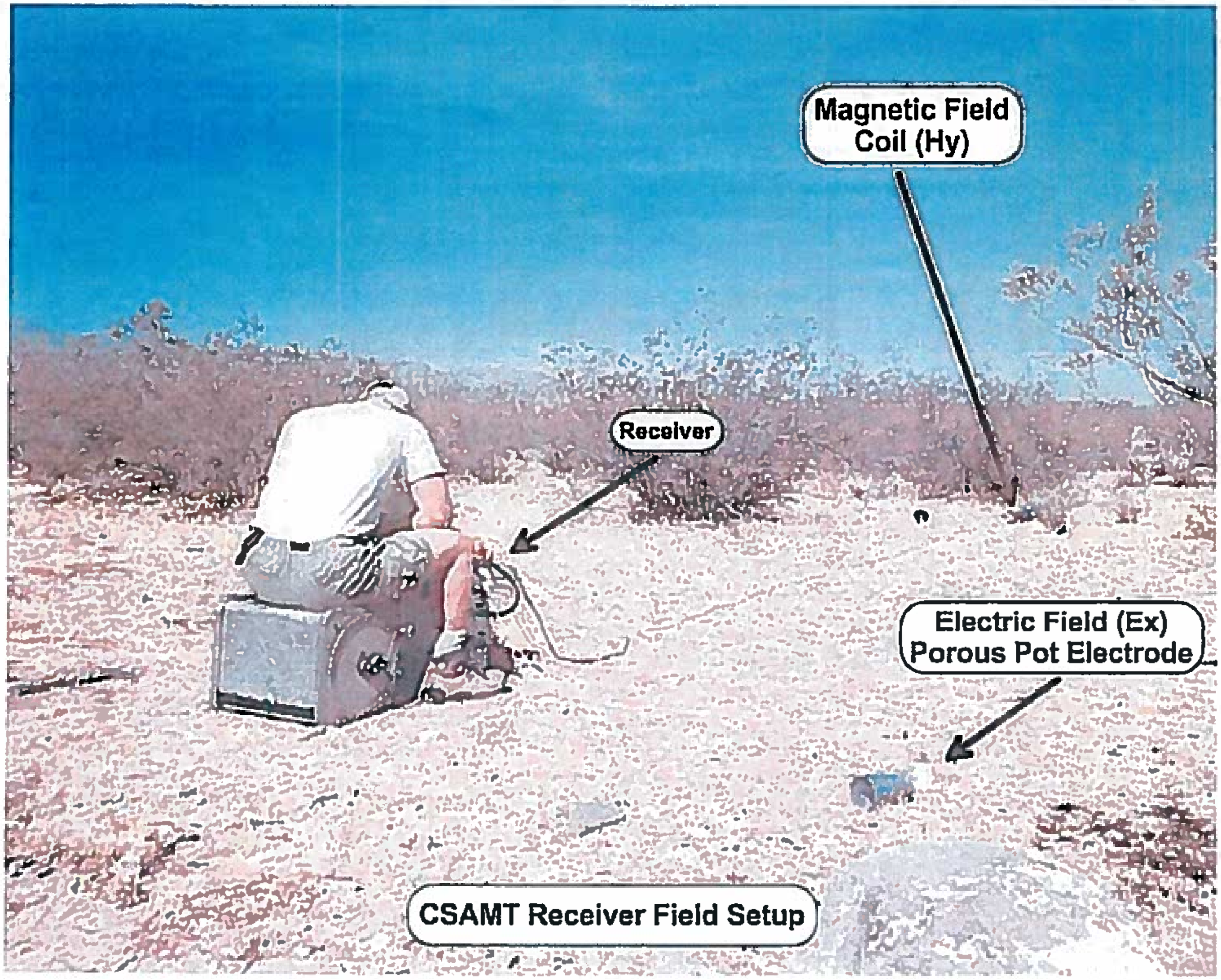

FIGURE 4-2: CSAMT RECEIVER SET-UP IN THE TULE DESERT, LINCOLN COUNTY, NEVADA.
SOURCE: ZONGE INTERNATIONAL MANUALS.

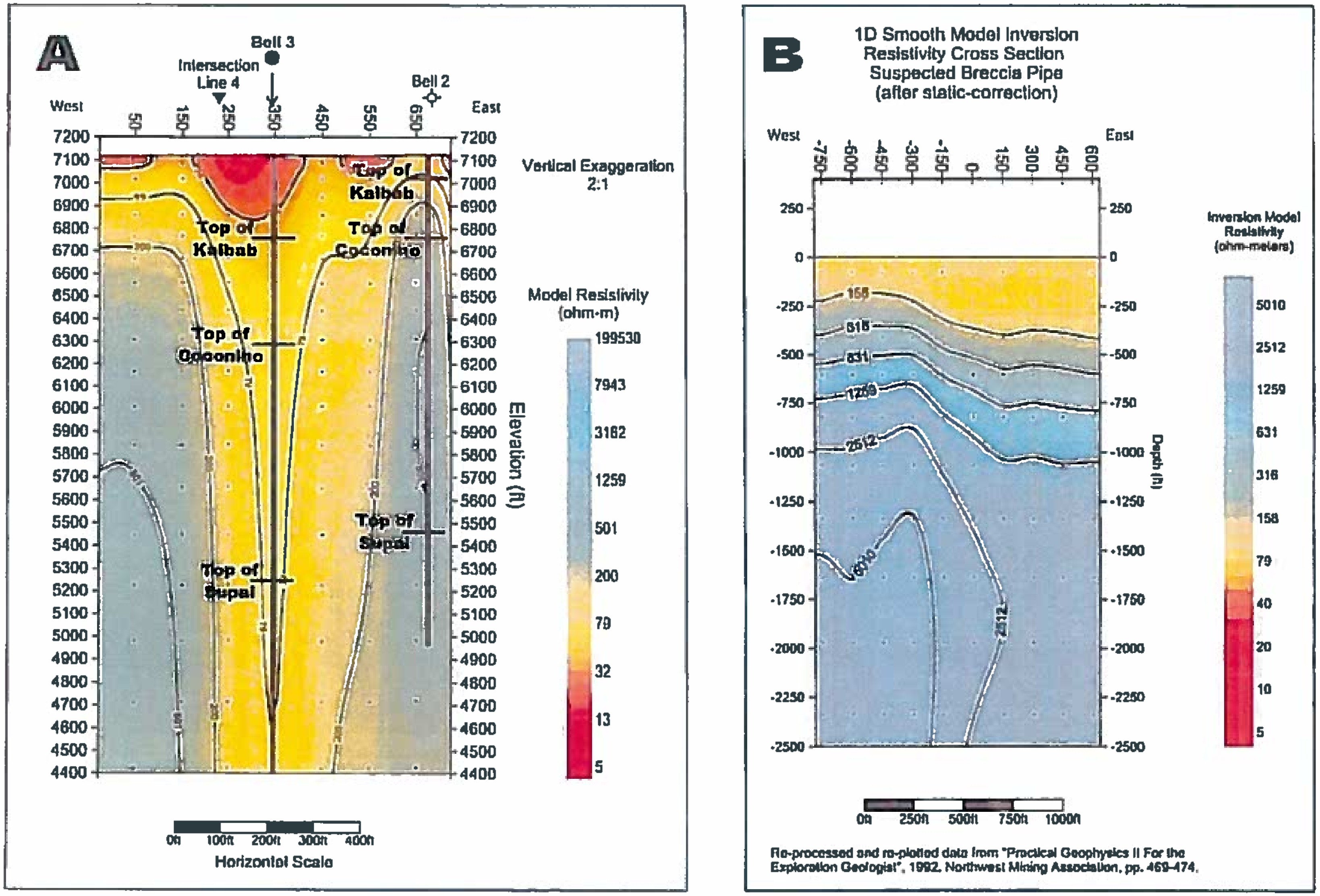

FIGURE 4-3: EXAMPLE OF FAULTS IN TWO CSAMT DATA SETS AS A) A NARROW LOW RESISTIVE ZONE AT STATION 350, VERSUS B) AS AN OFFSET IN LAYERING AT STATION -150.

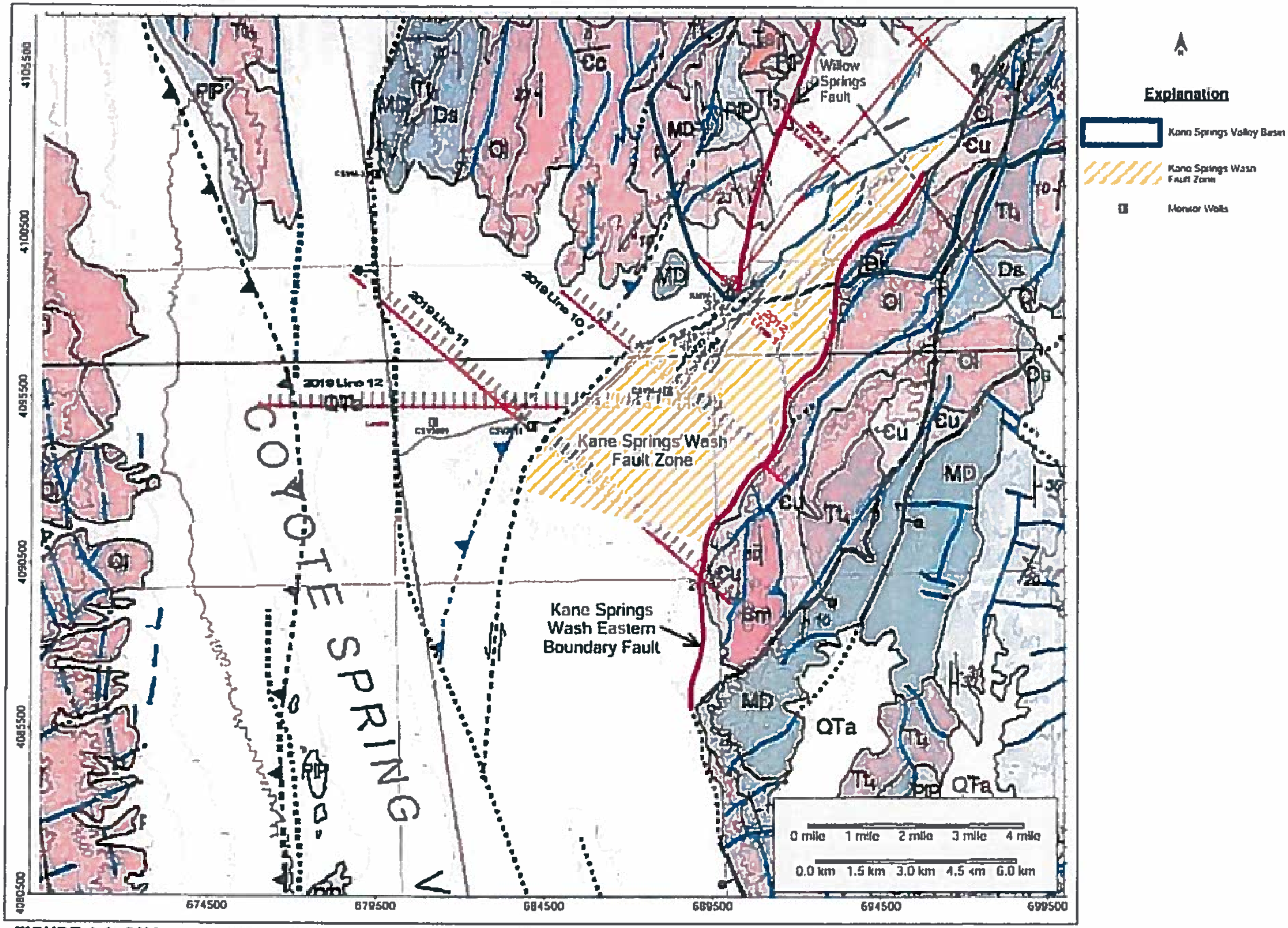

FIGURE 4-4: GEOLOGIC MAP AND LOCATION MAP OF CSAMT TRANSECT THROUGH SOUTHERN KANE SPRINGS VALLEY AND NORTHERN COYOTE SPRING VALLEY.

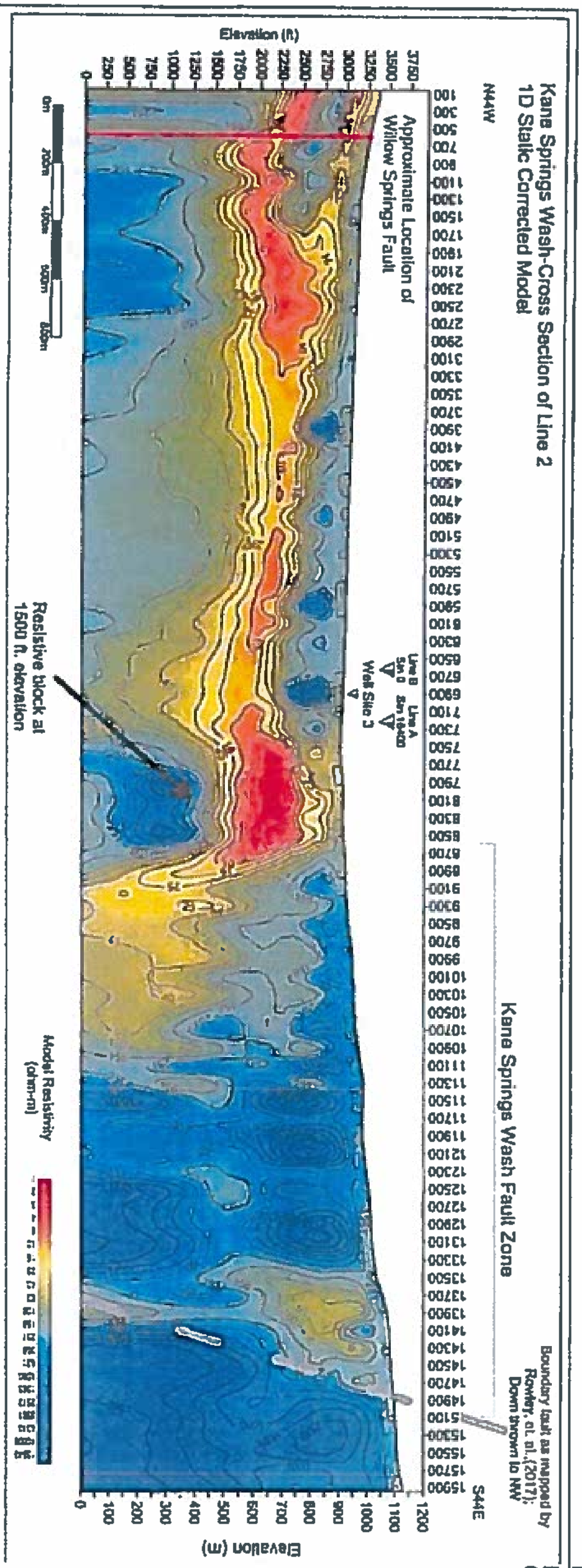

FIGURE 4-5: CSAMT TRANSECT OF LINE 2 THROUGH SOUTHERN KANE SPRINGS VALLEY

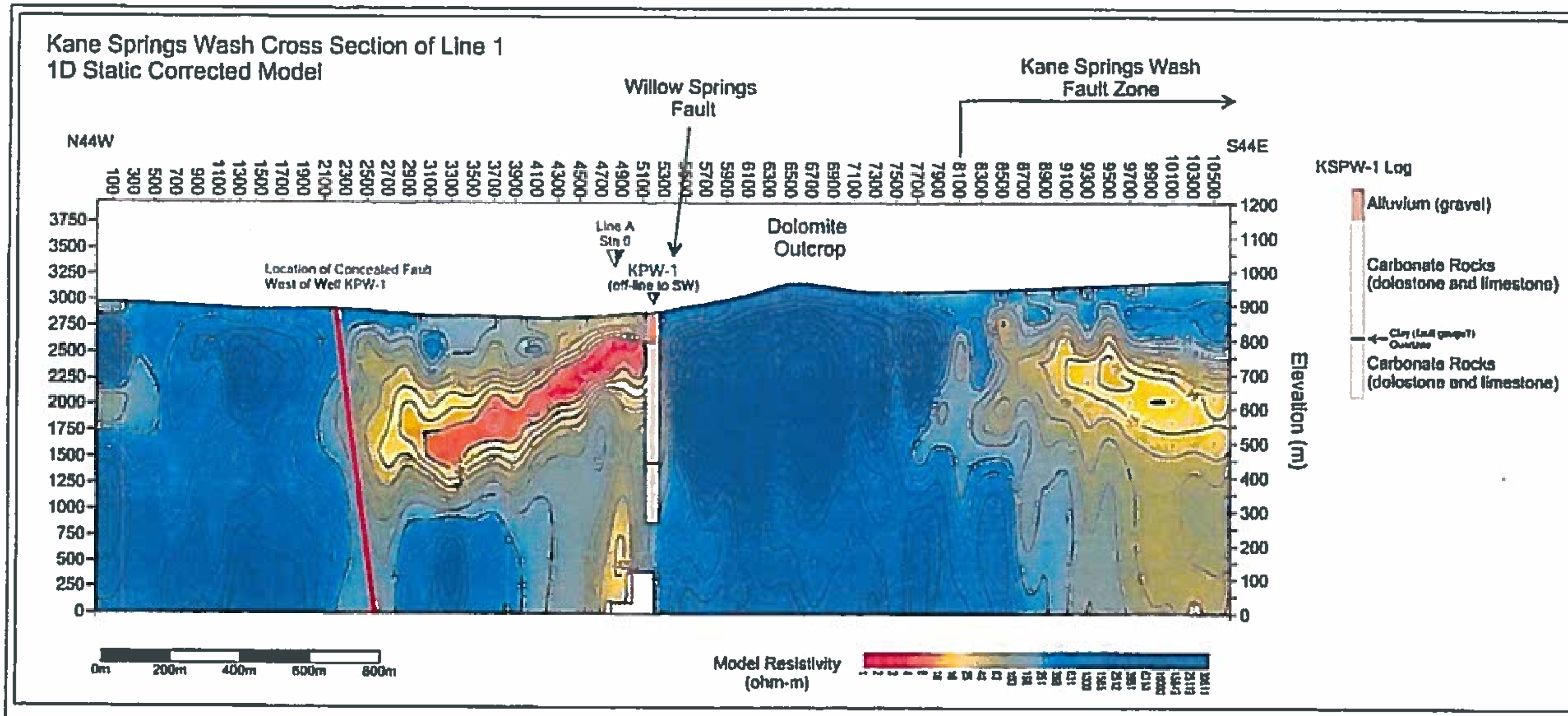

Figure 4-6: CSAMT TRANSECT OF LINE 1 THROUGH WELL KPW-1 OF SOUTHERN KANE SPRINGS VALLEY

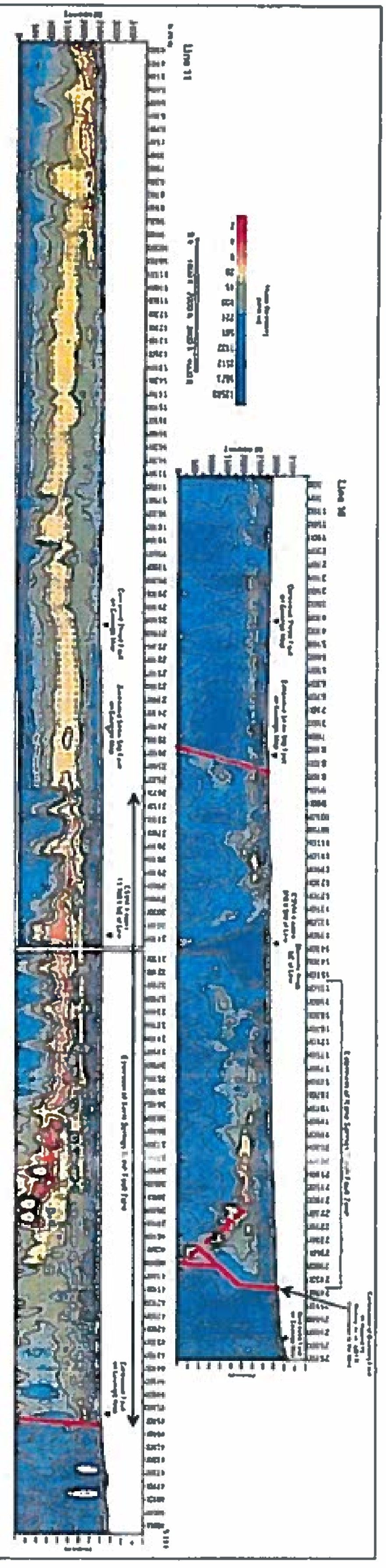

FIGURE 4-7: CSAMT TRANSECT FOR LINES 10 AND 11 THROUGH NORTHERN COYOTE SPRING VALLEY

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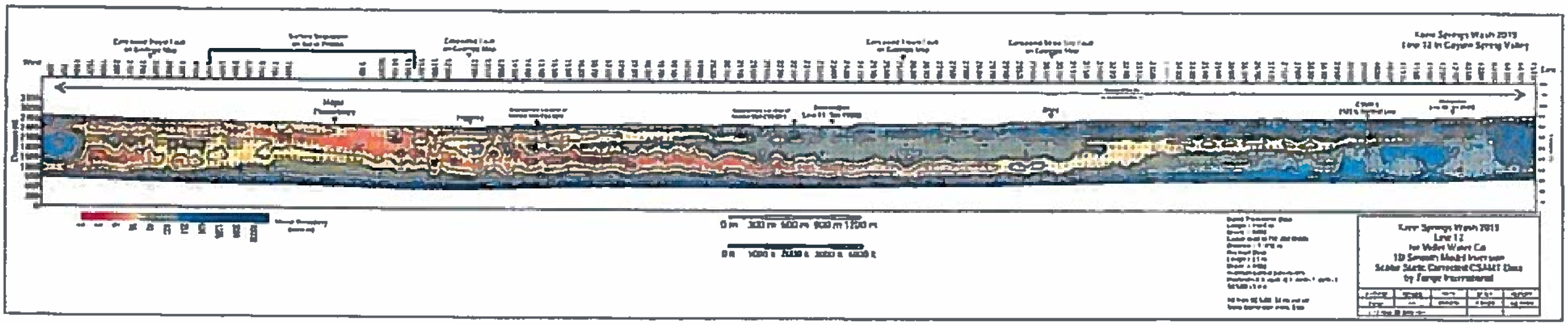


FIGURE 4-8: EAST-WEST CSAMT TRANSECT OF LINE 12 THROUGH NORTHERN COYOTE SPRING VALLEY

SE ROA 36262

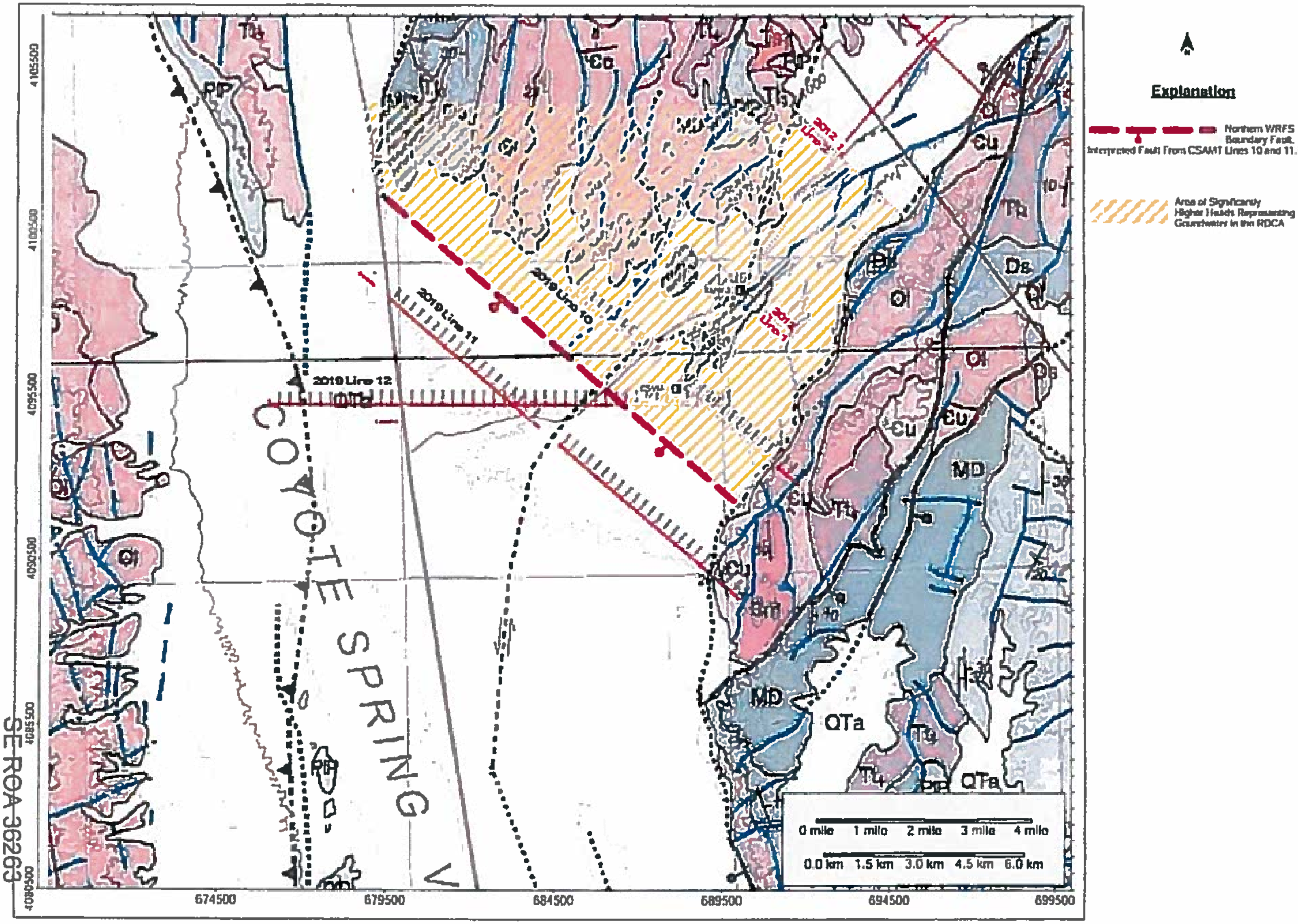
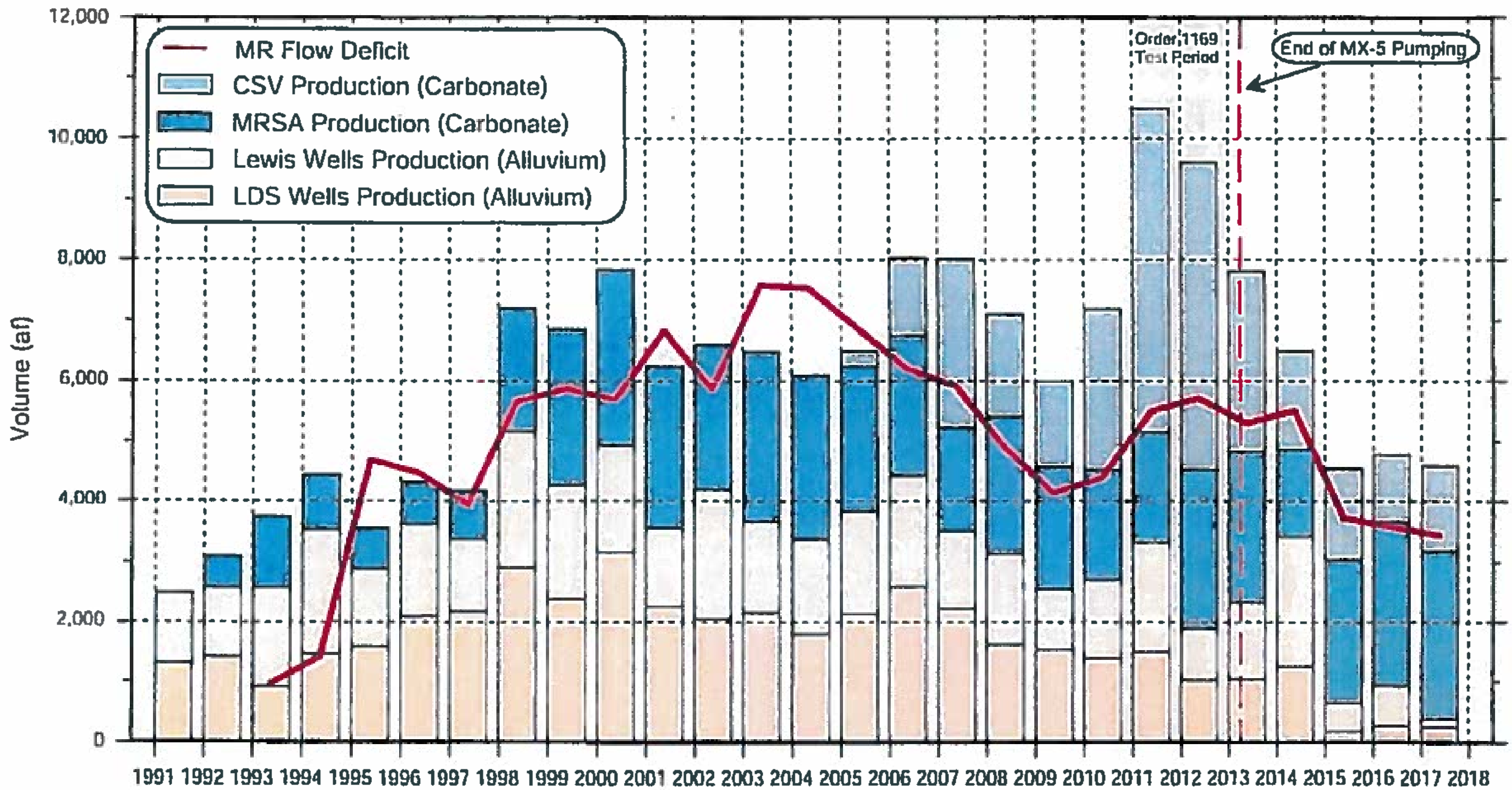
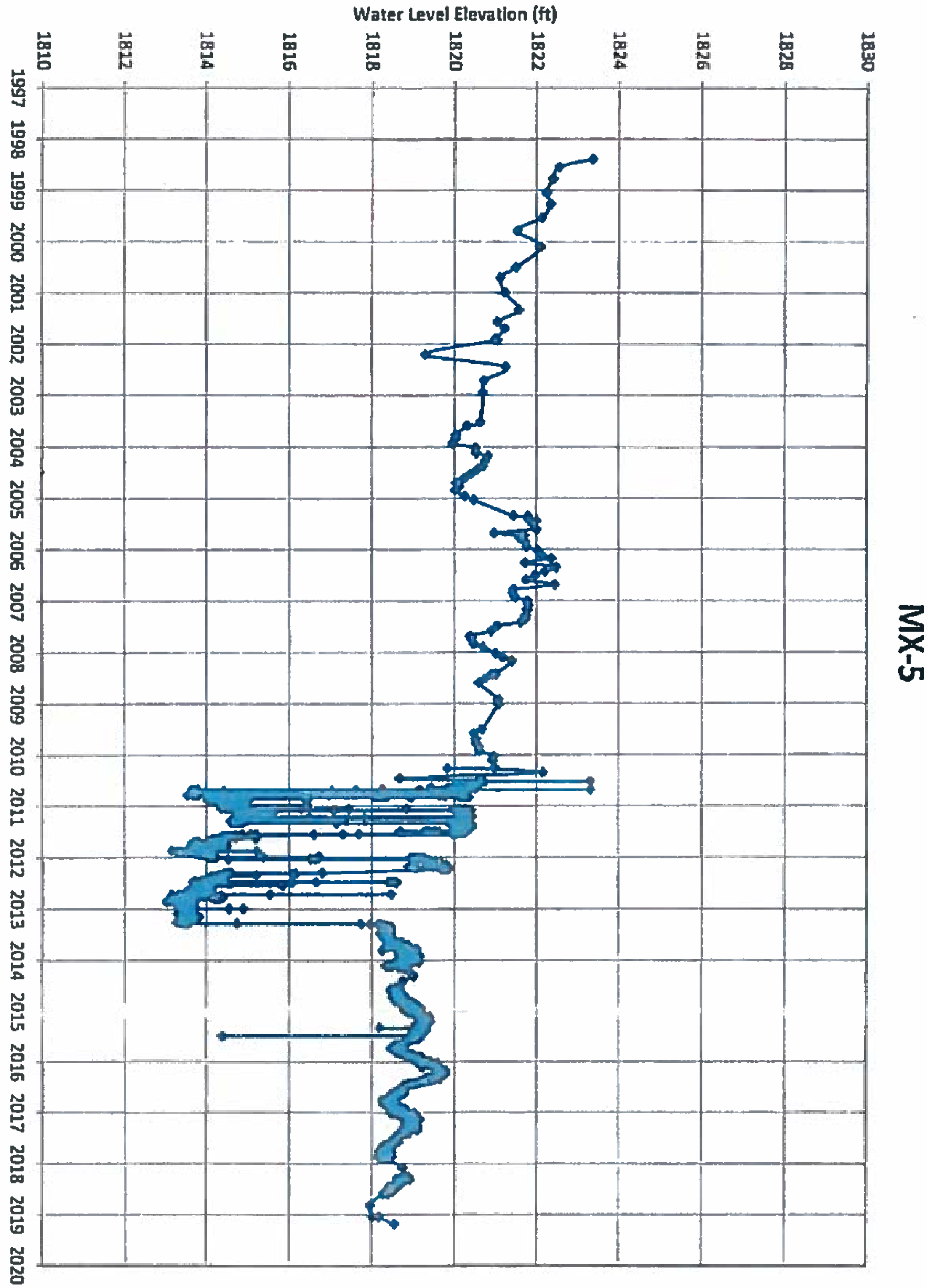


FIGURE 4-9: LOCATION MAP SHOWING THE NORTHERN LWRFS BOUNDARY FAULT

FIGURE 5-1. REPRODUCTION OF SNWA(2018) FIGURE 5-4, TITLED MR FLOW DEFICIT AND COYOTE SPRING VALLEY AND MRSA GROUNDWATER PRODUCTION



APPENDICES


MX-5
Water Level Elevation (ft)
1810
1812
1814
1816
1818
1820
1822
1824
1826
1828
1830
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
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2011
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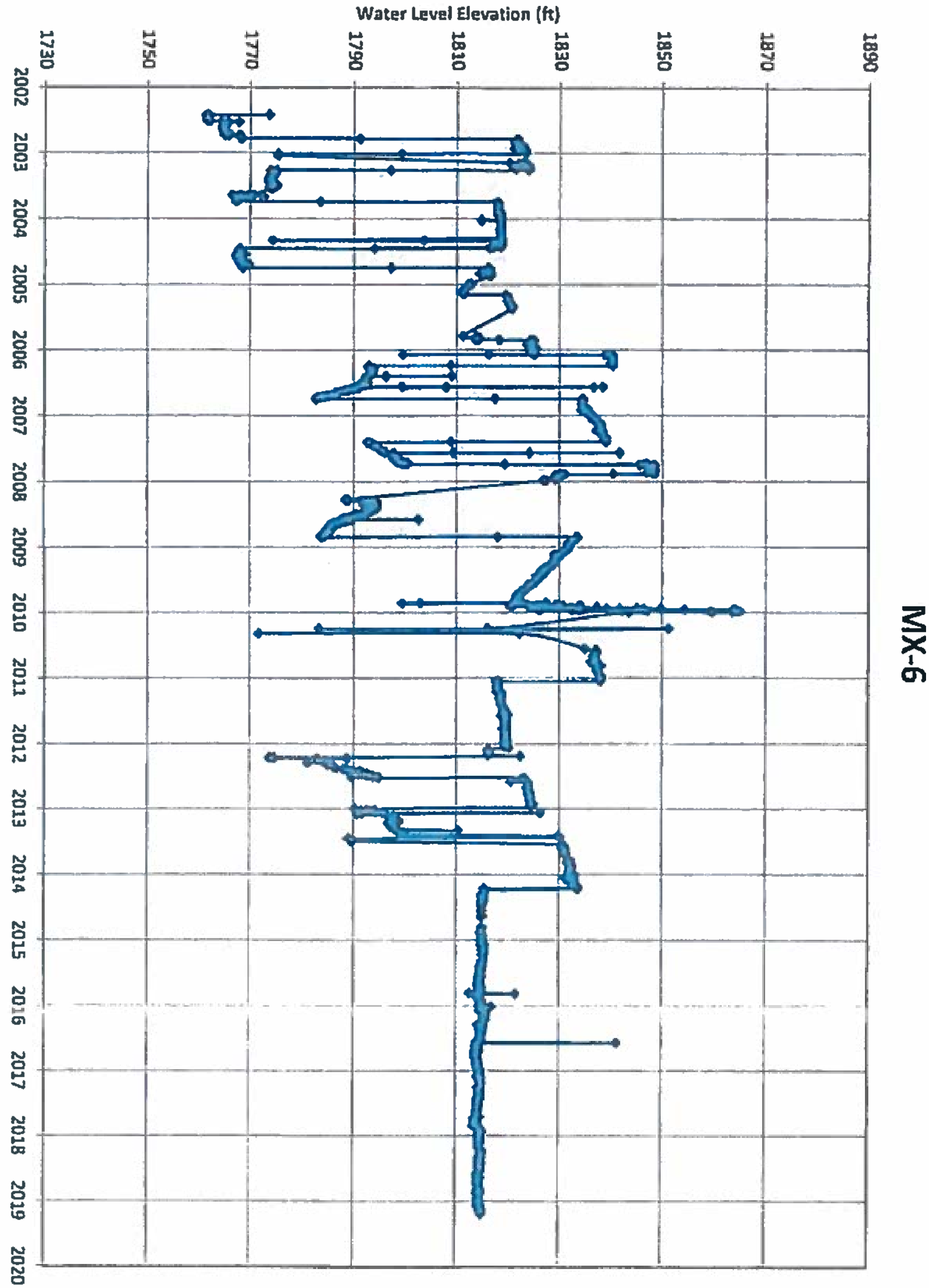
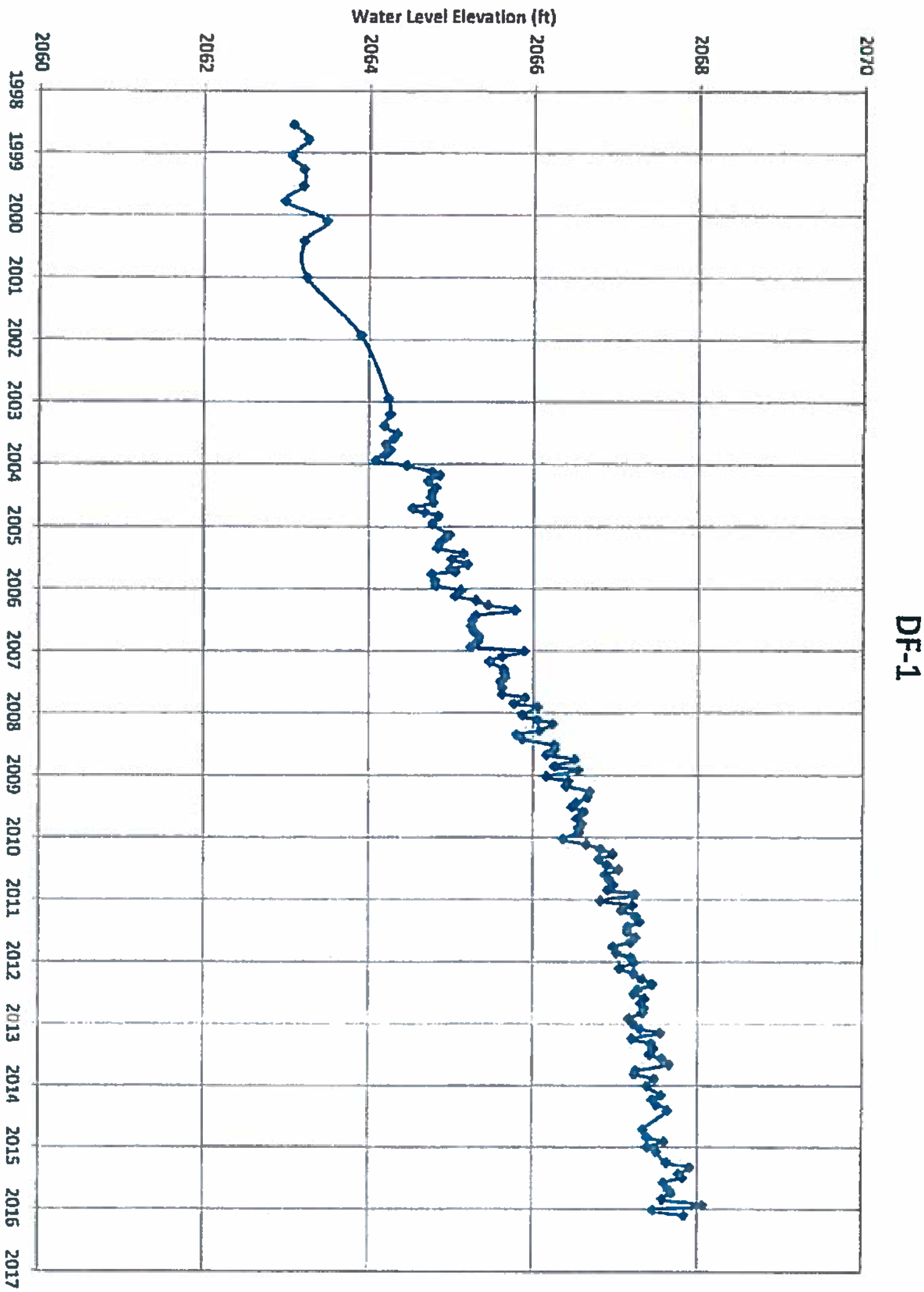
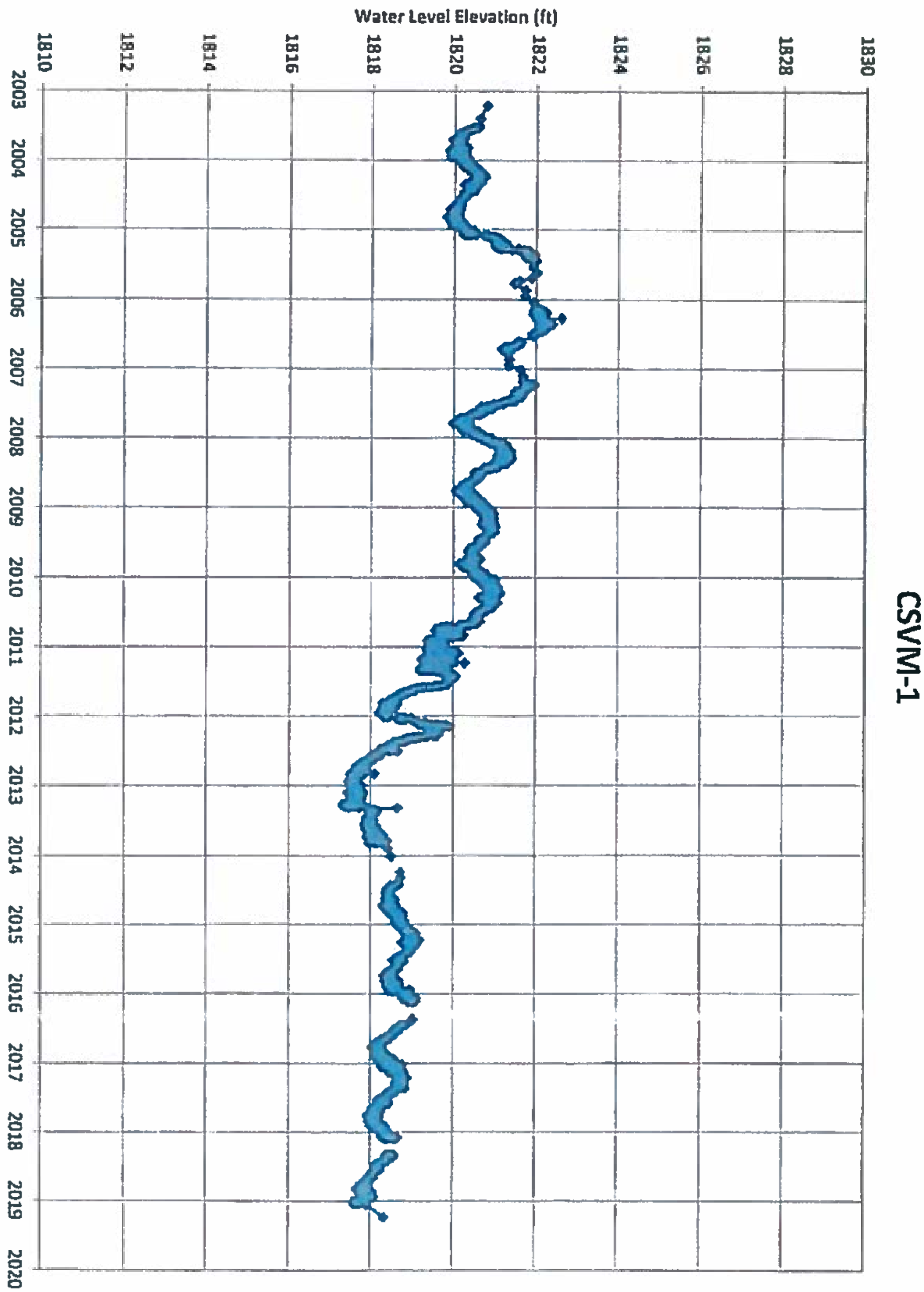
2015
2016
2017
2018
2019
2020


MX-6
Water Level Elevation (ft)
1730
1750
1770
1790
1810
1830
1850
1870
1890
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020


DF-1
Water Level Elevation (ft)
2060
2062
2064
2066
2068
2070
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017

SE ROA 36268


CSVM-1
Water Level Elevation (ft)
1810
1812
1814
1816
1818
1820
1822
1824
1826
1828
1830
2003
2004
2005
2006
2007
2008
2009
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2014
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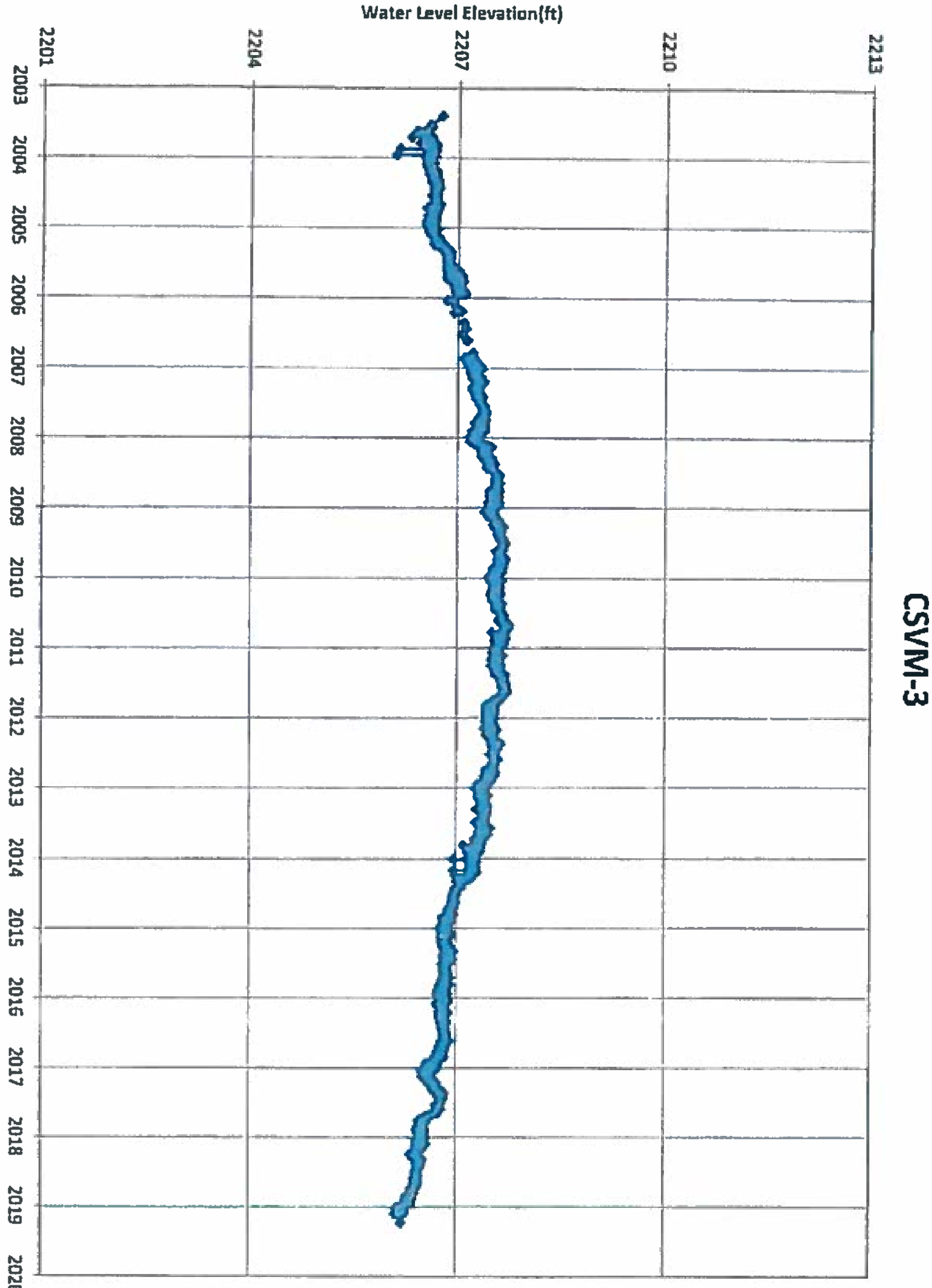
2016
2017
2018
2019
2020

SE ROA 36269


CSVM-3
Water Level Elevation(ft)
2201
2204
2207
2210
2213
2003
2004
2005
2006
2007
2008
2009
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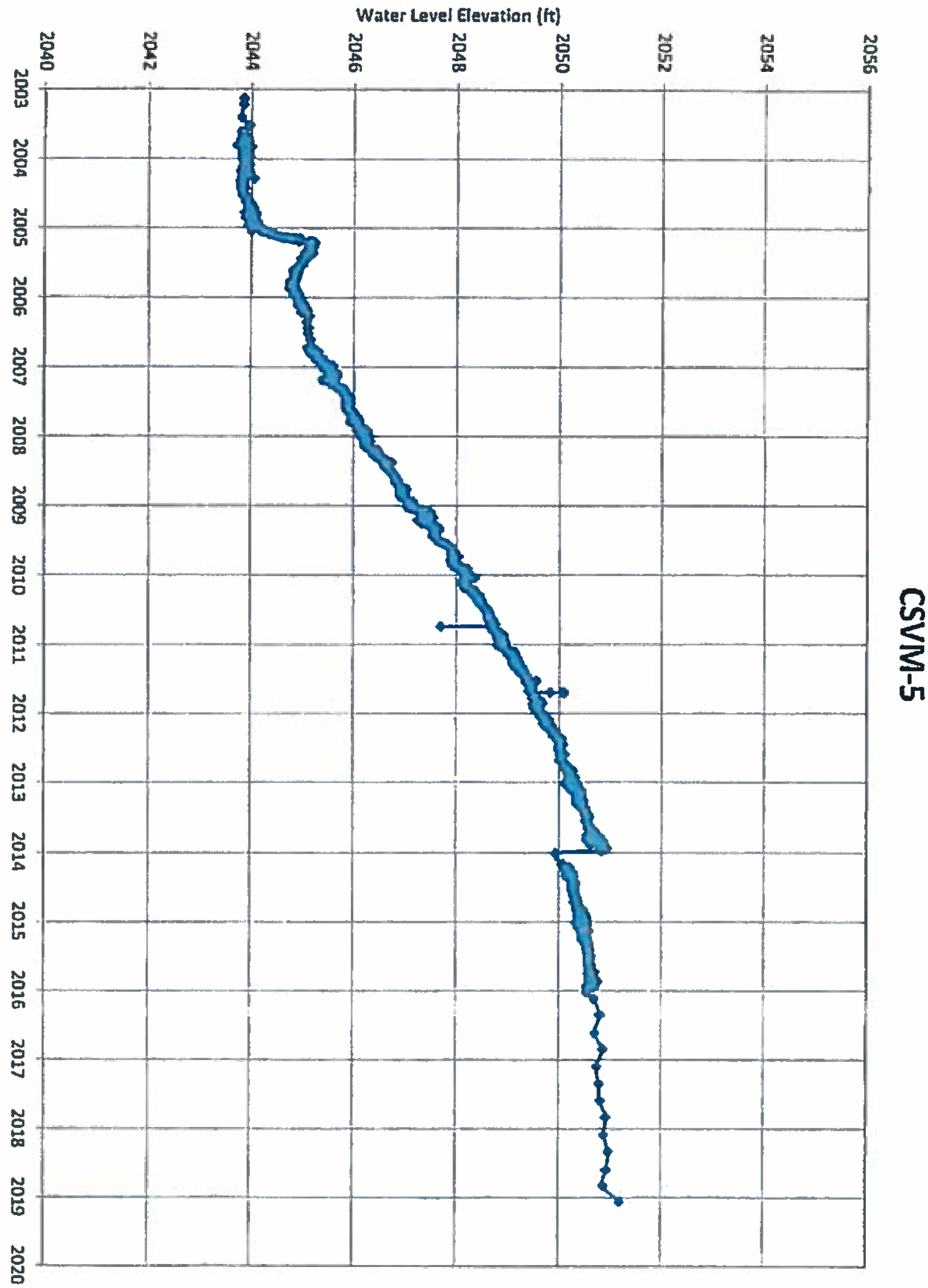
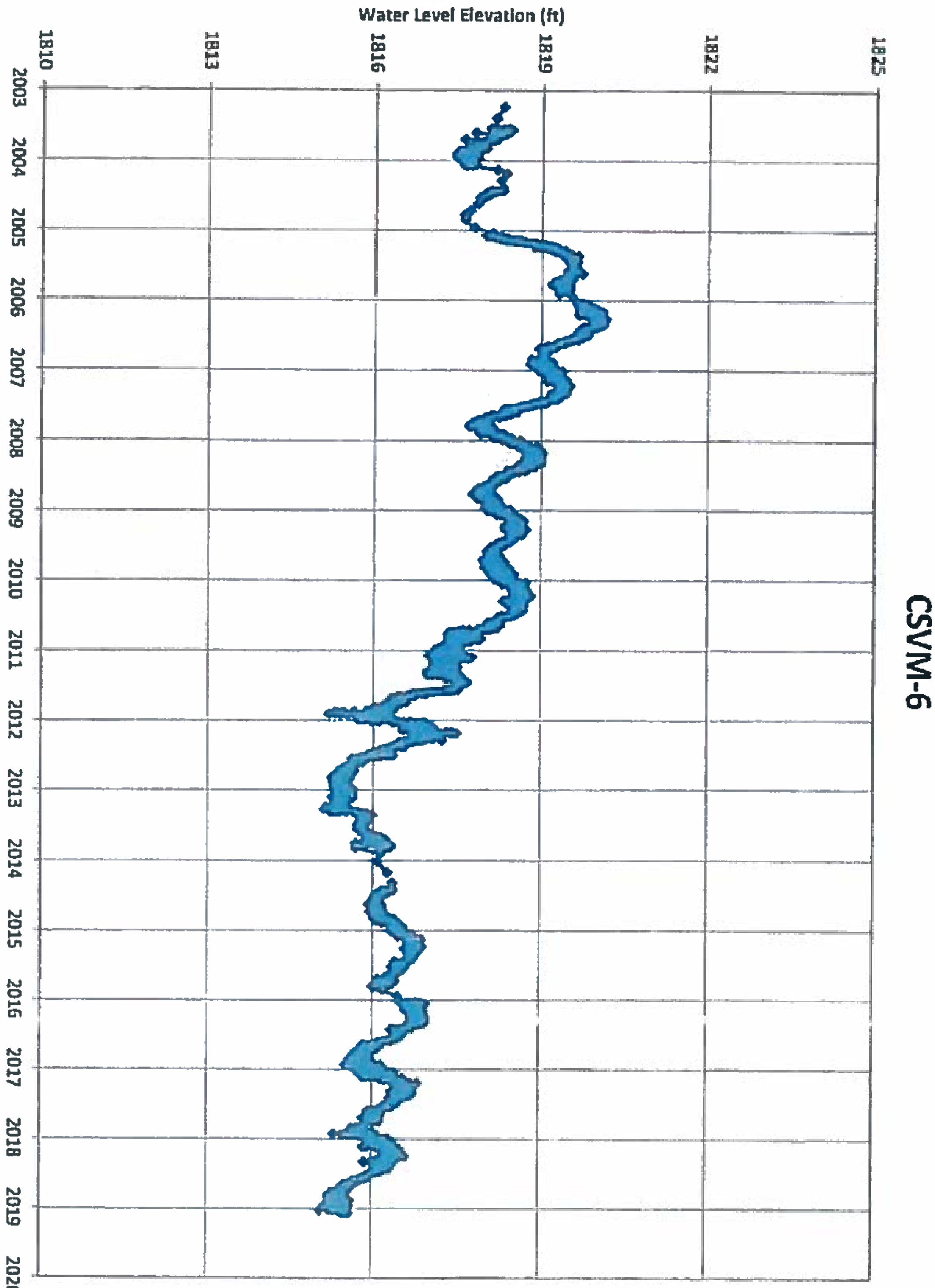
2016
2017
2018
2019
2020


CSVM-5
Water Level Elevation (ft)
2040
2042
2044
2046
2048
2050
2052
2054
2056
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020

SE ROA 36271


CSVM-6
Water Level Elevation (ft)
1810
1813
1816
1819
1822
1825
2003
2004
2005
2006
2007
2008
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2010
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2013
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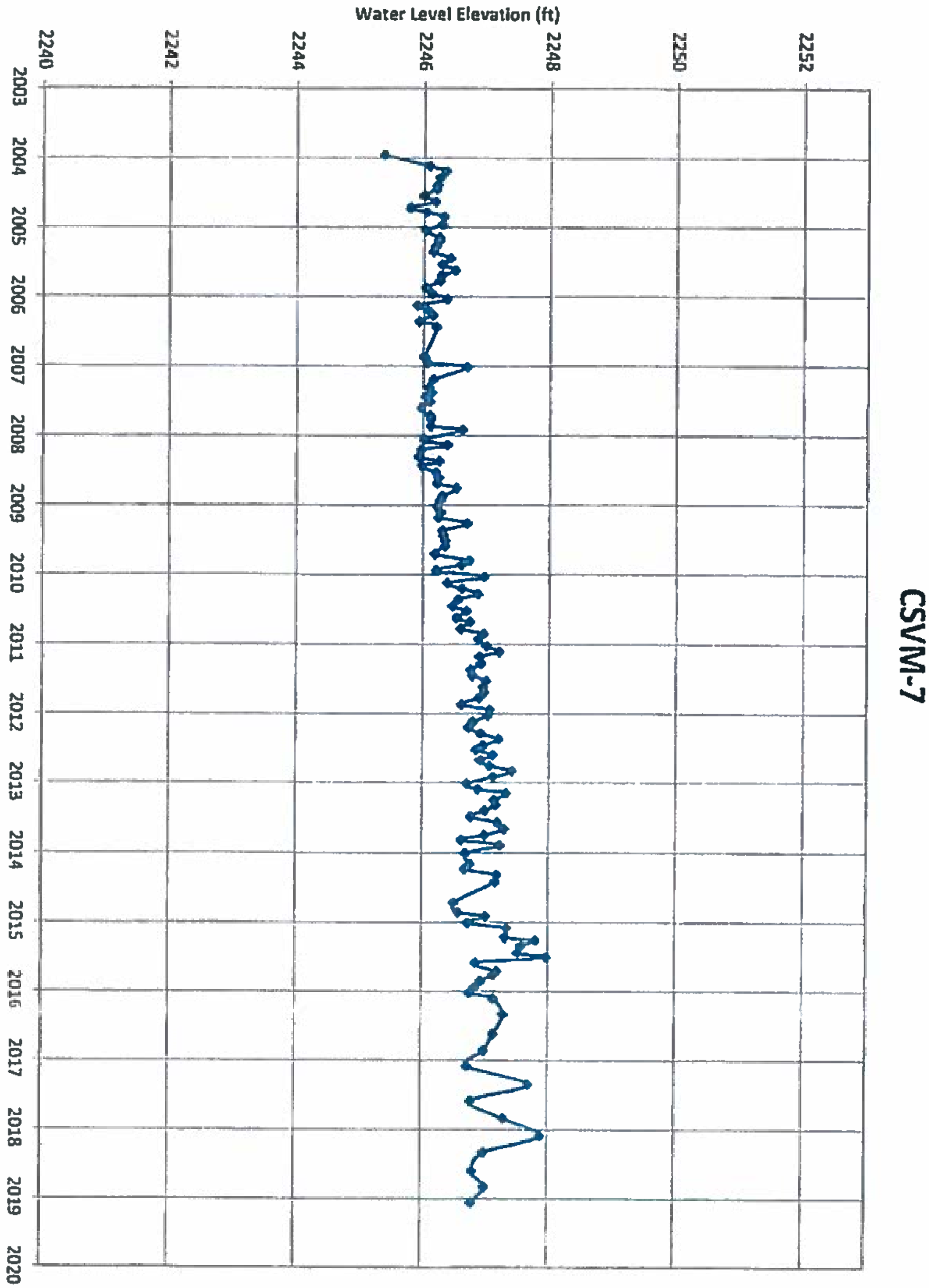
2015
2016
2017
2018
2019
2020


CSVM-7
Water Level Elevation (ft)
2240
2242
2244
2246
2248
2250
2252
2003
2004
2005
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2007
2008
2009
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2011
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2013
2014
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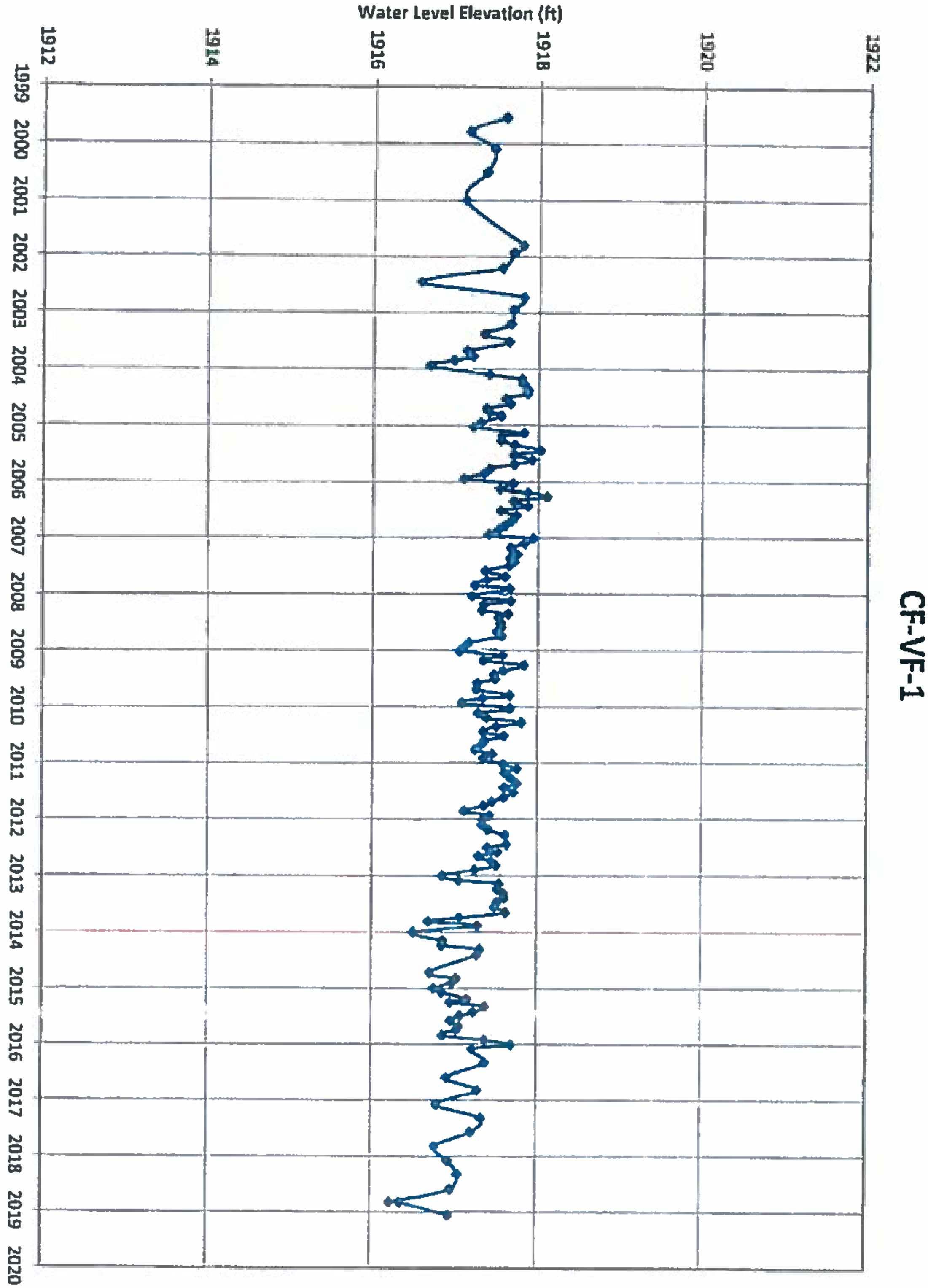
2016
2017
2018
2019
2020

SE ROA 36273


CF-VF-1
Water Level Elevation (ft)
1912
1914
1916
1918
1920
1922
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
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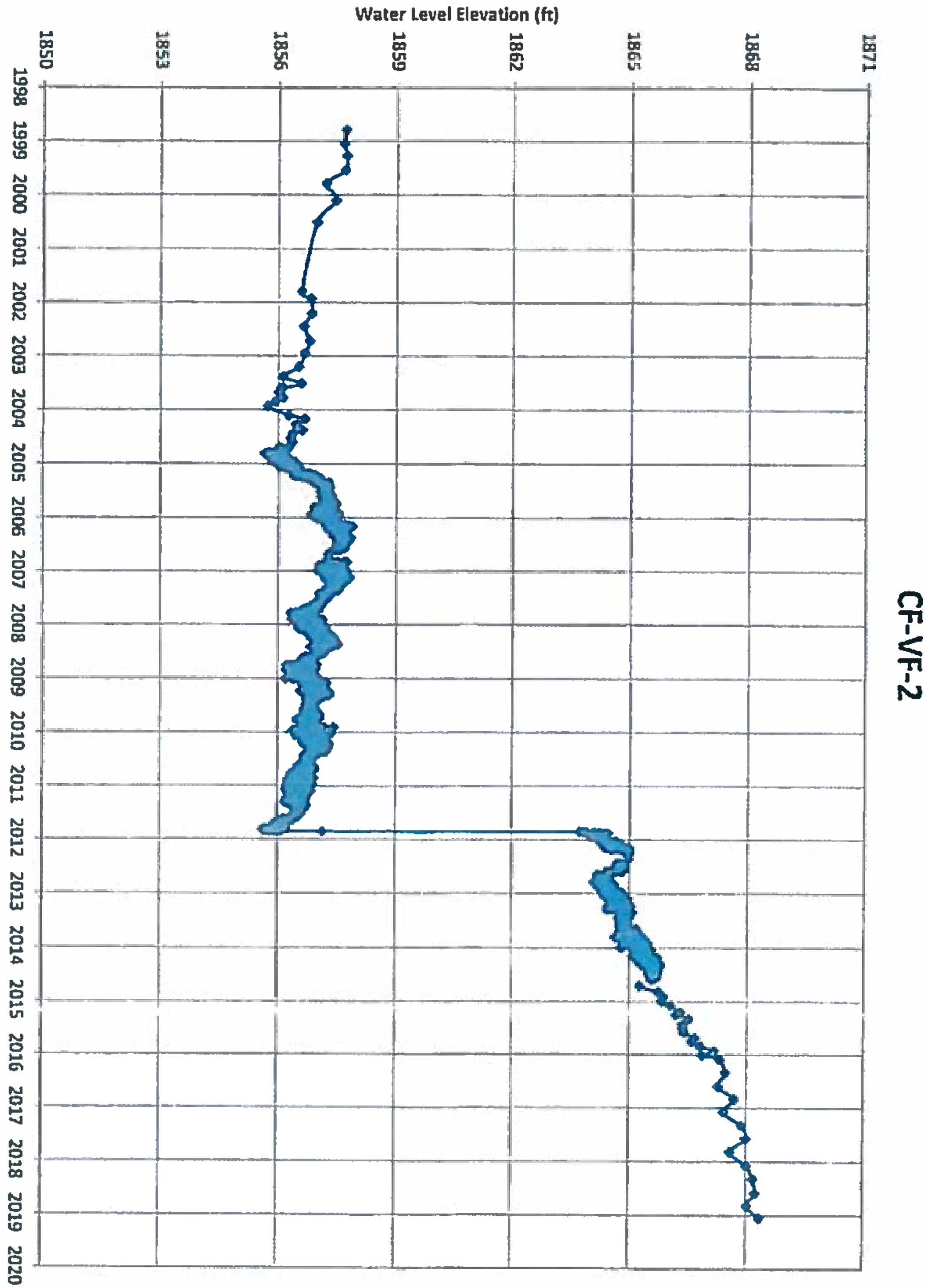
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020

SE ROA 36274


CF-VF-2
Water Level Elevation (ft)
1850
1853
1856
1859
1862
1865
1868
1871
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
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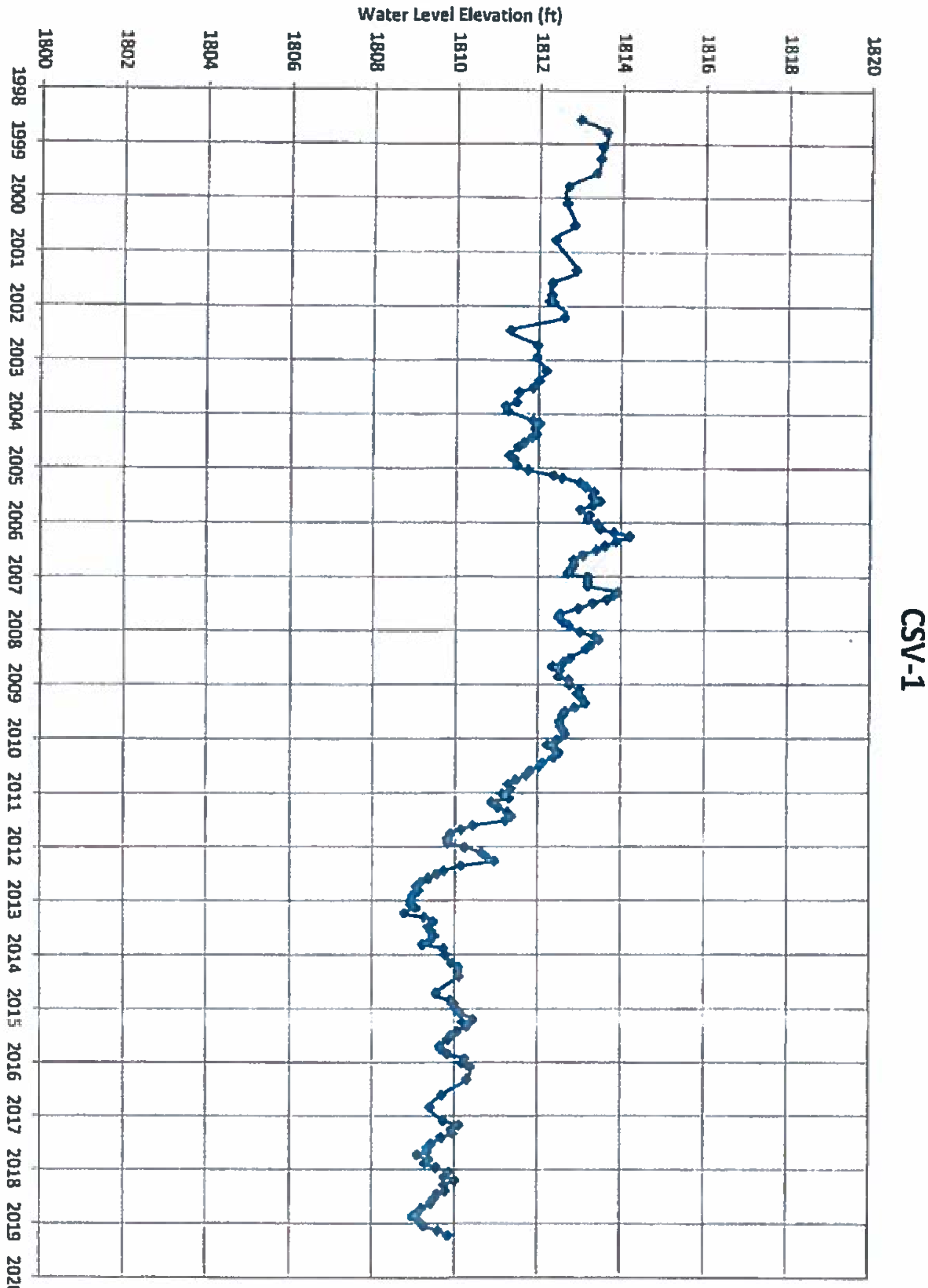
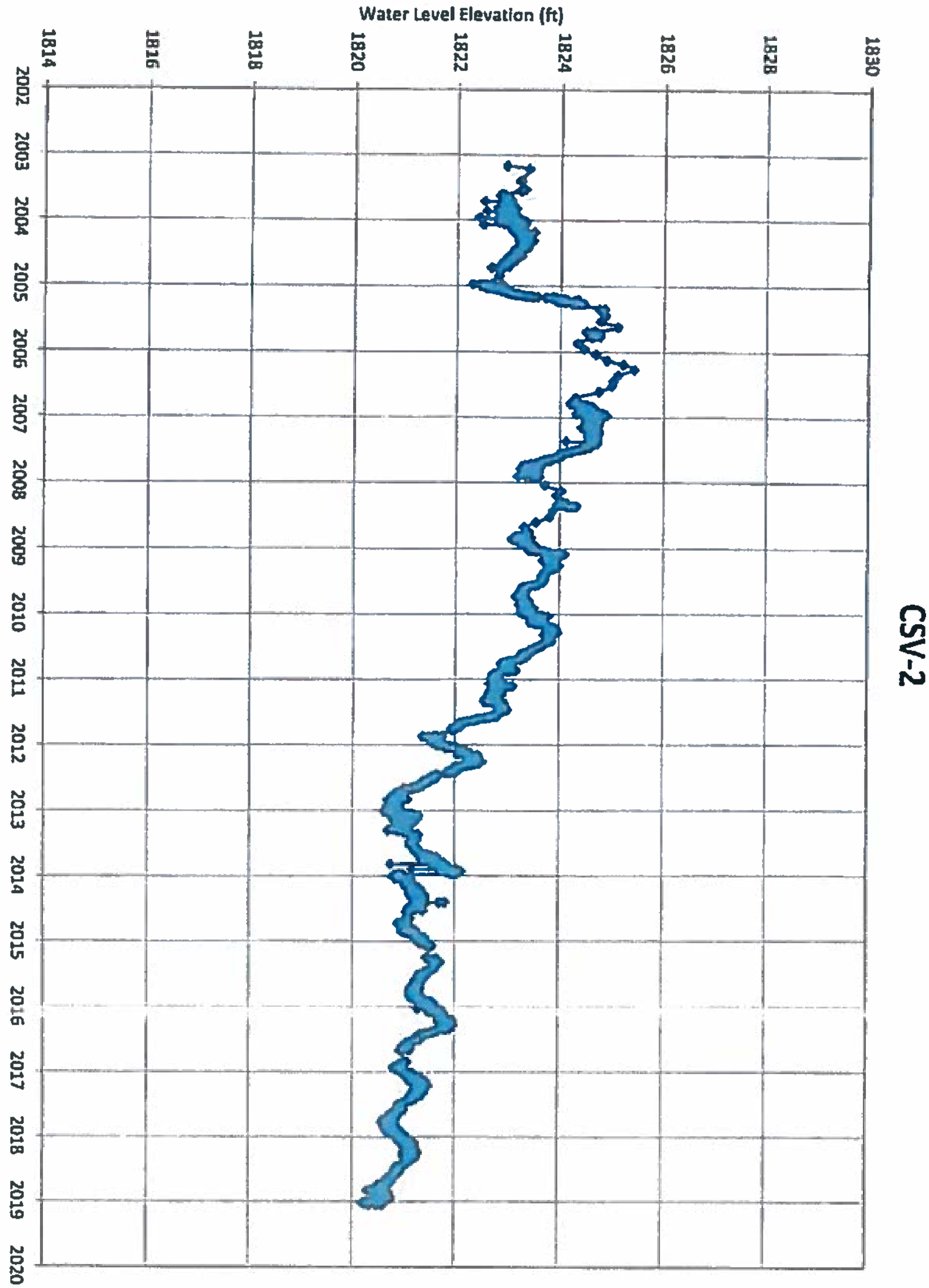
2019
2020

SE ROA 36275


CSV-1
Water Level Elevation (ft)
1800 1802 1804 1806 1808 1810 1812 1814 1816 1818 1820
1998 1999 1999 2000 2000 2001 2001 2002 2002 2003 2003 2004 2004 2005 2005 2006 2006 2007 2007 2008 2008 2009 2009 2010 2010 2011 2011 2012 2012 2013 2013 2014 2014 2015 2015 2016 2016 2017 2017 2018 2018 2019 2019 2020


CSV-2
Water Level Elevation (ft)
1814
1816
1818
1820
1822
1824
1826
1828
1830
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
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2013
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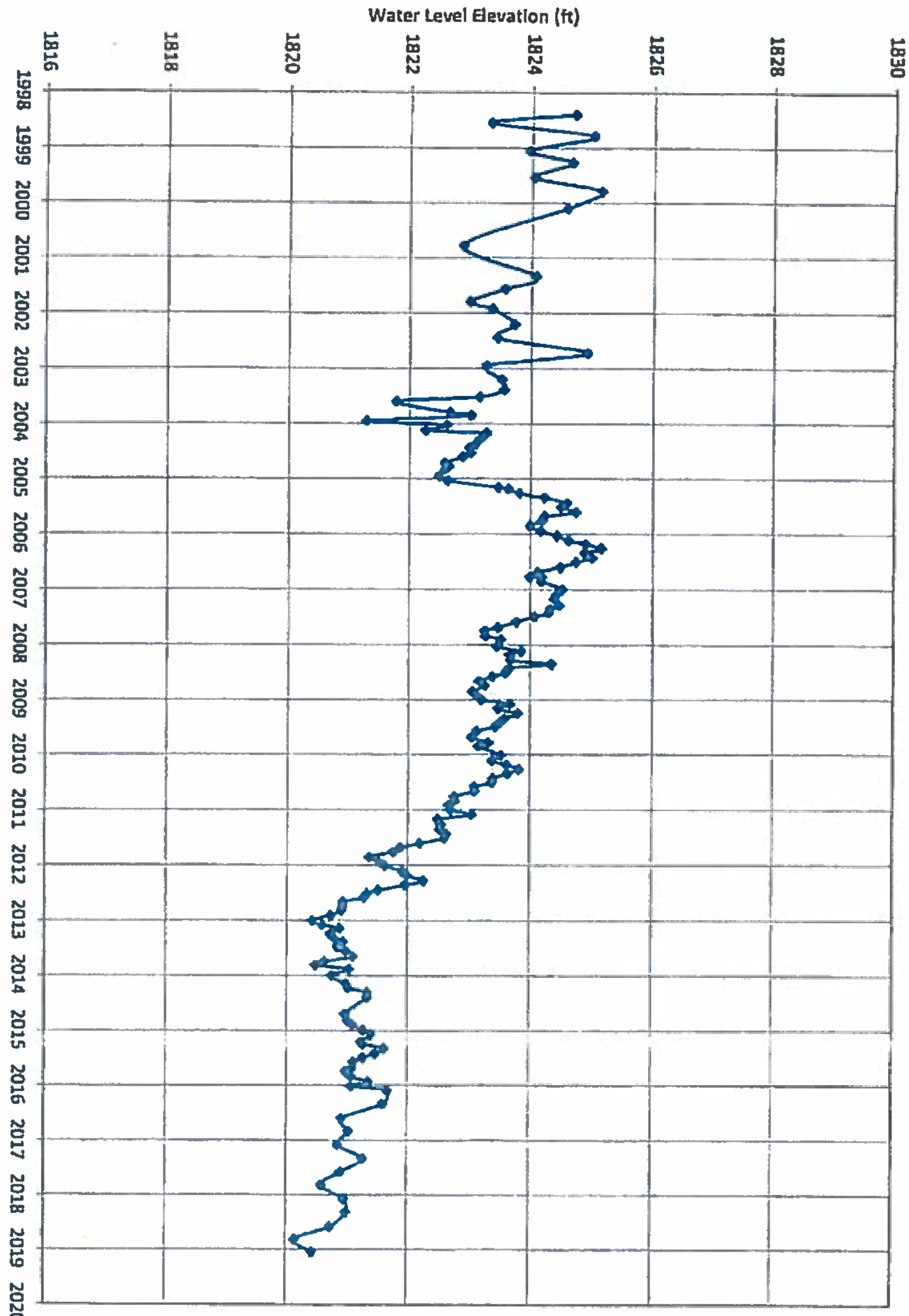
2015
2016
2017
2018
2019
2020

SE ROA 36277

CSV-3



Water Level Elevation (ft)
1816
1818
1820
1822
1824
1826
1828
1830
1998
1999
2000
2001
2002
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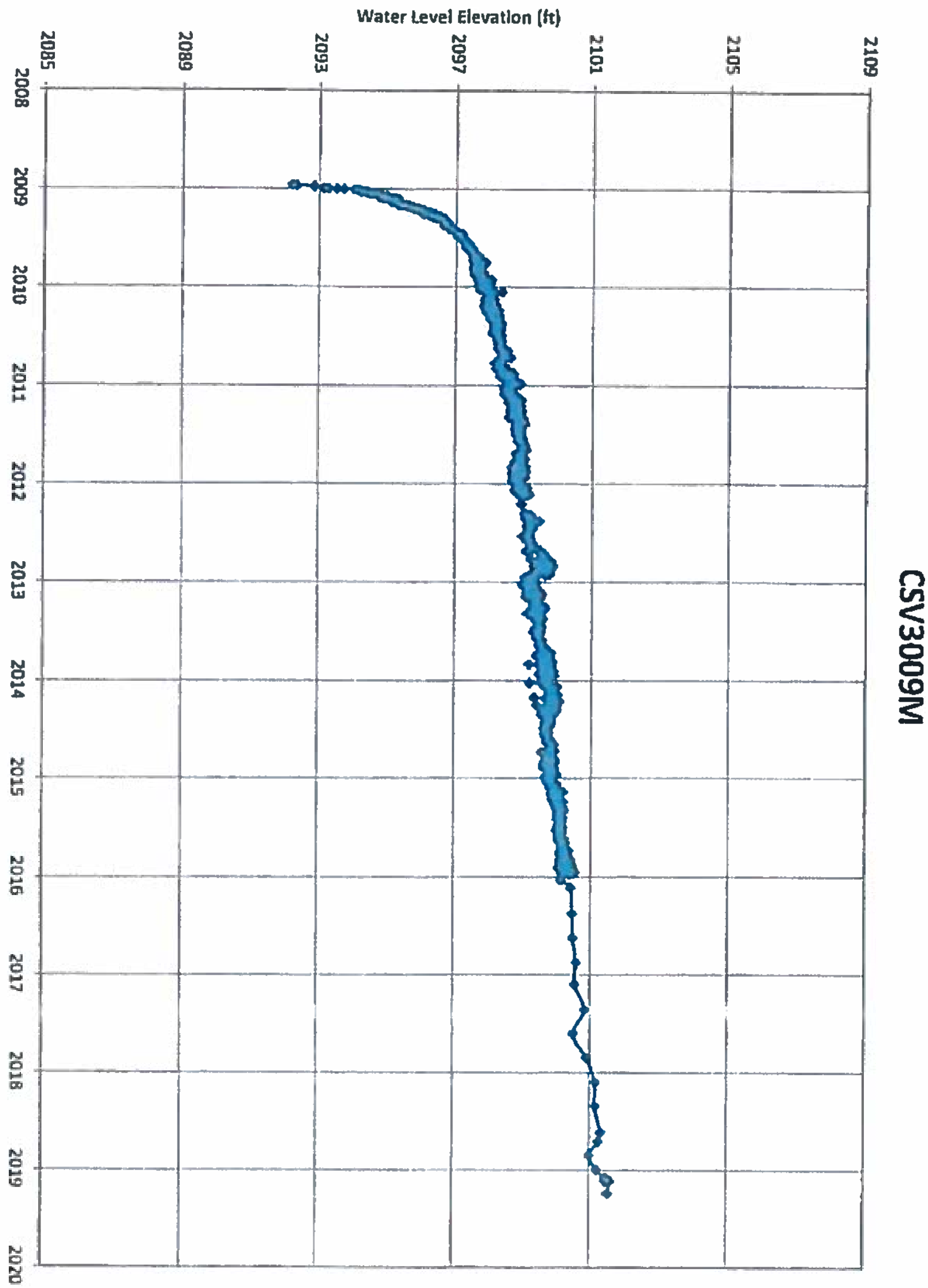
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020


CSV3009M
Water Level Elevation (ft)
2085
2089
2093
2097
2101
2105
2109
2008
2009
2010
2011
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2013
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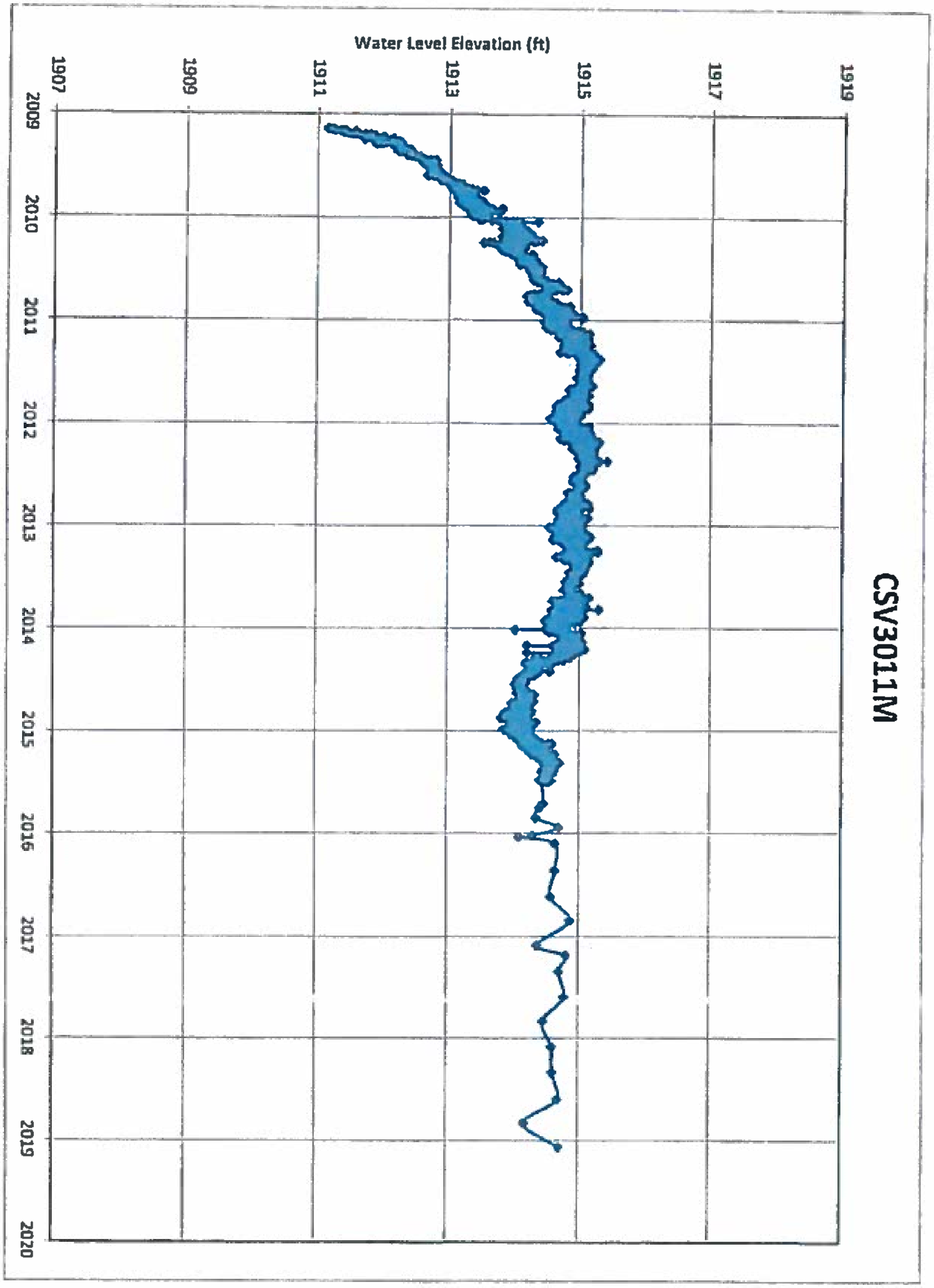
2015
2016
2017
2018
2019
2020



CSV3011M
Water Level Elevation (ft)
1907
1909
1911
1913
1915
1917
1919
2009
2010
2011
2012
2013
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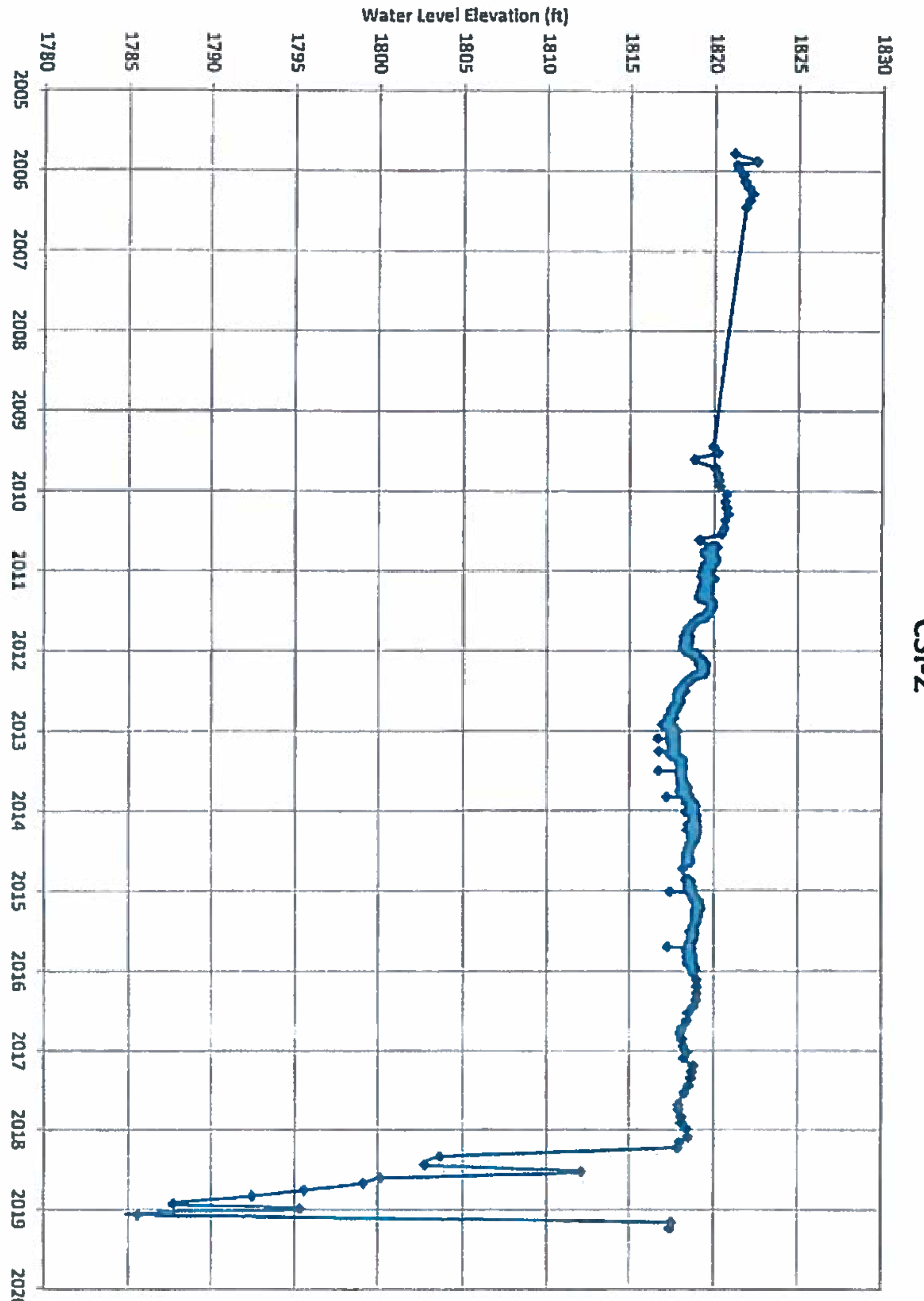
2016
2017
2018
2019
2020


CSI-2
Water Level Elevation (ft)
1780
1785
1790
1795
1800
1805
1810
1815
1820
1825
1830
2005
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2007
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2009
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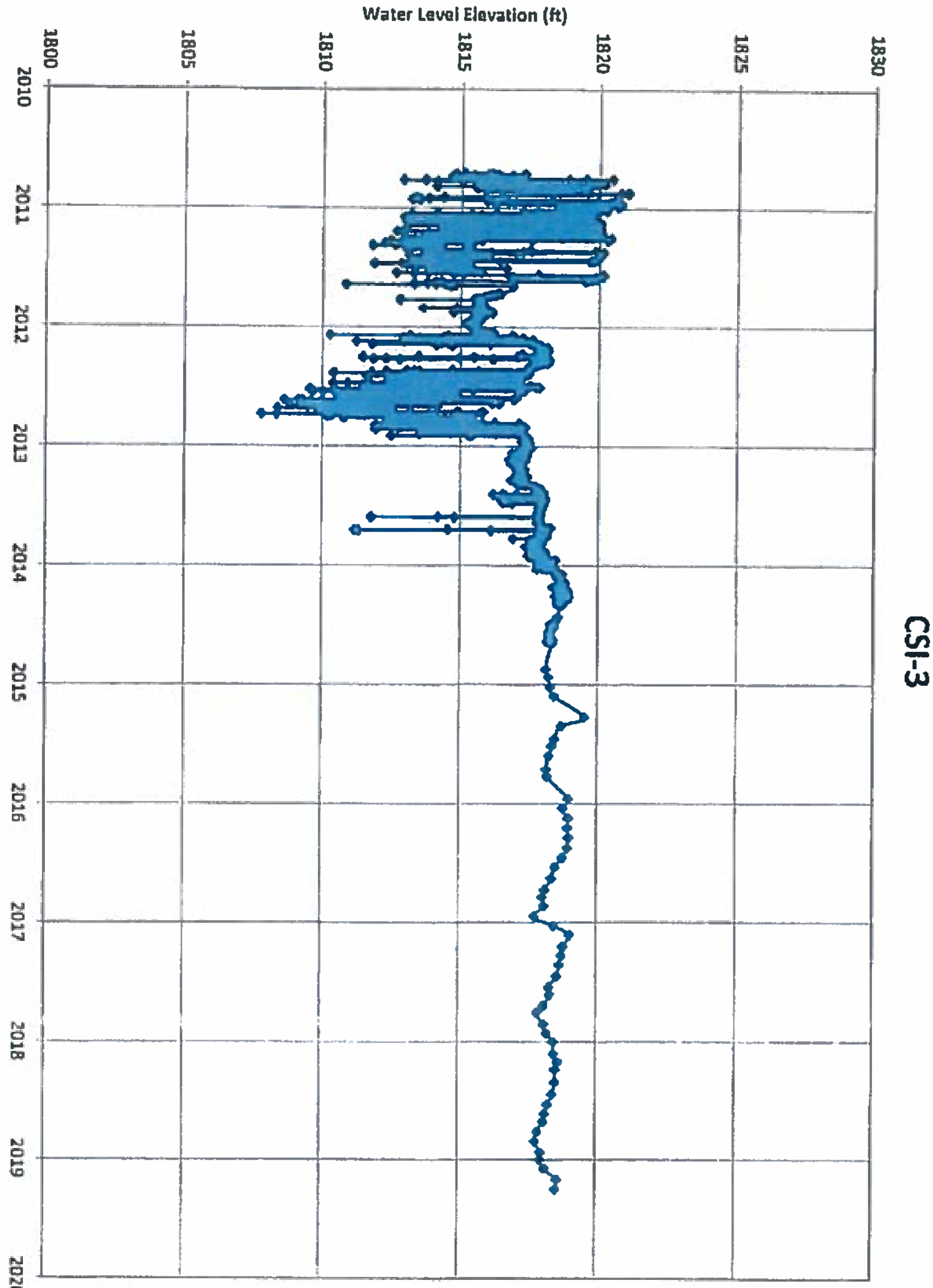
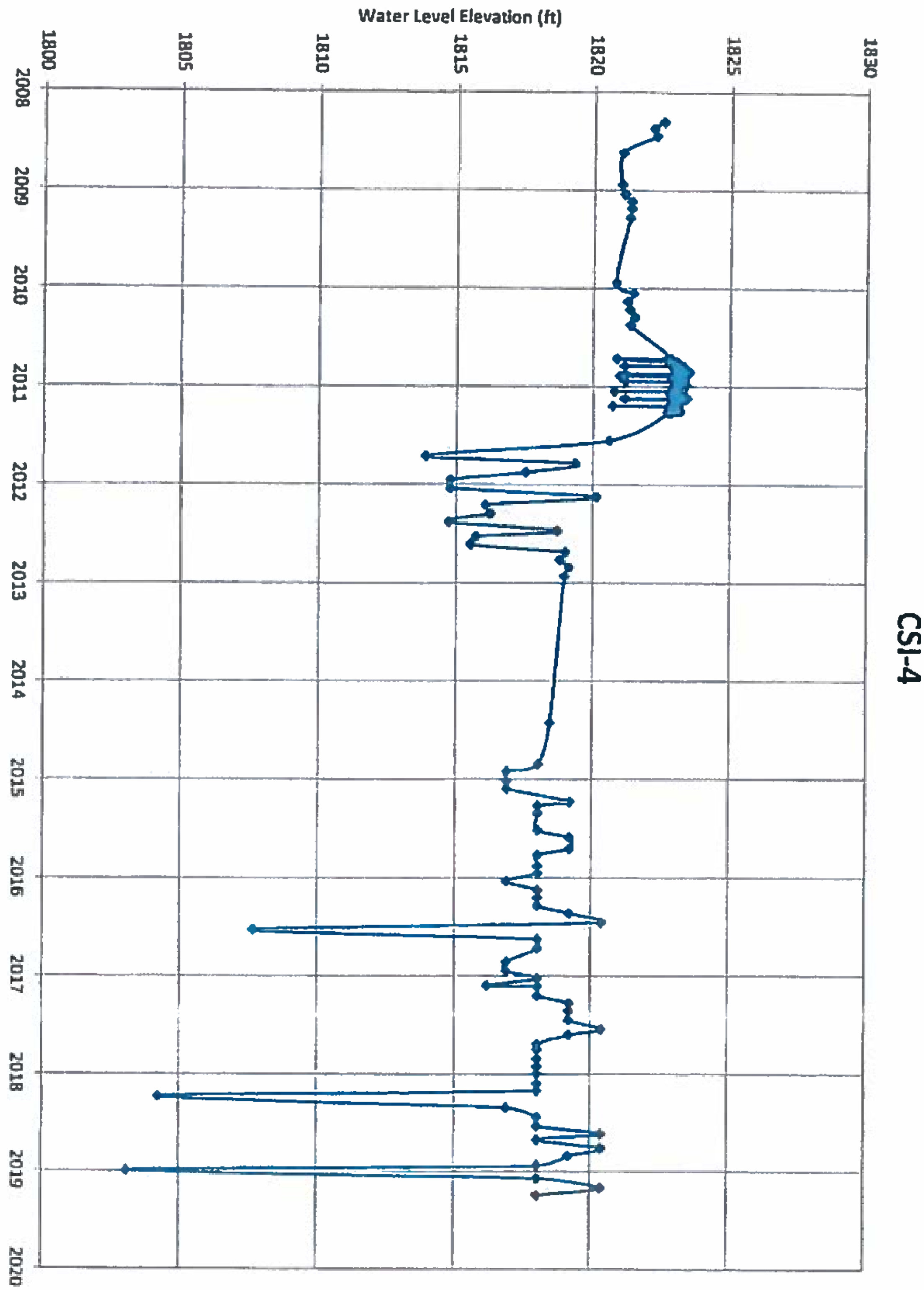
2016
2017
2018
2019
2020

SE ROA 36281

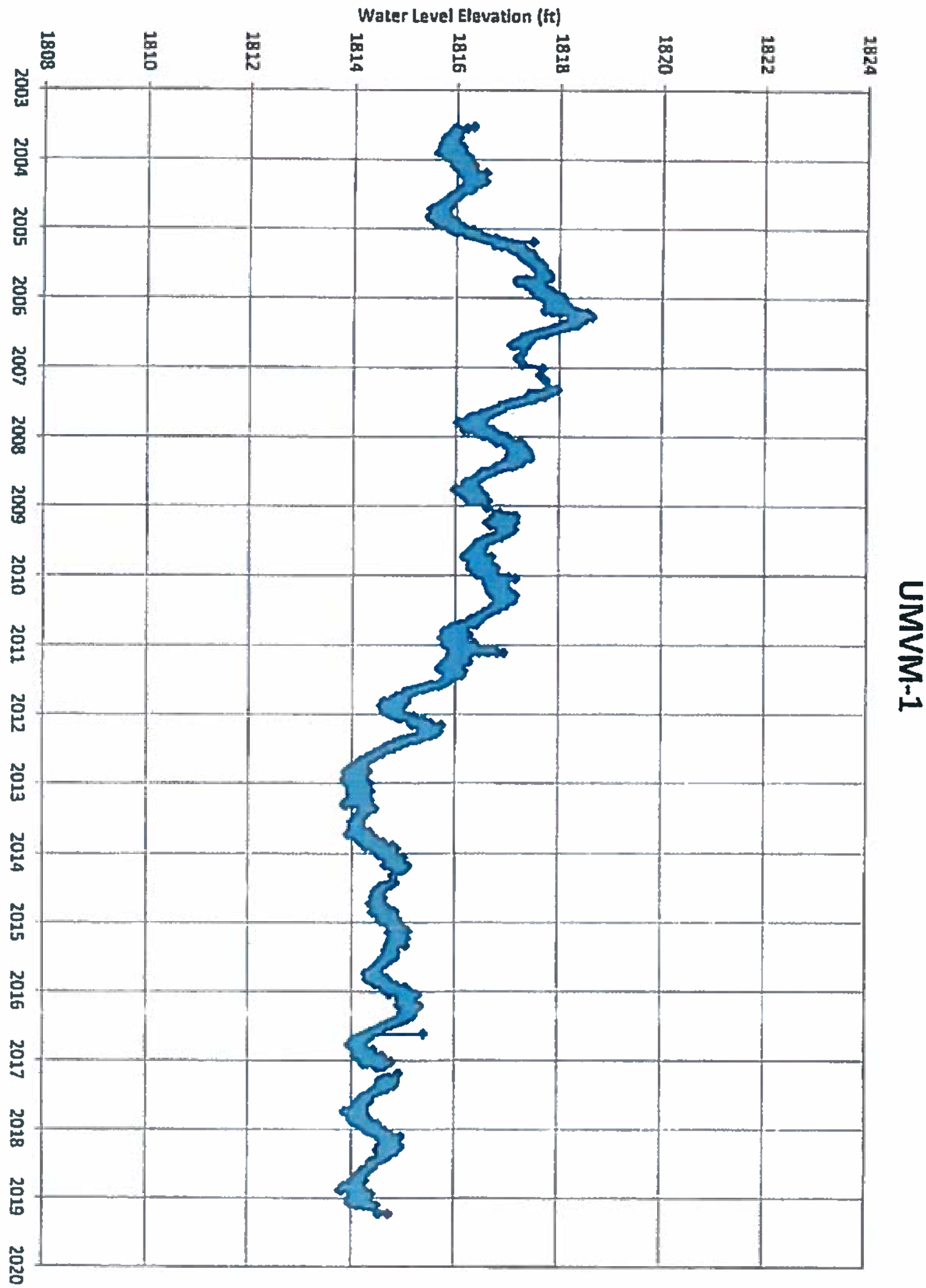

CSI-3
Water Level Elevation (ft)
1800
1805
1810
1815
1820
1825
1830
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020

SE ROA 36282



CSI-4
Water Level Elevation (ft)
1800
1805
1810
1815
1820
1825
1830
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020

SE ROA 36283


UMVM-1
Water Level Elevation (ft)
1808
1810
1812
1814
1816
1818
1820
1822
1824
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020

VIDLER
WATER. QUALITY. LIFE.

May 8, 2019

Adam Sullivan
Deputy State Administrator
State of Nevada, Division of Water Resources
901 South Stewart St.
Carson City, NV, 89701

Subject: Quarterly update of ongoing data collection in Kane Springs Valley Hydrographic Basin No. 13-206, Lincoln County, Nevada.

Dear Mr. Sullivan,

This letter summarizes the ongoing data collection activities in the Kane Springs Valley Hydrographic Basin. Instrumentation consisting of totalizing rain gauges, tipping bucket rain gauges, runoff event dataloggers, and chloride collectors, were initially installed in October 2007. In December 2009 soil temperature sensors were installed in two places. The following is a summary of the data that has been collected until April 16, 2019 (from equipment installation through the second quarter of the 2019 water year). It should be noted that this is all raw data being reported with no analysis or data interpretation.

Precipitation

Three totalizing rain gauges from NovaLynx (Model 260-2510) were installed on October 31, 2007 (K-PT-01, K-PT-02, and K-PT-03) at elevations of 4.401, 3,747, and 2,919 feet above mean sea level (ft msl), respectively (Figure 1). The NovaLynx rain gauge has a total capacity of 20 inches of rainfall. Several millimeters of mineral oil are added to the rain gauge to prevent evaporation of the rainwater following precipitation events before staff can visit the site to read the data. Two additional totalizing rain gauges were installed in December 2008 (K-PT-04 and K-PT-05) at elevations of 4,401 and 6,456 ft msl, respectively. In addition, a six-inch diameter tipping bucket rain gauge with datalogger (TE525-L, Campbell Scientific, Inc.) was installed at the K-PT-01 location on December 4, 2008. The rain gauges are downloaded and/or measured approximately every three months by staff.

Table 1 summarizes the precipitation data recorded from the totalizing rain gauges between visits. Table 2 summarizes the monthly total precipitation for Kane Springs RAWS station (downloaded from the Western Regional Climate Center website) along with the monthly precipitation data from the tipping bucket at K-PT-01.

Runoff

In order to measure runoff in the Kane Springs Valley basin, nine Tru Track Ltd. Water height recorders were installed throughout the basin in October 2007 (K-S-01 through K-S-09) Figure 1. The WT-HR 1000 1-meter water height datalogger uses a capacitive sensor, and datalogger that is set to collect data at 20-minute intervals. Five of these were installed in the main wash, while four were installed in smaller side washes. Data are downloaded from the dataloggers approximately every three months. Figures 2 through 10 summarize the average daily stage values of these instruments over the 2019 water year. Data presented in these figures represent raw data. Raw baseline water height data were set to zero inches above stream bed.

In addition, channel depth profiles were measured at each of the Tru Track datalogger location. The slope of the channel was measured at the location of the profile using a surveying level.

Chloride

Chloride in precipitation was sampled using collectors that were stationed at each of the three initial rain gauge locations (K-PT-01, K-PT-02, and K-PT-03; Figure 1). The precipitation collectors consisted of a funnel that was connected to a 500-mL Nalgene bottle that contained a small layer of laboratory-grade mineral oil to prevent evaporation of the precipitation. These collectors were emptied when the rain gauges were visited by staff, on average every three months. The chloride samples were sent to Western Environmental Testing Laboratory (WETLAB), Inc. in Sparks, Nevada for analysis. Table 3 displays the results of the chloride analysis measured from precipitation.

Runoff samples were collected for chloride analysis using storm samplers from Nalgene. Three storm water samplers were installed in wash locations adjacent to Tru Track dataloggers (Figure 1). The samplers were buried in the washes exposing only the top to collect any runoff that might occur. They can collect a full one liter sample of first flush runoff that occurs in a wash. A ball-valve shuts off the sample once the bottle is full to prevent additional storms from filling the bottle. The samplers were emptied approximately every three months by staff and water samples were sent to WETLAB for chloride analysis. Table 4 displays the results of the chloride analysis measured from runoff.

Groundwater-Level Monitoring

Lincoln/Vidler has been collecting manual water level data since the start of activities in late 2007 of well KMW-1. In early 2007, the Southern Nevada Water Authority (SNWA) took over measurements. Wells are measured by hand quarterly by Lincoln County Water District and Vidler Water Company. Figure 11 represents a hydrograph of data for the project well in Kane Springs Valley.

The data presented in this report is raw data with no analysis or data interpretation. Should you have any questions or need additional information, please do not hesitate to contact me at 775.885.5000, ext. 119.

Sincerely,
VIDLER WATER COMPANY

Ryan Hoerth

Ryan Hoerth, P.E.
Project Manager

cc: Wade Poulsen, Lincoln County Water District
Todd Umstot, Daniel B. Stephens & Associates
Levi Kryder, Division of Water Resources

Table 1 - Precipitation Recorded in Totalizing Rain Gages					
Observed Percipitation Water Year	K-PT-01 Elevation 5,090 ft (in/yr)	K-PT-02 Elevation 3,747 ft (in/yr)	K-PT-03 Elevation 2,919 ft (in/yr)	K-PT-04 Elevation 4,401 ft (in/yr)	K-PT-05 Elevation 6,456 ft (in/yr)
2008	8.54	7.24	3.84	---	---
2009	6.18	8.66	5.97	6.18	6.98
2010	12.11	8.69	6.12	8.4	2.99*
2011	20.82	13.23	5.95	14.04	12.13
2012	13.18	7.25	4.35	7.65	6.63**
2013	16.53	8.45	4.85	8.57	10.24
2014	9.2	5.60¨	6.7	5.72	7.06
2015	11.73	7.24	5.91	7.33	7.16
2016	13.34	12.76	8.89	9.54	7.87
2017	17.08	12.14	6.73	12.16	7.57
2018	6.14	4.67	2.21	4.51	4.47
2019	16.04	9.42	4.39	8.72	---

*Totalizer was found knocked over in December 2009, June 2010 , and September 2010

**Totalizer was found knocked over in December 2011 and September 2012

¨Totalizer was found knocked over in June 2014

ND - No Data could not reach site due to snow.

Table 2 Monthly Total Precipitation Measured at the Kane Spring RAWS Station and the K-PT-01 Tipping Bucket

Date	RAWS	K-PT-01	Date	RAWS	K-PT-01	Date	RAWS	K-PT-01
Oct-2007	0.00	---	Oct-2008	0.65	---	Oct-2009	0.01	0.01
Nov-2007	0.24	---	Nov-2008	0.26	---	Nov-2009	0.10	0.10
Dec-2007	0.22	---	Dec-2008	0.09	2.00	Dec-2009	0.74	2.39
Jan-2008	1.04	---	Jan-2009	0.07	0.35	Jan-2010	0.55	0.03
Feb-2008	1.79	---	Feb-2009	2.76	3.73	Feb-2010	0.94	0.00
Mar-2008	0.23	---	Mar-2009	0.00	0.00	Mar-2010	0.33	0.00
Apr-2008	0.00	---	Apr-2009	0.77	0.58	Apr-2010	0.09	0.40
May-2008	0.96	---	May-2009	0.05	0.30	May-2010	0.00	0.10
Jun-2008	0.00	---	Jun-2009	0.16	0.37	Jun-2010	0.08	0.07
Jul-2008	1.18	---	Jul-2009	0.17	0.32	Jul-2010	0.01	0.39
Aug-2008	0.18	---	Aug-2009	0.23	0.10	Aug-2010	0.27	0.45
Sep-2008	0.00	---	Sep-2009	0.01	0.15	Sep-2010	0.05	0.01
Total for 2008 Water Year	5.84	---	Total for 2009 Water Year	5.22	7.90	Total for 2010 Water Year	3.17	3.95

Date	RAWS	K-PT-01	Date	RAWS	K-PT-01	Date	RAWS	K-PT-01
Oct-2010	2.04	1.66	Oct-2011	1.97	3.28	Oct-2012	0.51	0.81
Nov-2010	0.17	0.56	Nov-2011	0.19	0.42	Nov-2012	0.00	0.00
Dec-2010	5.51	9.36	Dec-2011	0.46	0.47	Dec-2012	1.67	2.07
Jan-2011	0.00	0.21	Jan-2012	0.39	0.49	Jan-2013	0.67	0.83
Feb-2011	1.99	1.49	Feb-2012	0.43	1.05	Feb-2013	0.31	0.48
Mar-2011	0.66	1.17	Mar-2012	0.27	1.52	Mar-2013	0.91	0.87
Apr-2011	0.20	0.22	Apr-2012	0.41	0.45	Apr-2013	0.23	0.06
May-2011	0.45	0.67	May-2012	0.00	0.00	May-2013	0.19	0.75
Jun-2011	0.00	0.00	Jun-2012	0.00	0.00	Jun-2013	0.00	0.00
Jul-2011	0.47	1.03	Jul-2012	1.47	0.81	Jul-2013	1.61	2.55
Aug-2011	0.10	0.15	Aug-2012	1.55	1.74	Aug-2013	0.93	2.23
Sep-2011	0.48	0.21	Sep-2012	0.08	1.3	Sep-2013	1.00	4.09
Total for 2011 Water Year	12.07	16.73	Total for 2012 Water Year	7.22	11.53	Total for 2013 Water Year	8.03	14.74

Date	RAWS	K-PT-01	Date	RAWS	K-PT-01	Date	RAWS	K-PT-01
Oct-2013	0.49	0.67	Oct-2014	0.00	0.00	Oct-2015	2.38	2.97
Nov-2013	1.04	1.40	Nov-2014	0.08	0.22	Nov-2015	0.36	0.35
Dec-2013	0.00	0.10	Dec-2014	1.57	1.91	Dec-2015	0.04	0.59
Jan-2014	0.22	0.20	Jan-2015	0.57	0.58	Jan-2016	4.00	3.65
Feb-2014	1.10	1.86	Feb-2015	0.62	0.51	Feb-2016	0.09	0.48
Mar-2014	0.40	0.32	Mar-2015	0.61	0.91	Mar-2016	0.21	0.29
Apr-2014	0.75	0.44	Apr-2015	0.29	0.50	Apr-2016	1.69	2.23
May-2014	0.03	0.18	May-2015	1.43	1.96	May-2016	0.53	0.56
Jun-2014	0.01	0.00	Jun-2015	0.42	2.01	Jun-2016	0.59	0.61
Jul-2014	0.10	0.57	Jul-2015	0.62	0.32	Jul-2016	1.08	0.39
Aug-2014	1.77	2.28	Aug-2015	0.08	0.62	Aug-2016	0.91	0.74
Sep-2014	0.69	0.87	Sep-2015	0.36	0.27	Sep-2016	0.01	0.28
Total for 2014 Water Year	6.60	8.89	Total for 2015 Water Year	6.65	9.84	Total for 2016 Water Year	11.89	13.14

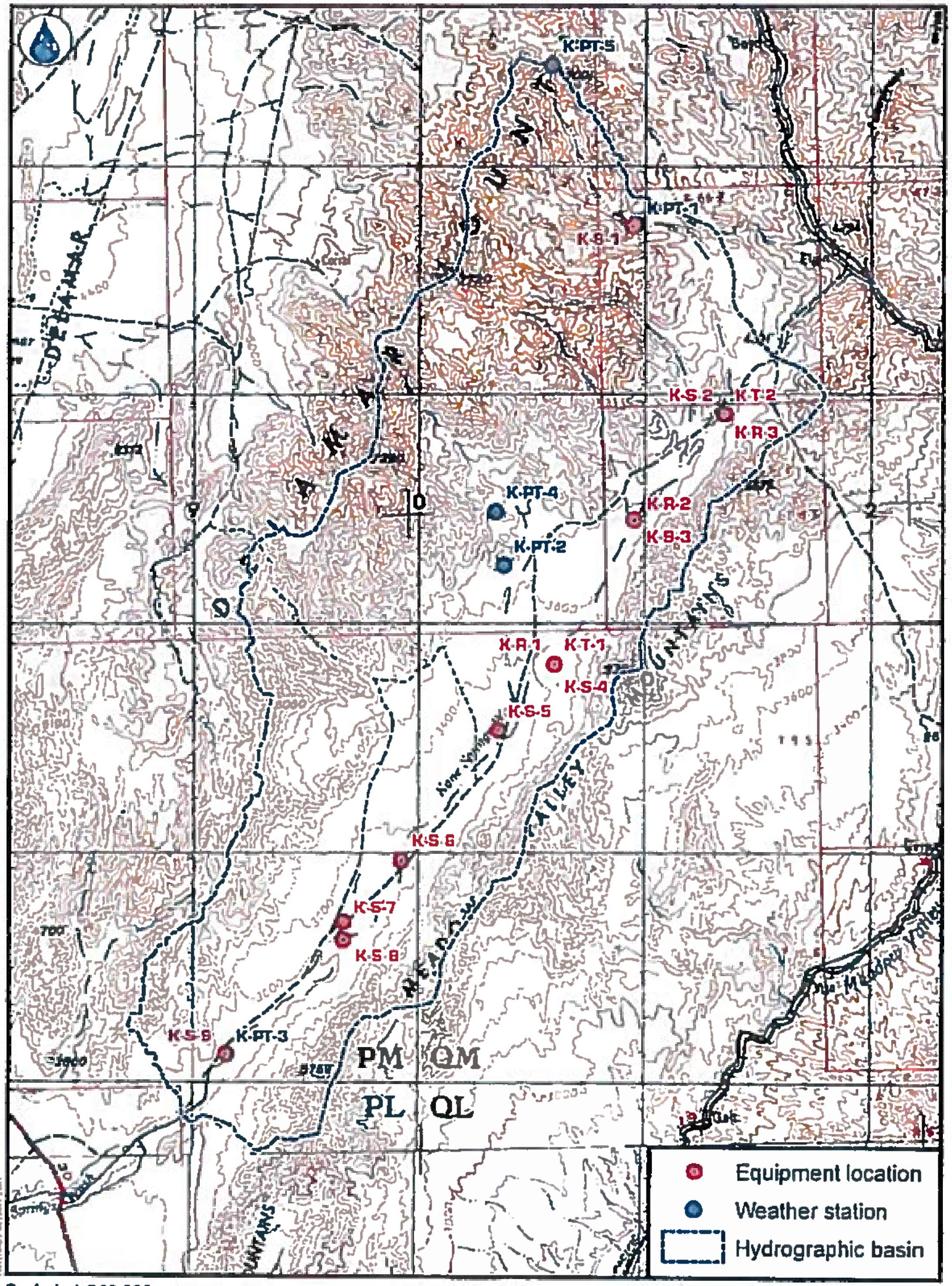
Date	RAWS	K-PT-01	Date	RAWS	K-PT-01	Date	RAWS	K-PT-01
Oct-2016	0.53	0.64	Oct-2017	0.00	0.00	Oct-2018	1.61	1.88
Nov-2016	0.09	0.26	Nov-2017	0.04	0.00	Nov-2018	0.62	0.61
Dec-2016	2.19	5.33	Dec-2017	0.00	0.00	Dec-2018	0.12	0.50
Jan-2017	4.23	2.75	Jan-2018	1.29	ND	Jan-2019	2.91	3.43
Feb-2017	1.25	1.97	Feb-2018	0.01	ND	Feb-2019	1.90	5.71
Mar-2017	0.84	0.65	Mar-2018	0.63	ND	Mar-2019	1.97	2.94
Apr-2017	0.00	0.03	Apr-2018	0.12	0.08	Apr-2019		
May-2017	0.01	0.03	May-2018	0.12	0.33	May-2019		
Jun-2017	0.00	0.01	Jun-2018	0.00	0.00	Jun-2019		
Jul-2017	0.19	5.53	Jul-2018	1.41	1.51	Jul-2019		
Aug-2017	0.55	0.37	Aug-2018	0.19	0.65	Aug-2019		
Sep-2017	0.64	0.06	Sep-2018	0.08	0.31	Sep-2019		
Total for 2017 Water Year	10.52	17.63	Total for 2018 Water Year	3.89	2.88	Total for 2019 Water Year	9.13	14.87

ND - No Data (tipping bucket was damaged)

Table 3 - Chloride Analysis Measured from Precipitation				
Date	K-PT-01 (mg/L)	K-PT-02 (mg/L)	K-PT-03 (mg/L)	PQL (mg/L)
1/21/2008	0.21	0.49	0.13	0.10
3/17/2008	0.39	0.32	0.26	0.10
5/15/2008	0.88	3.00	NS	0.10
8/12/2008	0.29	0.94	0.73	0.20
12/1/2008	0.22	0.31	0.58	0.10
3/16/2009	0.24	0.29	0.33	0.10
8/6/2009	ND	9.50	<2	2.00
11/12/2009	NS	ND	NS	0.10
2/9/2010	NS	ND	ND	2.50
4/6/2010	0.39	NS	NS	0.50
7/7/2010	NS	1.70	2.00	5.00
9/28/2010	1.20	NS	NS	2.50
12/1/2010	NS	ND	1.50	2.50
3/17/2011	NS	0.17	NS	0.50
12/1/2010	ND	NS	ND	0.50
6/16/2011	ND	ND	ND	2.50
9/28/2011	ND	2.10	ND	0.50
12/14/2011	NS	2.70	2.10	0.50
4/3/2012	1.20	1.00	0.75	0.10
6/13/2012	5.00	1.40	NS	0.15
10/3/2012	1.40	NS	1.90	0.15
12/4/2012	0.41	0.40	0.94	0.10
3/13/2013	0.24	0.90	1.00	0.10
6/13/2013	2.00	NS	NS	0.10
10/15/2013	0.25	0.43	0.65	0.10
1/7/2014	0.28	ND	0.15	0.10
3/18/2014	ND	0.15	0.17	0.10
6/13/2014	0.43	0.51	NS	0.10
10/1/2014	ND	0.26	0.49	0.10
12/10/2014	0.28	NS	NS	0.10
3/11/2015	ND	0.20	0.22	0.10
6/23/2015	0.48	0.37	1.5	0.10
9/23/2015	0.61	0.26	0.32	0.10
3/24/2016	ND	1.30	0.44	0.10
6/16/2016	ND	0.21	0.47	0.10
9/26/2016	0.63	NS	1	0.10
3/30/2017	0.17	0.18	0.31	0.10
6/8/2017	0.82	ND	ND	0.10
9/21/2017	0.73	0.24	0.84	0.10
3/26/2018	0.58	0.68	0.55	0.10
6/28/2018	NS	NS	2.00	0.10
9/25/2018	0.26	NS	1.7	0.10

Table 4 - Chloride Concentration Measured in Runoff				
Sample Location	Collection Date	Collection Time	Result (mg/L)	PQL (mg/L)
K-R-1 Runoff	11/11/2009	10:00	2.90	2.00
K-R-2 Runoff	11/11/2009	16:00	5.80	2.00
K-R-3 Runoff	11/11/2009	15:40	19.00	2.00
K-R-3 Runoff	7/6/2010	16:40	2.50	5.00
K-R-1 Runoff	9/28/2010	14:15	6.80	5.00
K-R-3 Runoff	12/1/2010	14:10	1.50	0.50
K-R-1 Runoff	6/16/2011	18:00	ND	2.50
K-R-3 Runoff	6/16/2011	8:00	8.40	2.50
K-R-1 Runoff	12/14/2011	11:45	2.10	0.50
K-R-3 Runoff	12/14/2011	13:15	0.30	0.50
K-R-1 Runoff	4/3/2012	13:00	15.00	1.00
K-R-2 Runoff	4/3/2012	14:30	4.40	0.10
K-R-3 Runoff	4/3/2012	15:00	2.00	0.10
K-R-1 Runoff	10/3/2012	12:45	6.30	0.15
K-R-2 Runoff	10/3/2012	14:20	4.10	0.15
K-R-3 Runoff	10/3/2012	15:00	1.50	0.15
K-R-1 Runoff	12/4/2012	8:00	5.00	0.10
K-R-3 Runoff	12/4/2012	9:30	2.20	0.10
K-R-1 Runoff	10/15/2013	11:00	1.60	0.10
K-R-2 Runoff	10/15/2013	13:00	0.49	0.10
K-R-3 Runoff	10/15/2013	14:00	0.55	0.10
K-R-3 Runoff	3/18/2014	13:00	0.44	0.10
K-R-1 Runoff	10/1/2014	11:30	1.10	0.10
K-R-2 Runoff	10/1/2014	12:30	0.80	0.10
K-R-3 Runoff	10/1/2014	13:00	0.42	0.10
K-R-3 Runoff	3/11/2015	9:30	0.22	0.10
K-R-1 Runoff	9/23/2015	12:00	1.30	0.10
K-R-2 Runoff	9/23/2015	13:00	0.53	0.10
K-R-3 Runoff	9/23/2015	14:11	0.57	0.10
K-R-1 Runoff	3/24/2016	15:00	0.56	0.10
K-R-2 Runoff	3/24/2016	14:15	0.60	0.10
K-R-3 Runoff	3/24/2016	15:40	1.30	0.10
K-R-1 Runoff	9/26/2016	12:00	3.90	0.10
K-R-3 Runoff	9/26/2016	14:00	0.37	0.10
K-R-1 Runoff	3/30/2017	10:00	2.6	0.10
K-R-3 Runoff	3/30/2017	8:30	5.3	0.10
K-R-1 Runoff	9/25/2018	10:00	1.2	0.10
K-R-2 Runoff	9/25/2018	8:30	0.66	0.10

Figure 1: Kane Springs Valley Equipment Locations



Scale is 1:250,000

5 0 5 10 15

Miles

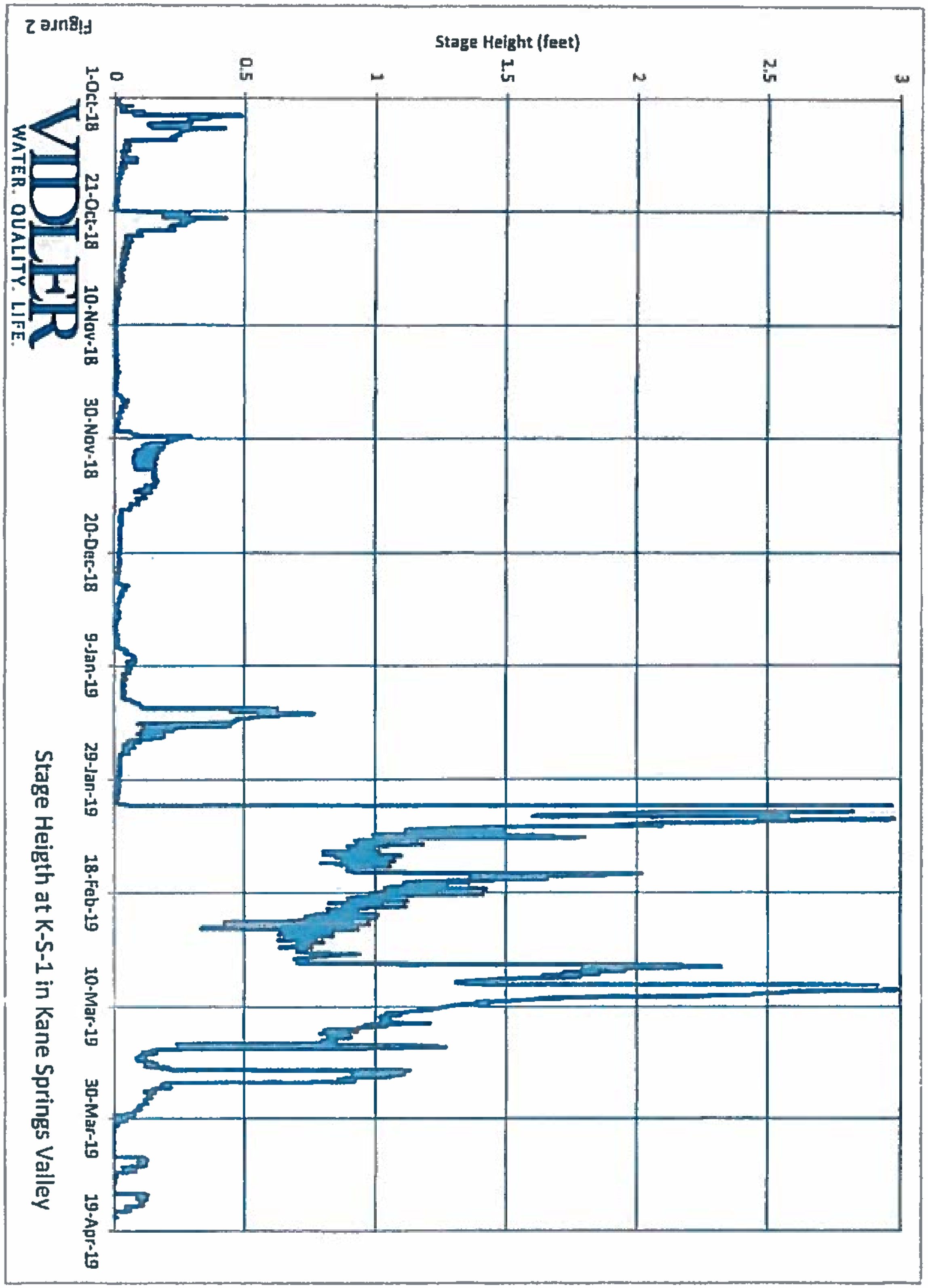


Figure 2
Stage Height (feet)
0
0.5
1
1.5
2
2.5
3
1-Oct-18
21-Oct-18
10-Nov-18
30-Nov-18
20-Dec-18
9-Jan-19
29-Jan-19
18-Feb-19
10-Mar-19
30-Mar-19
19-Apr-19
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Stage Heigth at K-S-1 in Kane Springs Valley

SE ROA 36293

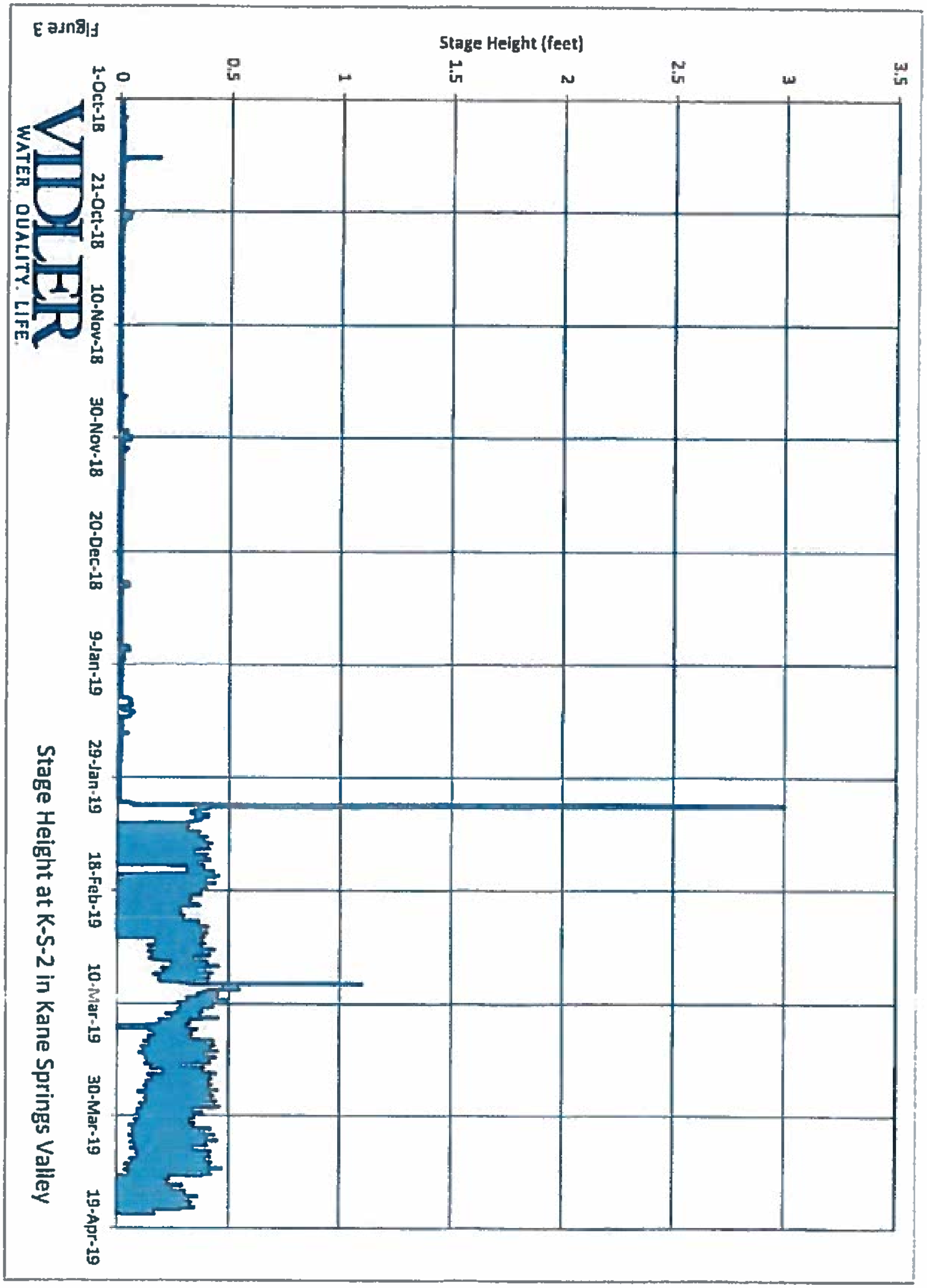
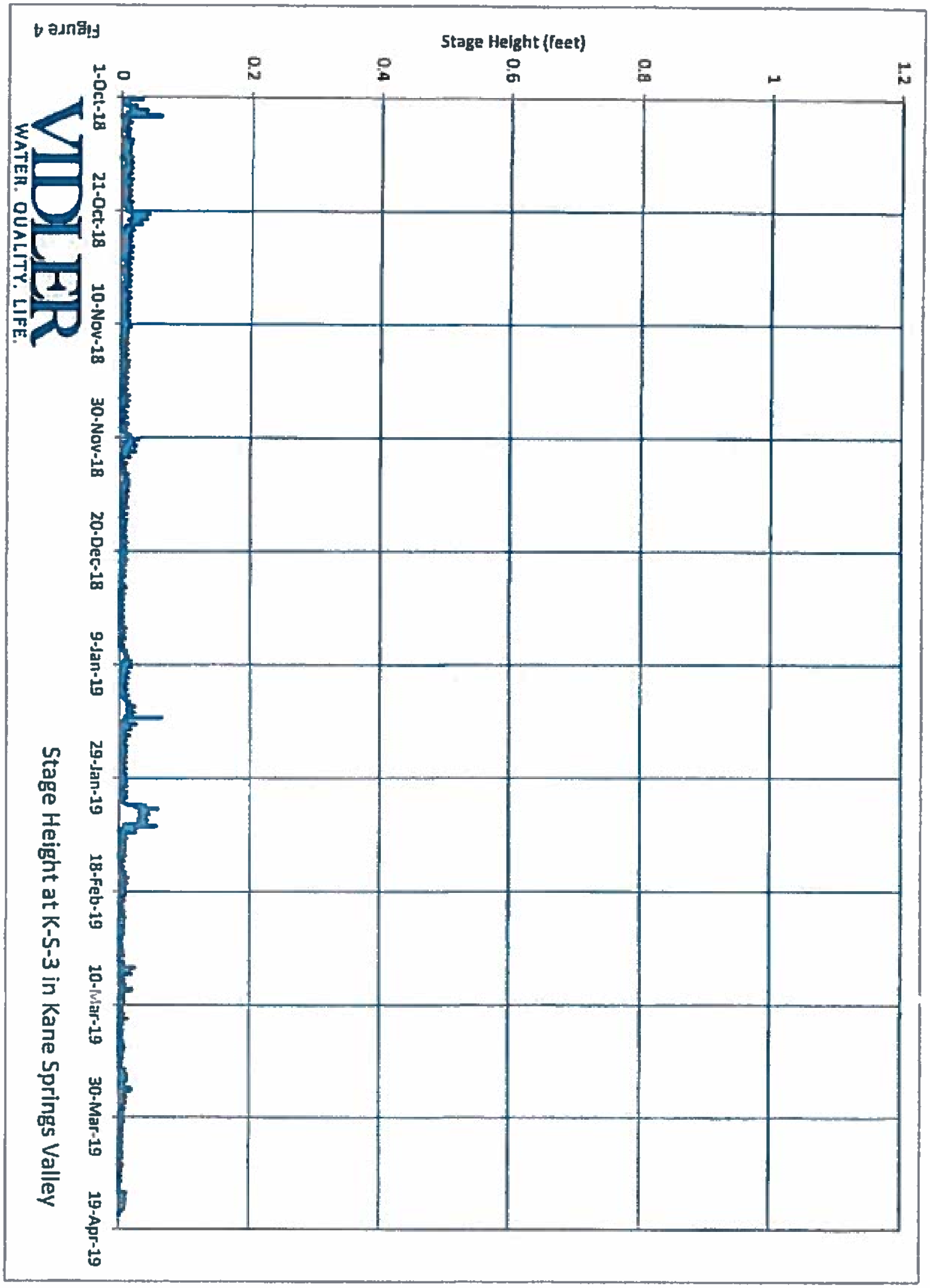


Figure 3
Stage Height at K-S-2 in Kane Springs Valley
Stage Height (feet)
0
0.5
1
1.5
2
2.5
3
3.5
1-Oct-18
21-Oct-18
10-Nov-18
30-Nov-18
20-Dec-18
9-Jan-19
29-Jan-19
18-Feb-19
10-Mar-19
30-Mar-19
19-Apr-19
VIDLER
WATER. QUALITY. LIFE.



Stage Height at K-S-3 in Kane Springs Valley
Stage Height (feet)
0
0.2
0.4
0.6
0.8
1
1.2
1-Oct-18
21-Oct-18
10-Nov-18
30-Nov-18
20-Dec-18
9-Jan-19
29-Jan-19
18-Feb-19
10-Mar-19
30-Mar-19
19-Apr-19
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Figure 4

SE ROA 36295

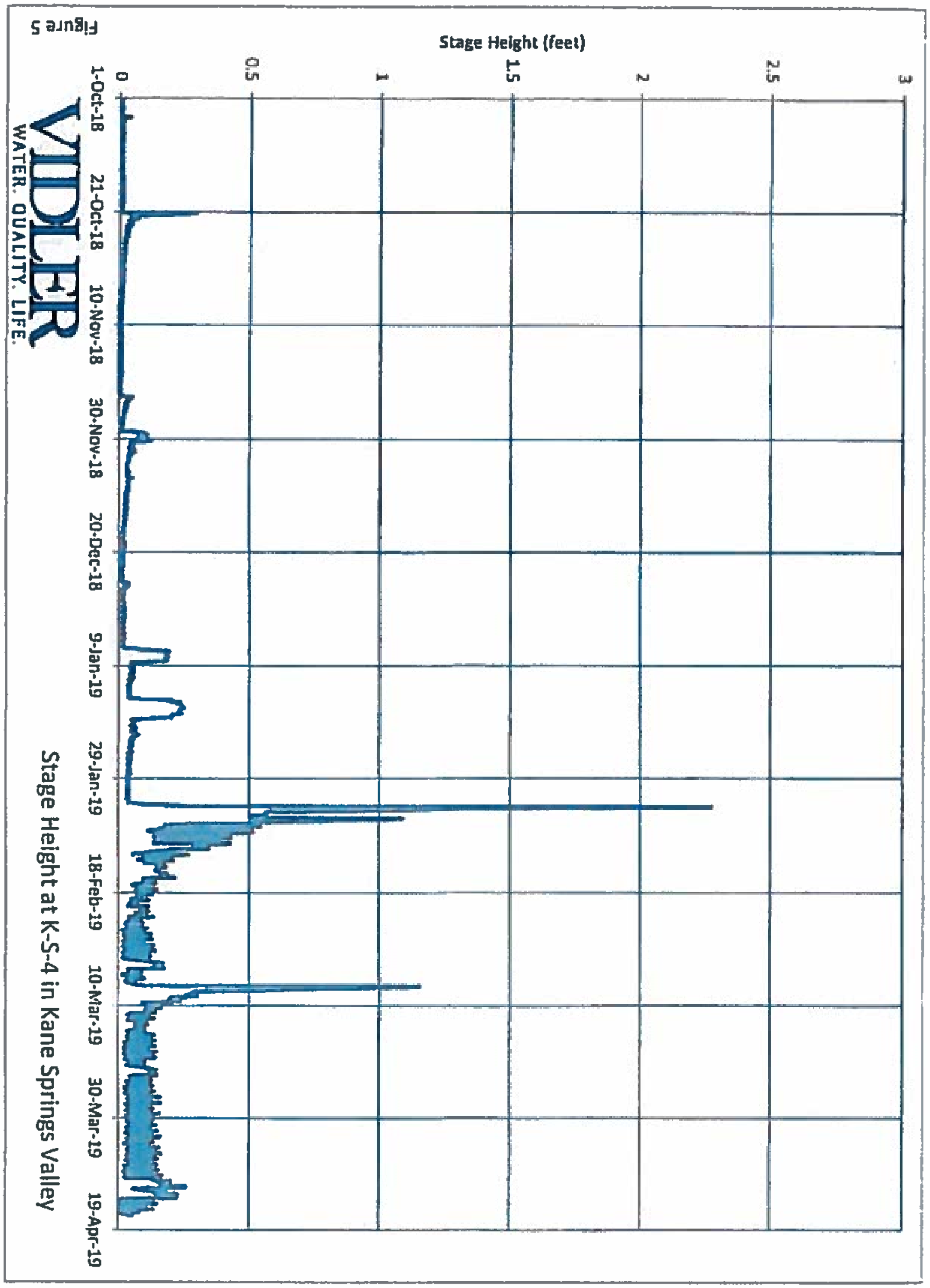
Figure 5
Stage Height at K-S-4 in Kane Springs Valley
Stage Height (feet)
0
0.5
1
1.5
2
2.5
3
1-Oct-18
21-Oct-18
10-Nov-18
30-Nov-18
20-Dec-18
9-Jan-19
29-Jan-19
18-Feb-19
10-Mar-19
30-Mar-19
19-Apr-19
VIDLER
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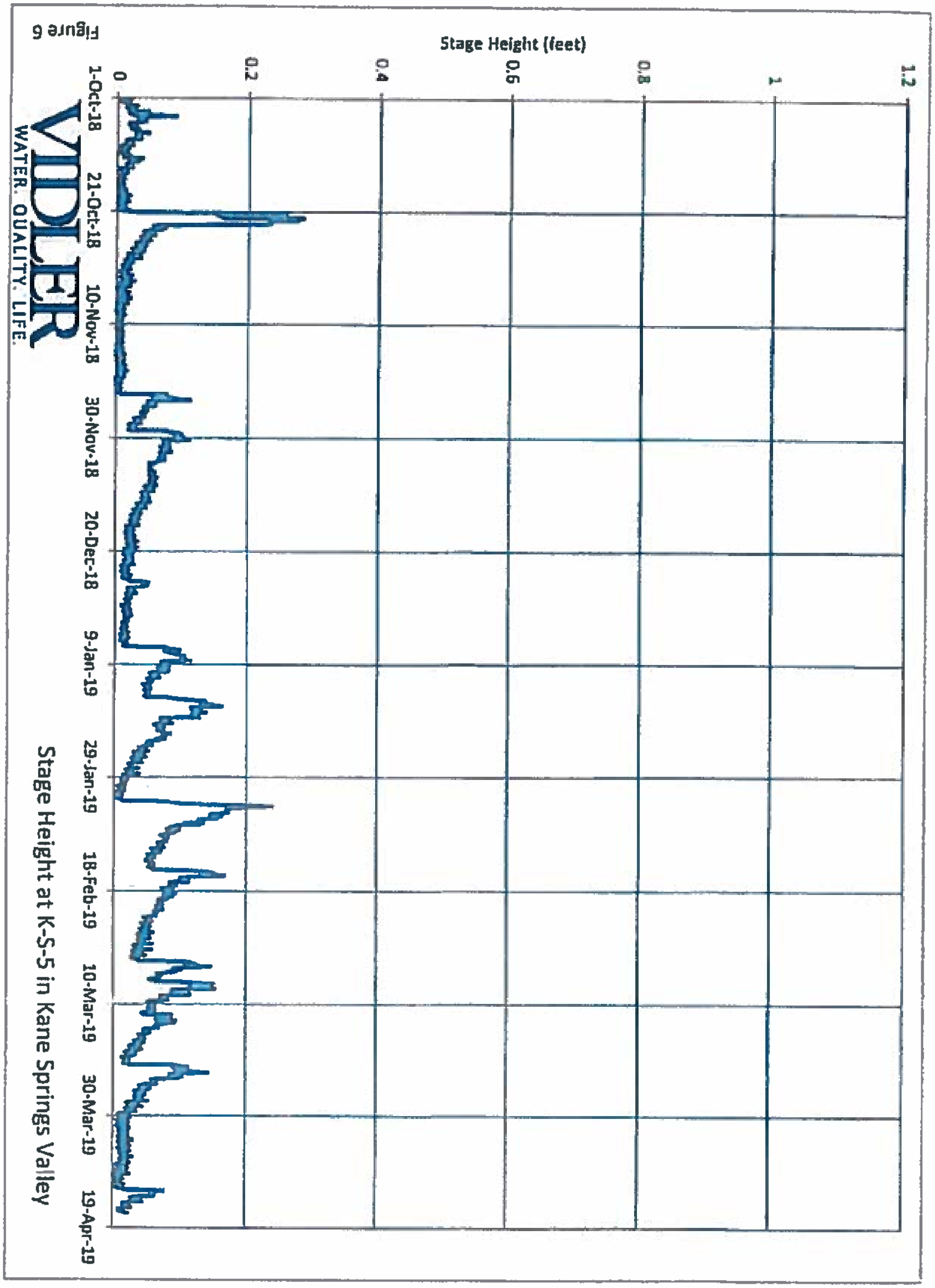
Stage Height at K-S-5 in Kane Springs Valley
Stage Height (feet)
0
0.2
0.4
0.6
0.8
1
1.2
1-Oct-18
21-Oct-18
10-Nov-18
30-Nov-18
20-Dec-18
9-Jan-19
29-Jan-19
18-Feb-19
10-Mar-19
30-Mar-19
19-Apr-19
Figure 6
VIDLER
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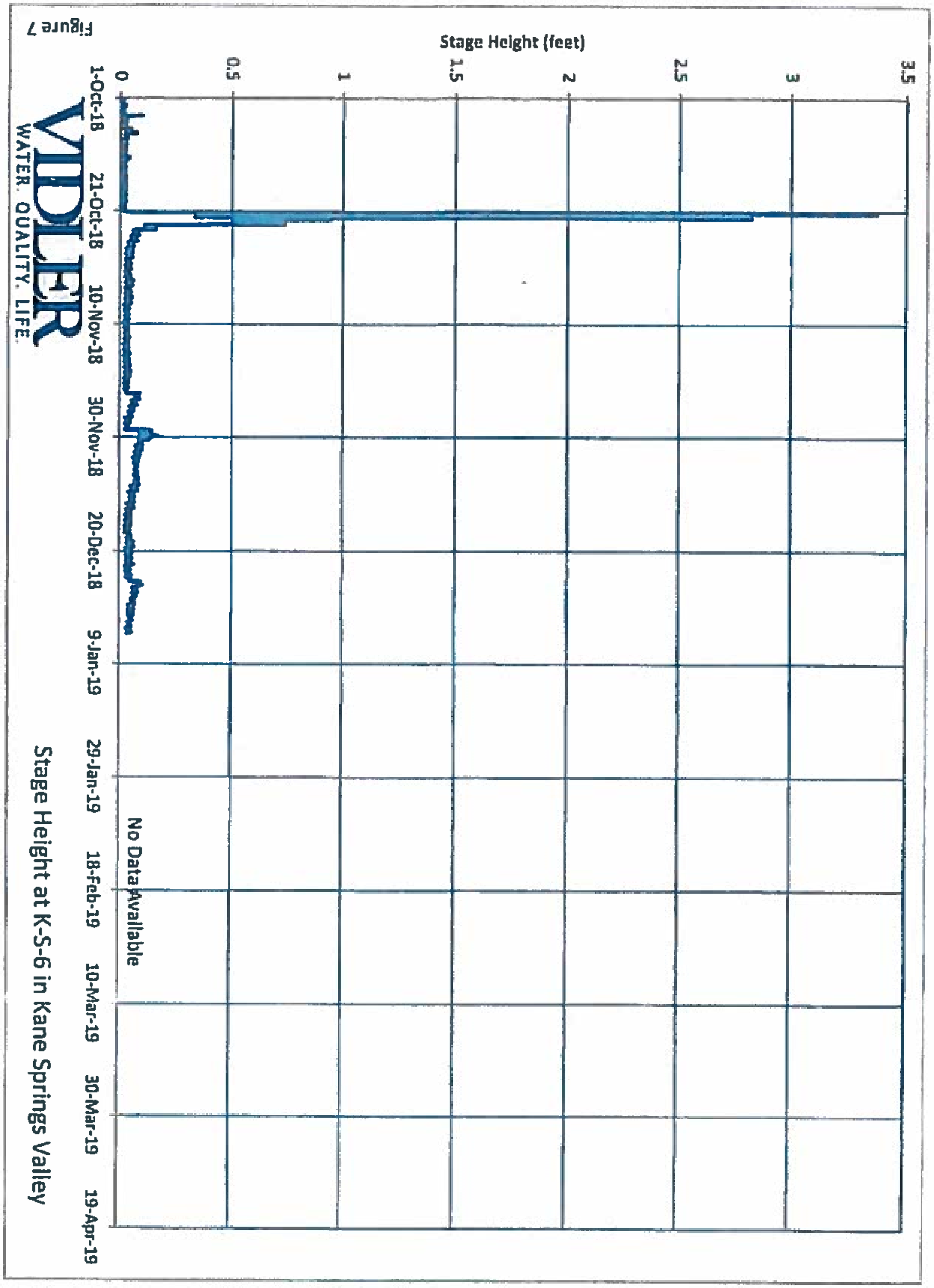

Stage Height at K-S-6 in Kane Springs Valley

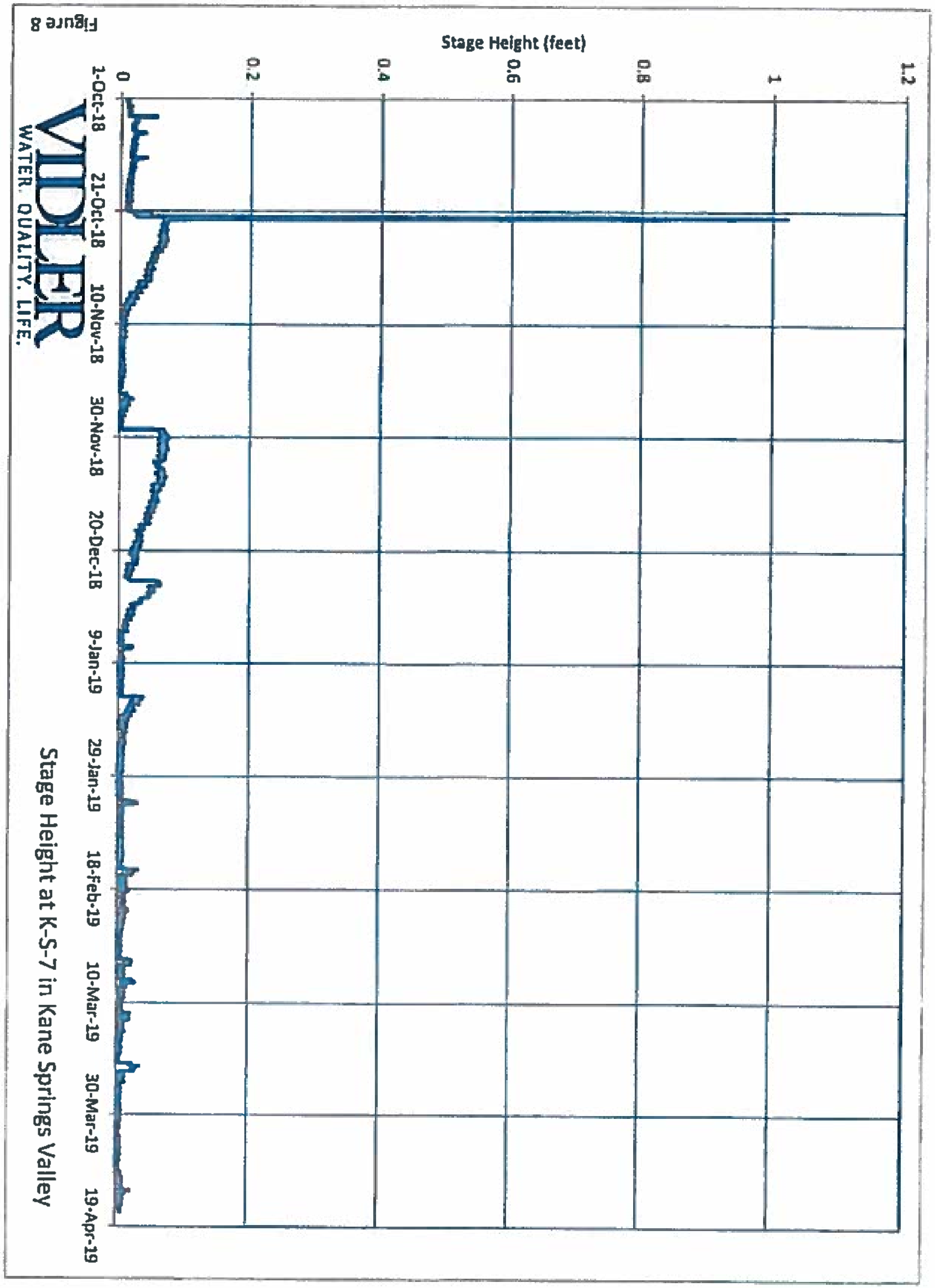
Stage Height at K-S-7 in Kane Springs Valley
Stage Height (feet)
0
0.2
0.4
0.6
0.8
1
1.2
1-Oct-18
21-Oct-18
10-Nov-18
30-Nov-18
20-Dec-18
9-Jan-19
29-Jan-19
18-Feb-19
10-Mar-19
30-Mar-19
19-Apr-19
VIDLER
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Figure 8

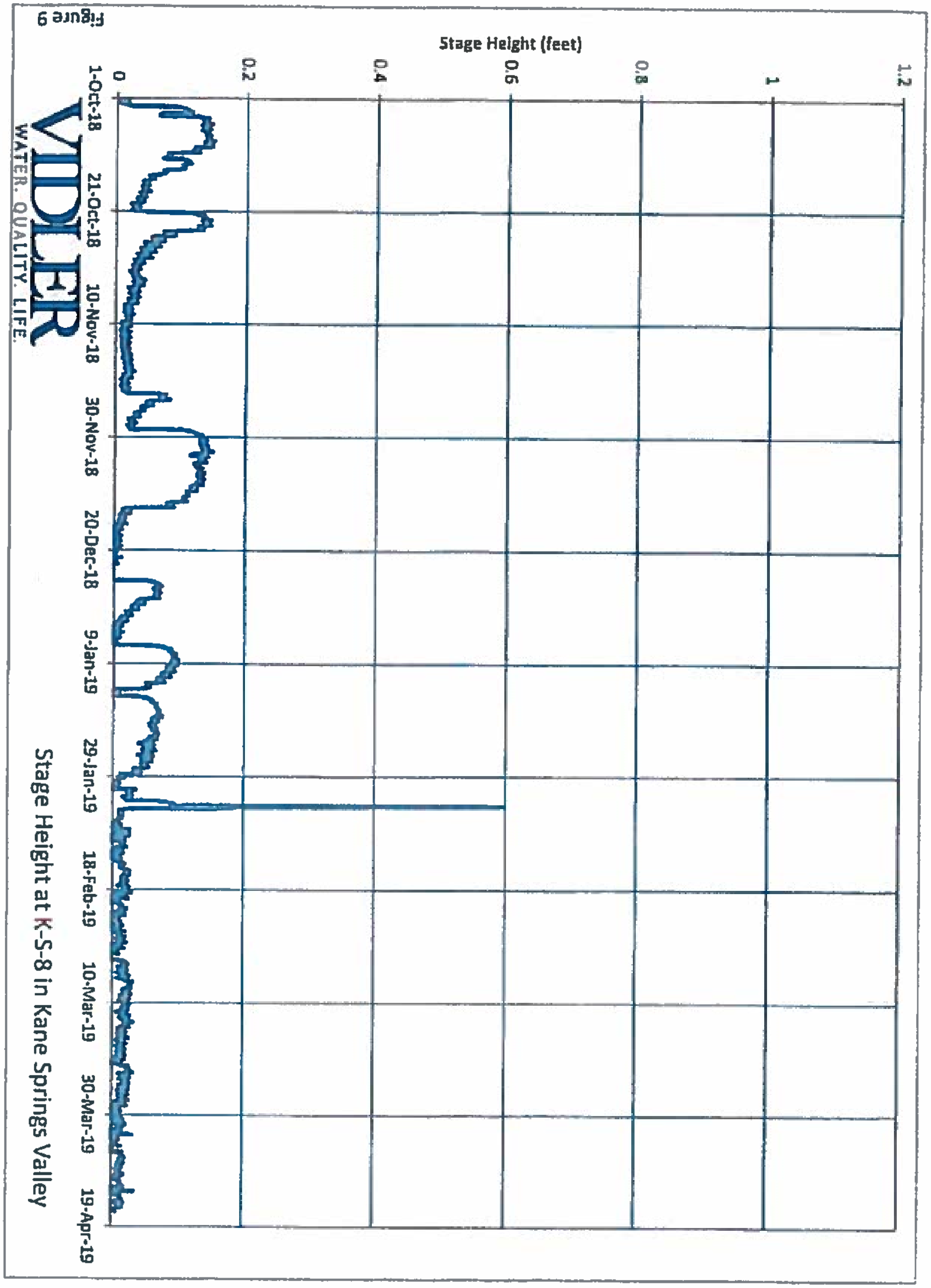
Figure 9
Stage Height (feet)
0
0.2
0.4
0.6
0.8
1
1.2
1-Oct-18
21-Oct-18
10-Nov-18
30-Nov-18
20-Dec-18
9-Jan-19
29-Jan-19
18-Feb-19
10-Mar-19
30-Mar-19
19-Apr-19
VIDLER
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Stage Height at K-S-8 in Kane Springs Valley

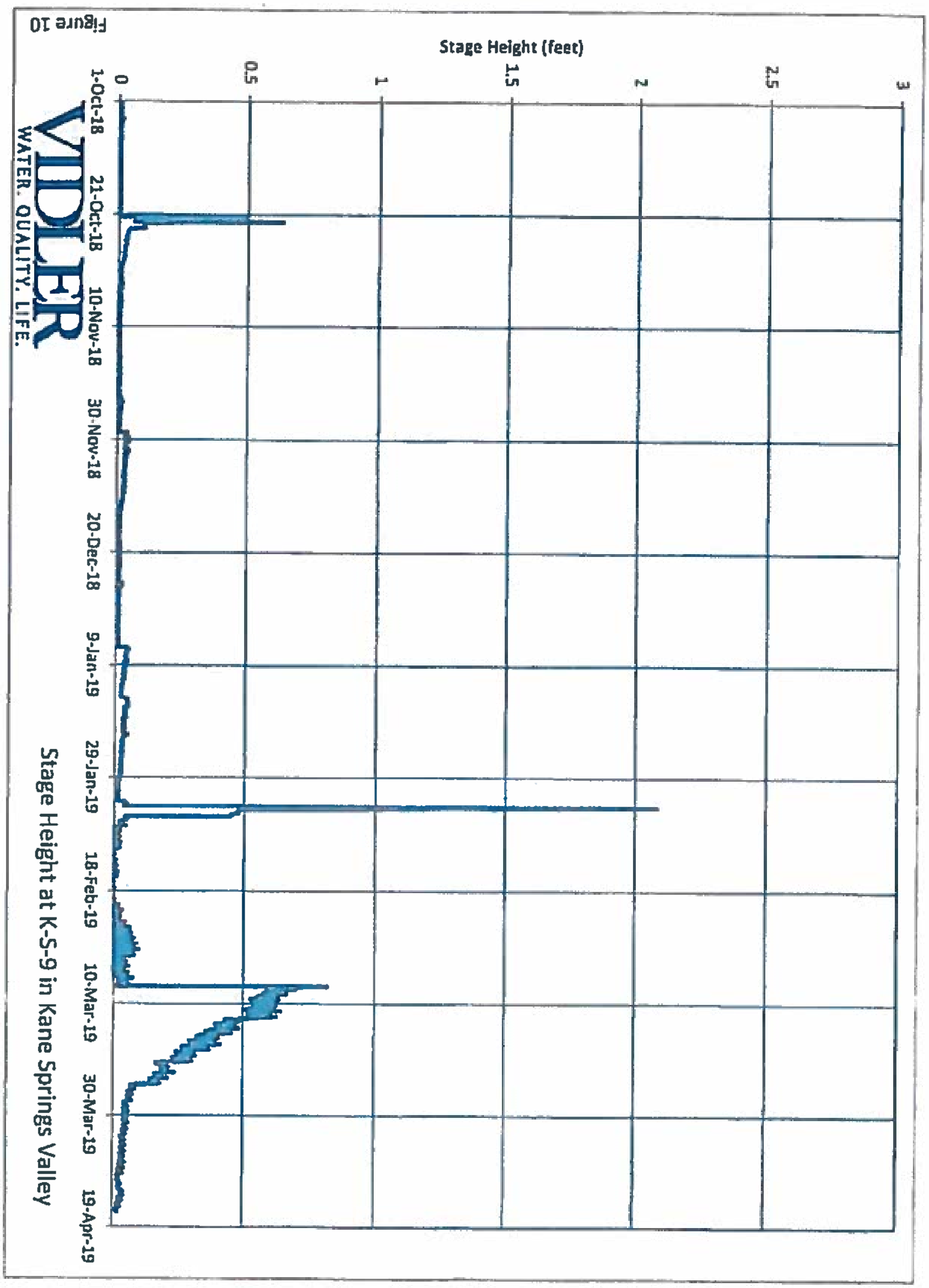
Figure 10
Stage Height (feet)
0
0.5
1
1.5
2
2.5
3
1-Oct-18
21-Oct-18
10-Nov-18
30-Nov-18
20-Dec-18
9-Jan-19
29-Jan-19
18-Feb-19
10-Mar-19
30-Mar-19
19-Apr-19
Stage Height at K-S-9 in Kane Springs Valley
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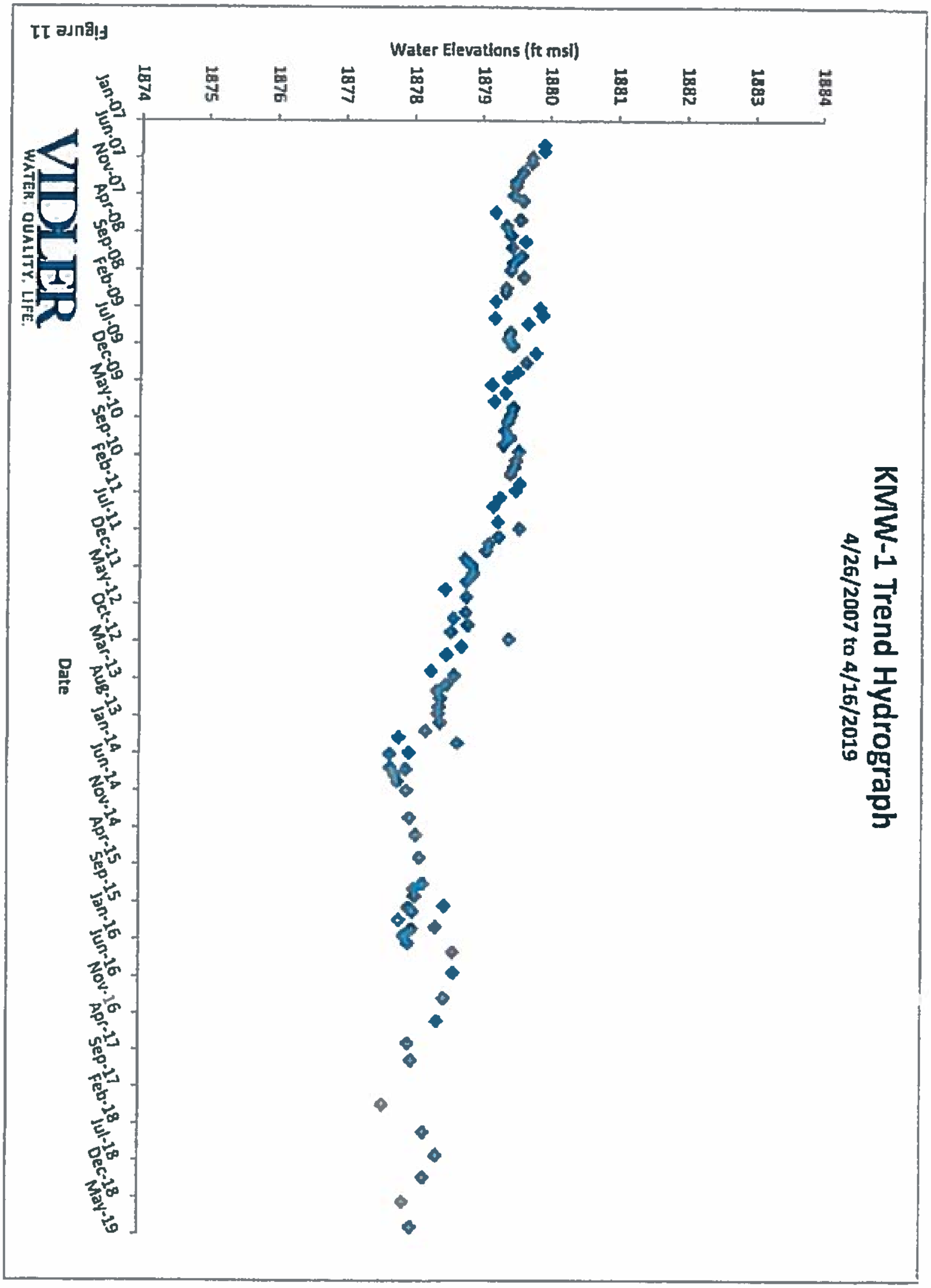

KMW-1 Trend Hydrograph
4/26/2007 to 4/16/2019
Water Elevations (ft msl)
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
Jan-07
Jun-07
Nov-07
Apr-08
Sep-08
Feb-09
Jul-09
Dec-09
May-10
Sep-10
Feb-11
Jul-11
Dec-11
May-12
Oct-12
Mar-13
Aug-13
Jan-14
Jun-14
Nov-14
Apr-15
Sep-15
Jan-16
Jun-16
Nov-16
Apr-17
Sep-17
Feb-18
Jul-18
Dec-18
May-19
Date
Figure 11
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SE ROA 36302

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Hydrologic Assessment of Kane Springs

Hydrographic Area (206):

Geochemical Framework

Presentation to the Office of
Nevada State Engineer

Prepared for: Lincoln County Water District
and Vidler Water Company, Inc.

April 2006

Hydrologic Assessment of Kane Springs Valley Hydrographic Area (206): Geochemical Framework

Presentation to the Office of the Nevada State Engineer

Prepared for: Lincoln County Water District and Vidler Water Company

CH2M HILL

April 2006

The locations of the wells and springs in the hydrographic areas of the Colorado River Basin in Nevada for the 99 available chemical analyses are shown on Figure 1a through 1c and listed in Table 1. Subsequent base maps for individual parameters will use only figures 1a and 1c for illustration purposes. Green colored circles are spring locations and red inverted triangles are well locations. These data are used to determine the geochemical framework within which to characterize the Kane Springs Valley. The base of the chemical analyses is from Thomas, Calhoun and Apambire (2001) (all analyses with a site number), supplemented with chemical analyses from other sources noted in the "Sources" column and included in the references.

Total dissolved solids of groundwater from the Kane Springs Valley (KSV) is higher than the TDSS of the Coyote Springs Valley (CSV) but appears to become relatively rapidly attenuated within the CPV groundwater system. These relationships indicate relatively rapid mixing and dilution of groundwater moving from KSV into the CSV system. Figure 2a and 2b are maps showing the calculated total dissolved solids sum (TDSS) concentrations for each of the locations with sufficient water chemistry to calculate the TDSS. The TDSS was calculated by summing the silica, calcium, magnesium, sodium, potassium, bicarbonate, sulfate and chloride. TDSS generally increases relatively gradually south from Pahranagat Valley through the Coyote Springs Valley to the Muddy Springs Area. The KSVproduction well, KPW-1 has a TDSS of 653 mg/L. The downgradient CSV well CSVM-4 has 564 mg/L suggesting a relatively rapid decrease in TDSS in groundwater moving from KSV to CSV. At, and south of, the Muddy River Springs Area (MRSA) TDSS increases from between about 250 and 660 milligrams per liter (mg/L) in the CSV to between 500 and 4,000 mg/L. VF-2 Spring with a TDSS of 9,970 mg/L has the highest TDSS.

The temperature of the KSV well KPW-1 of 57 degrees Celsius (°C) indicates that the KSV has a high thermal gradient. The average temperature of the other 79 analyses ranges from 7 to 41.6°C with a mean temperature of 24.3°C. This next highest temperature (41.6°C) is from a sample of groundwater from CSV well CSVM-4 downgradient of KPW-1.

TABLE 1
List of locations and parameters included in the geochemical framework assessment for the Kane Springs Valley Hydrographic Area (206)

Sequential Number	Location	Type	Valley	Hydro Area	Latitude	Longitude	Site	Source	pH	Spec. Cond	Temp (°C)	Deuterium δD	Oxygen-18 δ18O	Carbon-13 δ13C	Carbon-14	Apparent Age	Tritium	Calcium	Magnesium	Sodium	Potassium	Bicarbonate	Sulfate	Chloride	Silica	Fluoride	Total Diss. Solids Sum	Arsenic	Dissolved Iron	Dissolved Manganese	[illegible]	[illegible]	Sequential Number
					(degrees)	(degrees)				(µS/cm)		(permil)	(permil)	(permil)	(pmc)	(yrs BP)	(TU)	Milligrams per Liter										Micrograms per Liter					
1	[illegible]	Spring	PRV	209	37.[illegible]	-114.[illegible]	[illegible]	A				-89	-11.8																		25		1
2	[illegible] Spring	Spring	PRV	209	37.[illegible]	-115.[illegible]	[illegible]	A	7.7		[illegible]	[illegible]	-14.4	-4.9				46	23	27	7	[illegible]	28	23	22.7	[illegible]	[illegible]				60		2
3	Crystal Spring	Spring	PRV	208	37.[illegible]	-115.[illegible]	110	A	7.6	[illegible]	27.3	[illegible]	[illegible]	-6.2	6.4	20,000	1	44	27	26	6	[illegible]	23	9	24.6	0.3	[illegible]				60		3
4	[illegible]	Spring	PRV	208	37.[illegible]	-115.[illegible]	[illegible]	A	7.5		27	[illegible]	[illegible]	-11.9				45	11	17	1	[illegible]	12	2	[illegible]	0.1	[illegible]				44		4
5	Ash Spring	Spring	PRV	209	37.[illegible]	-115.[illegible]	110	A	7.6	[illegible]	[illegible]	[illegible]	-14.1	-5.8	6.2	22,000	2	30	14	20	7	[illegible]	25	10	30	[illegible]	[illegible]				100		5
6	Little Ash Spring	Spring	PRV	209	37.[illegible]	-115.[illegible]	111	A	7.4	487	30.0	[illegible]	-14.2	-4.6				51	16	30	6	[illegible]	65	10	[illegible]	4.0	307				94		6
7	[illegible]	Spring	PRV	209	37.[illegible]	-115.[illegible]	[illegible]	A	8.3	[illegible]	13	-90	-12.3					45	9	21	2	[illegible]	15	6	30		243				43		7
8	Lone Tree Spring	Spring	PRV	209	37.[illegible]	-115.[illegible]	90	A	7.8		11	[illegible]	-10.9	-4.8				65	43	130	30	[illegible]	140	60							20		8
9	[illegible]	Spring	PRV	209	37.[illegible]	-115.[illegible]	90	A	8.2		8.8	-91	-12.3					45	23	114	14	[illegible]	30	20							40		9
10	[illegible] Well	Well	PRV	209	37.[illegible]	-115.[illegible]	[illegible]	A	7.7		19	[illegible]	-13.7	-4.5				84	44	110	16	[illegible]	100	40	[illegible]	1.0	720				80		10
11	[illegible] City Well	Well	PRV	209	37.[illegible]	-115.[illegible]	[illegible]	A	7.8		19.8	[illegible]	-13.5	-10.3				61	80	86	14	404	120	16	[illegible]	1.3	790				73		11
12	US Fish and Wildlife	Well	PRV	209	37.[illegible]	-115.[illegible]	90	A	7.8		14	-97.3	-13.1	-4.1				79	64	120	13	[illegible]	[illegible]	60	40.1	1.0	913				30		12
13	[illegible] Spring	Spring	KSV	206	36.[illegible]	-114.[illegible]	110	A	7.3	487	9	-86	-12.1					80	8	20	6	[illegible]	30	20	60		305				60		13
14	[illegible] Spring	Spring	KSV	206	37.[illegible]	-114.[illegible]	130	A				-84	-12.3																		48		14
15	[illegible] Spring	Spring	KSV	206	37.[illegible]	-114.[illegible]	125	A	7	844	19	-91	-12.8					111	9	17	6	340	30	11	60		442				20		15
16	[illegible]	Well	KSV	206	36.[illegible]	-114.[illegible]	130	A	7.1	740	27.0	[illegible]	-14.2					72	20	20	7		17	8	25	6.0					80		16
17	[illegible]	Well	KSV	206	37.71	-114.9	134	A				-98																			80		17
18	U.S. Air Force	Well	KSV	206	36.[illegible]	-114.[illegible]		F	7.9	[illegible]	34							30	60	75	5.5	210	44	31									18
19	[illegible] Spring	Spring	[illegible]	182	37.[illegible]	-114.[illegible]	117	A	7.4	[illegible]	13	-86	-10.8					63	15	31	1	280	60	37	33		305				14		19
20	[illegible] Well	Well	[illegible]	182	37.[illegible]	-114.[illegible]	171	A				-88																			25		20
21	U.S. Air Force	Well	[illegible]	182	36.446	-114.[illegible]		F		303	30							31	8.7	43	2.7	142	20	8.8	31	0.5	[illegible]						21
22	[illegible]	Spring	[illegible]	209	37.[illegible]	-114.[illegible]	140	A			19.9	-98	-11.9																		25		22
23	[illegible] Spring	Spring	[illegible]	209	37.27	-114.[illegible]	[illegible]	A	7.9		19.0	-97.3	-13.3					71	6	12	3	[illegible]	8	9	41	1.7	148				30		23
24	[illegible]	Spring	[illegible]	209	37.[illegible]	-114.[illegible]	67	A	7.3		19.4	-96.9	-13.3					40	10	20	6	210	14	17	60	2.3	[illegible]				31		24
25	[illegible] Spring	Spring	[illegible]	207	37.[illegible]	-114.[illegible]	[illegible]	A	7.3		18.5	-97.9	-11.8					70	23	17	2	230	40	37	27	4.0	345				34		25
26	[illegible] Spring	Spring	[illegible]	209	37.[illegible]	-114.[illegible]	[illegible]	A	7.8		17.4	-97.3	-11.8					20	5	60	0	140	31	22	[illegible]	1.7	275				20		26
27	[illegible]	Well	[illegible]	209				C	7.10	1,000	57	-110	-14	-2.9	2.1	30,000		45	14	[illegible]	10	240	140	[illegible]	40	0.1	[illegible]	40	0.1	3.84	60		27
28	[illegible] Spring	Spring	CSV	210	36.[illegible]	-114.[illegible]	90	A			13.6	[illegible]	-12.2					27	41	1	1		24	5	47	0.2					41		28
29	[illegible] Spring	Spring	CSV	210	36.[illegible]	-114.57	[illegible]	A	6.2	[illegible]	7	-91	-10.0					71	10	10	3	[illegible]	8	6	20	0.3	405				8		29
30	[illegible]	Spring	CSV	210	36.[illegible]	-114.[illegible]	[illegible]	A	7.8	[illegible]	18.1	[illegible]	-12.7	-6.0			41	70	41	10	1	[illegible]	22	10	13.3	0.1	[illegible]				20		30
31	[illegible]	Well	CSV	210				B	6.2	[illegible]	28.4	-98	-13.1	-4.8	17.8	14,300		40	20	71	12	330	73	20	64	1.9	402	8.3	0.1	0.01	61		31
32	[illegible]	Well	CSV	210				C	7.82	[illegible]	24.8	-98	-13.6	-4.7	7.8	31,000		30	10	44	5.5	[illegible]	46	21	60	4.1	343	17	0.4	0.003	45		32
33	[illegible]	Test	CSV	210				C	7.45	1,001	41.6	-100	-13.6	-4.1	4.3	28,300		40	12	120	13	311	120	60	37	4.0	604	0	0.2	0.004	70		33
34	[illegible] Well	Well	CSV	210	36.975	-114.[illegible]	61	A	7.4	[illegible]	34	-101	-13	-6.1	7	52,000		47	21	60	11	303	60	34	34	1.7	479				71		34
35	[illegible]	Well	CSV	210	36.[illegible]	-114.[illegible]	92	A	7	[illegible]	38	-94	-12.7					41	8	34	1	[illegible]	30	42	11	0.5	236				40		35
36	[illegible]	Well	CSV	210				C	7.24	1,014	37.3	-98	-13	-6.3	3.3	75,000		40	10	73	14	325	60	35	30	0.7	457	3.7	2.3	0.071	34		36
37	[illegible]	Well	CSV	210	36.[illegible]	-114.[illegible]		B	7.3		34.2	-99.0	-13.9					40.7	21	39.7	13.0	304	90.1	30.7	38.7	1	476	13.0	1.3	0.1	60		37
38	[illegible]	Well	CSV	210	36.[illegible]	-114.[illegible]	77	A	7.2	730	21	-98.8	-13.8		5.5	39,400	7	45	20	76	10	305	100	34	20	1.0	473				60		38

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TABLE 1
List of locations and parameters included in the geochemical framework assessment for the Kane Springs Valley Hydrographic Area (206)

Sequential Number	Location	Type	Valley	Hydro Area	Latitude	Longitude	Site	Source	pH	Spec. Cond	Temp (°C)	Deuterium δD	Oxygen-18 δ18O	Carbon-13 δ13C	Carbon-14	Apparent Age	Tritium	Calcium	Magnesium	Sodium	Potassium	Bicarbonate	Sulfate	Chloride	Silica	Fluoride	Total Dissolved Solids	Arsenic As	Dissolved Iron	Dissolved Manganese	[illegible]	[illegible]	Sequential Number
					(degrees)	(degrees)				(µS/cm)		(permil)	(permil)	(permil)	(pmc)	(yrs BP)	(TU)	Milligrams per Liter										Milligrams per Liter					
39	[illegible]	Well	CSV	210	[illegible]	-114.[illegible]		B	7.3	720	34.7	-101	-13		7.6	24,300		40	30	81	11	[illegible]	[illegible]	34	[illegible]	1.9	473				71		39
40	MX-4, CE-VF-4	Well	CSV	210	[illegible]	-114.[illegible]	70	A	7.4		34	-102.6	-13					40	16	84	11	234	110	30	33	1.3	466				77		40
41	CE-1	Well	CSV	210	[illegible]	-114.[illegible]		B	7.65		23.0							52.1	21.4	81.2	10.0	[illegible]	[illegible]	30	33	2.00	482	14	0.570	0.010			41
42	CE-2	Well	CSV	206	[illegible]	-114.[illegible]		C	7.30		24							74.9	30	81.4	10.1	[illegible]	[illegible]	47	30	2.47	507	14	0.571	0.044			42
43	U.S. Air Force	Well	CSV	210	[illegible]	-114.[illegible]		F										51	30	80	11	[illegible]	[illegible]	27	34	2.1	484						43
44	CSVM-4	Well	CSV	210				C	7.45	844	34.0	-93	-12.6	-7	0	30,500		40	30	220	12	244	[illegible]	16	22	0.68	544	1.6	0.1	0.020	46		44
45	CSVM-5 Well	Well	CSV	210	[illegible]	-114.835	80	A	7.4	690	41	-75	-10.4					34	25	30	10	230	34	30	24	1.5	348				-31	-40	45
46	CSVM-6	Well	CSV	206	[illegible]	-114.835		B	7.45	620	41	-75	-10.6	-4.4	3.4	36,000		54	30	35	11	220	54	32	22	1.1	330	13	0.1	0.014	-31	-16	46
47	CSVM-3	Well	CSV	206				C	7.13	1,300	37.7	-96	-10.3	-3.3	3.5	35,500		80	34	80	15	222	218	37	27	1.6	640	1.6	0.1	0.067	34	83	47
48	[illegible] Sp	Spring	Mud	210	[illegible]	-114.[illegible]	60	A				-97																			67	80	48
49	[illegible] Spring	Spring	Mud	210	[illegible]	-114.7[illegible]	60	A				-99	-12.5																		84	77	49
50	Big Muddy Spring	Spring	Mud	210	[illegible]	-114.[illegible]	60	A	7.3	880	32.1	-97.9	-12.9	-4	7	23,000	[illegible]	54	27	97	11	270	177	71	21.1	2.3	684				80	73	50
51	Pederson's Warm	Spring	Mud	210	36.71	-114.716	37	A	7.2	1,012	32.2	-97.8	-13.0					71	24	100	8	270	190	69	103.5	2.2	747				80	71	51
52	[illegible] Spring	Spring	Mud	210	[illegible]	-114.[illegible]	70	A				-98.2	-13.0																		80	67	52
53	[illegible] Well	Well	Mud	210	[illegible]	-114.7[illegible]	43	A	8.3	830	23.0	-98	-13					49	30	80	12	245	171	87	23		550				91	73	53
54	USGS CSV-1	Well	Mud	210	[illegible]	-114.[illegible]	71	A			26.0	-102	-13.0					205	86	160	36		1300	30	19	1.2					70	60	54
55	CE-VF-2 Well	Well	Mud	210	[illegible]	-114.[illegible]	72	A	7.3	900	25.0	-98	-13	-6	6.4	30,300	1.6	80	30	80	11	300	160	60	30	2.3	591				61	73	55
56	Arrow Canyon	Well	Mud	210				C	7.3	900	34.7							64	30	97	12	271	130	60		2.3							56
57	EH-4A	Well	Mud	210	[illegible]	-114.[illegible]		B	8.1	880	22	-104.3	-13.2					43	30	95	12	230	130	64	30		543				73	67	57
58	EH-5	Well	Mud	210	[illegible]	-114.[illegible]		B	7.6	3,300	26.3	-96	-12.7					511	101	170	27	122	1900	196	11		2275				30	46	58
59	CSVM-[illegible] Well	Well	Mud	210	[illegible]	-114.[illegible]	70	A	7.4	880	27	-98	-13.0	-6.5	6.4	30,300	4	60	27	100	10	270	160	60	30	2.2	565				61	73	59
60	[illegible] Spring	Spring	LMV	220	[illegible]	-114.[illegible]	107	A				-98.5	-11.7																		19	35	60
61	[illegible] Spring	Spring	LMV	220	[illegible]	-114.[illegible]	80	A			14.3	-97	-12.3																		30	30	61
62	[illegible] City	Well	LMV	220	[illegible]	-114.[illegible]	104	A			14.3	-99	-10.4																		70	30	62
63	LDS Well	Well	LMV	220	[illegible]	-114.[illegible]	120	A	7.8		34							80	16	60	30	237	94	33	60	1.4	400						63
64	Miller Well	Well	LMV	220	[illegible]	-114.[illegible]	120	A	7.6		26.7							600	6	47	10	260	44	33	119	1.5	944						64
65	[illegible] Well	Well	LMV	220	[illegible]	-114.[illegible]	102	A	7.3	1,400	14.0	-98.8	-11.4					65	30	120	11	600	79	57	60	2.3	719				37	37	65
66	Railroad Well	Well	LMV	220	[illegible]	-114.[illegible]	100	A	7.8	730	16	-96	-11.0					42	14	90	8	282	90	47	61	2.5	460				16	37	66
67	[illegible] Well	Well	LMV	220	[illegible]	-114.[illegible]	100	A				-97.5	-11.7																		30	30	67
68	[illegible] Well	Well	LMV	220	[illegible]	-114.[illegible]	90	A	7.7		16	-98.5	-11.6					66	14	100	7	240	90	16	60	3.1	627				27	37	68
69	[illegible]	Well	LMV	220	37.002	-114.40	91	A																									69
70	[illegible]	Well	LMV	220	[illegible]	-114.[illegible]	90	A	8	1,330	23.0	-97.0	-12.5					94	34	103	10	84	320	92	30	1.9	941				90	71	70
71	[illegible]	Well	LMV	220	[illegible]	-114.[illegible]	92	A	7.1	2,940	34							135	147	227	10	400	1200	300	60		2726						71
72	[illegible]	Well	LMV	220	[illegible]	-114.[illegible]	80	A	7.7	3,360	24.0	-99.0	-12.5					311	131	270	31	176	1600	44	11		2790				80	76	72
73	[illegible]	Well	LMV	220	[illegible]	-114.[illegible]	97	A				-98.2	-12.7																		80	67	73
74	[illegible]	Well	BV	210	[illegible]	-114.[illegible]	37	A				-97	-13.0																		57	60	74
75	Dry Lake Valley	Well	BV	210	[illegible]	-114.[illegible]	34	A	7.3	1400	29	-97.5	-13.3	-4.2	3	28,600	7	170	46	120	10	210	320	170	27	3.1	947				80	71	75
76	[illegible]	Well	BV	210	[illegible]	-114.[illegible]	37	A	7.4	1300	30	-97	-13.6	-4.9				133	47	140	8	230	379	100	23	1.5	890				57	60	76
77	[illegible] Well	Well	BV	210	[illegible]	-114.[illegible]	94	A	7.5		26.0	-94	-13.7					123	40	140	10	230	320	100	71	1.6	1011				54	60	77
78	BP Apex Well	Well	BV	210	[illegible]	-114.[illegible]	17	A	7	1700	31	-97.3	-13.5	-6.6				130	47	130	15	230	320	330	30	1.4	1006				80	70	78
79	[illegible] Apex	Well	BV	210				H	7.45	1400		-102	-13.6					100	47	90	11	130	300	140	7.3	1.6	763	4.0	0.46		90	61	79

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TABLE 1

List of locations and parameters included in the geochemical [illegible] for the Kane Springs Valley Hydrographic Area (206)

Sequential Number	Location	Type	Valley	Hydro Area	Latitude	Longitude	[illegible]	Source	pH	Spec. Cond.	Temp (°C)	Deuterium δD	Oxygen-18 δ18O	Carbon-13 δ13C	Carbon-14	Apparent Age	Tritium	Calcium	Magnesium	Sodium	Potassium	Bicarbonate	Sulfate	Chloride	Silica	Fluoride	Total Dissolved Solids	Arsenic As	Dissolved Iron	Dissolved Manganese	[illegible]	[illegible]	Sequential Number
					(degrees)	(degrees)				(µS/cm)		(per mil)	(per mil)	(per mil)	(pmc)	(yrs BP)	(TU)	Milligrams per Liter										Milligrams per Liter					
[illegible]	[illegible]	Well	[illegible]	[illegible]				N	[illegible]	[illegible]		[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Well	[illegible]	[illegible]				N	[illegible]	[illegible]		[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Well	[illegible]	[illegible]				N	[illegible]	[illegible]								[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]				[illegible]
[illegible]	[illegible]	Well	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Well	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]				[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Well	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A				[illegible]	[illegible]																		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Well	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A				[illegible]	[illegible]																		[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Test Well [illegible]	Well	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A			[illegible]	[illegible]	[illegible]																		[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Spring	Spring	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]				[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Spring	Spring	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]				[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Well	Well	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Spring	Spring	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Spring	Spring	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]				[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Spring 1	Spring	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]																	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Spring 2	Spring	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Spring 3	Spring	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]				[illegible]	[illegible]	[illegible]
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MAJOR ION CHEMISTRY OF GROUNDWATER

The major ion groundwater chemistry indicates three end-members water chemistry types: calcium-bicarbonate, sodium-bicarbonate and a mixture of calcium-sodium-sulfate water chemistry types. These water chemistry types for the end-members documenting mixing trends in both the springs and wells. Spring water chemistry forms more representative groups within the three end-members indicating more unique end-member representation than groundwater from the wells. Big Muddy Springs and associate springs in the MRSA are intermediate between all three end-members indicating they are a mixture of the three. In other words, the flow at MRSA do not originate from a single source but are a mixture of the three sources. Rogers and Blue Point Springs form a calcium-sodium-sulfate end-member. Groundwater from most of the wells indicates a mixing of the three end-members. Groundwater from only a few wells represent end-member water chemistry types indicating that most of the groundwater from wells are a mixture of water primarily between the regional carbonate aquifer and volcanics in the northern part of this segment of the Colorado River Basins. Beginning with the MRSA, this mixed groundwater continues to mix and is impacted by the evaporite-rich Muddy Creek Formation. The water chemistry reflects groundwater flowpaths presented in Eakin (1966). Northern and central CSV groundwater is primarily a mixture of recharge water from springs and regional carbonate aquifer groundwater in upgradient basins that includes groundwater from KSV. Regional carbonate groundwater from Pahanagat Valley appears to dominate the source of groundwater to CSV. Hidden Valley groundwater is very nearly the same type as the northern and central CSV. There is a water chemistry type trend that is compatible with two major groundwater flowpaths: one from central CSV through not only MRSA to Rogers and Blue Point springs but also one that moves from the central CSV through both Hidden and Garnet valleys.

Figure 3 shows the major ion relationships for all the analyses. Figures 4 and 5 are trilinear diagrams for all the springs and wells, respectively. Figure 6 illustrates the overlapping of well and spring data. Groundwater from the wells shows the mixing between the spring chemical types. Figure 7 shows the three-end-member distributions and their general associations. The calcium-bicarbonate type represents water primarily associated with calcite and carbonate rock. Regional carbonate aquifer groundwater from both the springs and wells forms a major part of this water chemistry type. Water from many mostly higher elevation springs are also represented in this type. The sodium-bicarbonate type represents water primarily in contact with and chemically reflects volcanic rocks. Groundwater from KSV Willow Springs and KPW-1 as well as CSV well CSVM-4 are indicative of this type. Gypsum in the evaporite-rich Muddy Creek Formation significantly impact groundwater within the boundary of this formation beginning with the MRSA and extending through the Rogers Blue Point springs in the Black Mountain Area. The sodium-chloride mineral, halite, is present in the Muddy Creek Formation in the extreme southern part of the Black Mountain Area and is probably responsible for the higher chloride in southern springs. Water from VF Spring 2 probably reflects a near boundary of halite associated with the groundwater.

Figure 8 is a trilinear diagram showing the average water chemistry types for the springs and groundwater from wells in each of the hydrographic areas. Groundwater from Pahranagat Valley springs and wells, KSV springs and groundwater from KPW-1 are most closely associated with northern and central CSV groundwater suggesting that these two valleys provide major sources of recharge to CSV. CSV springs are on a direct mixing line with KSV springs and are also a probable source of groundwater to the CSV mixed water chemistry type. Hidden Valley groundwater is closely associated with the CSV groundwater suggesting groundwater moves to Hidden Valley from CSV with little change in water chemistry. The average for MRSA groundwater includes CSV groundwater mixed with and/or impacted by association with the Muddy Creek Formation. Rogers and Blue Point springs represent the groundwater most impacted by evaporite minerals in the Muddy Creek Formation. Groundwater in Garnet Valley is more strongly influenced by the Muddy Creek Formation than Hidden Valley groundwater.

Major ion chemistry does not indicate the origin of water that is associated with either the volcanic rocks or the Muddy Creek Formation. In other words, it does not separate water from the regional carbonate aquifer that moves into and within the volcanic rocks and Muddy Creek Formation from localized sources of recharge water moving into and within these two major chemistry altering units. From the above water chemistry types on the trilinear diagrams, all of these conditions are probable within the groundwater system. The stable isotope, deuterium is capable of making these distinctions and provides a quantitative estimate of the mixture for each sample location.

DEUTERIUM

Deuterium is not only a naturally occurring stable isotope of hydrogen present in all water it is also an integral part of the water molecules themselves. It initially becomes part of the water molecules forming rain and snow that recharges the groundwater system. The deuterium value in parts per thousand (δD in permil units) depends on the storm tracks from the ocean to where it reaches the land surface and the elevation of the land surface where it infiltrates into the subsurface groundwater system. Deuterium is an excellent marker to track a specific water source because it does not participate in chemical reactions. It retains an essentially constant δD in the groundwater as groundwater moves along and through the various flowpaths. Deuterium in the groundwater packet of recharged water does not change by chemical reactions with the rock but the δD does change if the groundwater mixes with another groundwater with a different δD. The δD change is proportional to the volume and δD of the mixing water.

There have been many excellent groundwater investigations that include this area utilizing deuterium for estimating the groundwater exchanges as the regional carbonate groundwater moves through the basins (Winograd and Friedman, 1972, Kirk and Campana, 1990, Thomas et al., 1996; and Thomas et al., 2001 to name a few). Most recently Smith et al. (2002) concluded that geologically historical "δD values of groundwaters in southern Nevada fall within the range of present-day recharge." This conclusion supports a time independent nature of the δD indicating that recent and ancient deuterium values in water recharging the aquifers in this area have remained essentially the same over time therefore δD depend only on the dominant storm path contributing recharge and land surface elevation.

Figures 8 and 9 show the 88 deuterium analyses for the locations having deuterium data. The δD ranges from -109 permil in the northern Pahranagat Valley spring water to -75 permil in the southern part of CSV. Overall, the δD becomes more positive to the south indicating increasing mixing of recharge water with the regional carbonate groundwater. The KSV well KPW-1 has a δD close to the lowest Pahranagat δD with -104 permil. A duplicate sample analyzed by SNWA reported a δD of -105 permil.

Figure 11 is a standard δD-δoxygen-18 plot showing data points for all the springs and groundwater from wells. Many of the points fall near or on the global meteoric water line (GMWL) defined by [$\delta D=8(\delta^{18}O)+10$] based on worldwide precipitation data (Craig, 1961) indicating some degree of evaporation affecting the precipitation forming recharge to the groundwater system in this area. Only three locations fall to the right of the dashed line defined by [$\delta D=8(\delta^{18}O)+0$] used by Thomas et al., 1996 to "eliminate samples significantly affected by evaporation for use in estimating groundwater flow systems." The three samples are groundwater from the Hidden well SHV-1 very near the line, Pahranagat Valley, Lone Tree Spring in the middle and US FWS Well also in Hidden Valley farthest from the line indicating significant evaporation has affected these waters. Figure 12 shows the average δD-oxygen-18 for each of the hydrographic area wells and springs. These average points also show a considerable amount of mixing of δD values.

Mixing between the regional carbonate aquifer and other recharge sources (annual recharge from precipitation and geologically historical water recharge) is indicated by the intermixture of springs and wells virtually over the entire δD range. If mixing did not occur then the δD plotted on Figures 11 and 12 would consist of essentially two clusters of points with the regional carbonate aquifer clustering around -109 permil plus or minus about 2 permil and the other waters clustering around about -87 permil. Some springs and wells do occur around these δD but by far most of the δD of both wells and springs plot between these two end-members indicating that they represent a mixture of the two.

Mixing naturally occurs between the regional carbonate groundwater and the other sources. Mixing is promoted by geological structures including faults, fractures, joints and karst features in the carbonate rocks. Mixing also occurs by pumping a well completed across two or more contributing depth intervals with different δDs. Figure 12 plots δD against the depth interval that contributed the δD in the California Wash area showing a shallow very high δD of about -70 permil but by a depth of about 400 feet the groundwater becomes considerably lighter with a range of values between -90 and -105 permil. The shallow groundwater is likely geologically recent recharge water and the deeper groundwater is probably the regional carbonate groundwater. Figure 13 shows what the δD of groundwater sampled from open-hole wells completed at deeper and deeper depths from the surface. Mixing between the geologically recent recharge water and the regional carbonate groundwater would occur from this pumped groundwater. The δD would significantly change toward that of the regional carbonate groundwater with completion depth of the well but it would not achieve the full δD signature even with full depth completion. Of course, a sample collected from a well completed over the entire depth during the earliest pumping time would likely have a recharge signature and the signature would become more like the regional carbonate groundwater as pumping continues.

Since the δD of the groundwater appears to be a mixture of regional carbonate groundwater and other waters the proportion of both groundwaters can be calculated by the simple mixing equation:

PRCGW= (δDSample – δDSGW)/(δDRCG – δDSGW) where PRCGW is the percent of regional carbonate groundwater (RCG) in the spring or well sample, SGW; δDSample is the δD for the groundwater sample collected from a spring or well in the area; δDSGW is the δD for the end-member of the other water mixing with the RCG; and δD RCG is the end-member of the regional carbonate groundwater. All that is needed is the end-member δD for the regional carbonate groundwater and the end member δD of recharge water.

The upgradient regional carbonate aquifer is believed to have a δD of about -109 permil represented by the δD of Hiko, Crystal and Ash springs in Pahranagat Valley. This δD is supported by the Fugro Dry Lake Well in Dry Lake Valley with a δD of -108 permil. Groundwater from the KSV well KPW-1 has a δD of -104 permil (-105 permil from SNWA sample) suggesting minor mixture with recharge water from this new carbonate aquifer well. Finally, in the MRSA, groundwater in well EH-5, at a depth of 265 feet, had a δD of -107 permil (Thomas et al., 1996). These spatial relationships indicate a δD for the regional carbonate aquifer is probably between -107 and -109 permil and probably closer to -109 than -107 permil. Therefore, if groundwater in the regional carbonate aquifer forms a continuous flow from Pahranagat Valley and above to all southern basins without mixing with another groundwater along the way then this end-member has a δD of about -109 permil. The available δD data indicate that minimal mixing occurs at least between Pahranagat Valley to the MRSA. Data on the carbonate aquifer south of the MRSA is very sparse and available data, for example at Rogers and Blue Point Springs, are highly mixed groundwaters. If the regional carbonate groundwater mixes with other groundwater below the MRSA then it will have a more positive δD. Groundwater from the EH well depth sampling indicates that this may have occurred in California Wash with a probable regional carbonate groundwater shift to a δD of about -105 permil (Figure 12). The Eh-2 well depth distribution clearly indicates that this is a possibility (Thomas et al., 1996). Therefore, a δD of -105 permil is the regional carbonate groundwater end-member δD for the calculated discontinuous groundwater flowpath between the MRSA and Rogers-Blue Point Springs in the Black Mountain Area.

Springs from six of the hydrographic areas cluster around an average δD of -87 permil. Average spring water indicate a surprisingly narrow range of δD with an average of 87.1 per mil. The average δD for spring waters of Delamar Valley is -85; KSV, -87.4; CSV, -88.4; Meadow Valley Wash, -87.2 and California Wash-Black Mountain -87.2 permil. This indicates that a δD value of -87 permil represents an end-member for recharge and therefore, groundwater other than the regional carbonate groundwater in these areas. This end-member δD is used to calculate continuous mixing proportions between the regional carbonate groundwater for all springs and well samples. However, there are a number of analyses below the MRSA with lower δD so a discontinuous groundwater flowpath end-member for this water used a δD of -79 permil.

The above mixing equation was used to estimate the percentage of regional carbonate groundwater for each of the analyses with a δD. Since the average δD is used as end members in the equation, the estimate for some springs will have percentages of regional carbonate groundwater that may be too high. For example, in the high mountain springs of KSV and CSV, the estimated percentages of regional carbonate groundwater may be too high because the regional carbonate groundwater elevation is too low for it to be currently contributing to the spring flow. However, regional carbonate groundwater could still be present in todays spring waters from geologically historical regional carbonate groundwater when its water level could have been higher. Therefore, the estimated regional carbonate groundwater percentages are retained and shown for all samples to be conservative and eliminate bias.

The estimated percentages of regional carbonate groundwater in each water sample with a δD are listed in Table 1 and shown on Figures 15 and 16. These two figures assume a continuous regional carbonate groundwater flow from Pahranagat Valley south through springs in the Black Mountain area using the same end members for the entire flowpath. Figure 17 shows the percentage of regional carbonate groundwater assuming that the δD end members of the regional carbonate groundwater and recharge water change (shift) to -105 and -79 permil, respectively, within and/or downgradient of the MRSA (southern part of the area). This shift in the δD end members results for the discontinuous groundwater flowpath causes the estimated regional carbonate groundwater percentages to be 10 to 15 percent higher than the estimates for the continuous groundwater flowpath.

Figure 18 shows the estimated percentages of regional carbonate groundwater in each well and spring sample for the continuous groundwater flowpath. As would be expected, groundwater from most wells have a higher percentage of the regional carbonate groundwater and most springs have higher percentages of recharge water. Most of the well samples form a trend line of increasing recharge from their high latitude locations to the lowest latitude. This trend line suggests an average increase in recharge of about 0.3 per mile along the groundwater flowpath. The cluster of springs at a latitude of about 36.4 are the Rogers, Blue Point and other springs in the Black Mountain area. They are considerably below the well trend line with an estimated average of about 40 percent regional carbonate groundwater.

Figure 19 separates out the springs for the continuous groundwater flowpath. Only the Pahranagat Valley and MRSA (including Big Muddy Springs) are above 50 percent regional carbonate groundwater. Most of the springs approach and are parallel to that percentage but others like CSV and a couple of the very southern Black Mountain Area springs imply a trend of increasing recharge water along a groundwater flow to the south.

Figure 20 shows the estimated regional carbonate groundwater for the individual wells (continuous flowpath). The trend is toward increasing recharge with groundwater flow to the south in an envelope of all the wells. The single well sample in the Black Mountain Area contains virtually no estimated regional carbonate groundwater and, therefore is almost all recharge water. Figure 21 segments the upper tier of wells and springs by groups showing a consistent trend from Pahranagat through CSV and MRSA to Garnet Valley. Rogers and Blue Point springs and other Black Mountain Area springs are below the trend.

Table 2 lists the average estimated percentages of regional carbonate groundwater in wells for the hydrographic areas, KPW-1, Big Muddy Spring and both Rogers and Blue Point Springs. Values are for the continuous groundwater flowpath except for Rogers and Blue Point Springs where the continuous and discontinuous groundwater estimates, respectively, are listed. There is a dominance of about 60 percent for most of the hydrographic areas suggesting that this is the average percentage of regional carbonate groundwater moving south from Pahranagat Valley through Garnet Valley and California Wash. CSV has an estimated five percent more recharge water mixing with the regional carbonate groundwater while Meadow Valley Wash has an estimated 22 percent more recharge water. However, the Rogers and Blue Point springs estimate is about 20 percent below the about 60 percent continuous groundwater flowpath that probably documents the major flowpath to

Table 2. Average percentage of regional carbonate Groundwater in wells of the hydrographic areas plus KPW-1 well, Big Muddy, Rogers Springs and Blue Point Springs.

Hydrographic Area/Well/Spring	Average Percent Regional Carbonate Groundwater
Pahranagat Valley	60
KPW-1	82
Coyote Springs Valley	55
Garnet Valley	58
Muddy River Springs Area	62
Big Muddy Spring	60
Meadow Valley Wash	38
California Wash	61
Rogers Spring	39 and 50
Blue Point Spring	42 and 53

the south. This relationship suggests that either Rogers and Blue Point springs are on a entirely different flowpath origin, for example the Virgin-River-Mesquite groundwater flowpath, a mixture of this different flowpath or are a weak secondary groundwater flowpath from the major MRSA flowpath. Given this ambiguity of the regional carbonate groundwater flow path to these two springs, the latter is included in this work. Therefore, the estimated regional groundwater percentages suggest two major groundwater flowpaths south of CSV, one through Garnet Valley moving south and a second moving through the MRSA into California Gulch flowing to the south but with the potential for a weak secondary flowpath that might include the Rogers Spring and Blue Point Spring to the east of this second major groundwater flowpath.

CARBON-14

Carbon-14 is a radionuclide that decays with a half-life of 5,370 years occurring as part of the carbon molecules that comprise the bicarbonate, carbonate and organic carbon in a water. Unlike deuterium, carbon-14 can be lost along groundwater flowpaths by carbonate precipitation or gained by dissolution of carbonate minerals and rocks as well as degraded organic carbon compounds. There are several geochemical models that approach accounting for these sources by using carbon-13 values and other techniques but there are insufficient data to approach modeling the carbon-14 date. Even the current geochemical models cannot really account for the relative amounts of mixing of groundwater with many different ages. The carbon-14 values typically reported in percent modem carbon (pmc) for the bulk groundwater in some cases can be, for example, almost all regional carbonate groundwater so that an apparent age calculated by using only the carbon-14 half-life may be near the true age of the groundwater. Alternately, and perhaps more usual, the bulk groundwater has a considerably more complex history that involves not only the products of precipitation and dissolution reactions but also mixing between groundwaters of considerably variable ages. There are significant problems with age dates in southern Nevada as described by Winograd and Pearson (1976). This problem is still being worked on but at this point there is no readily available method that can give a consistently true "age" of any groundwater sample.

Figures 22 and 23 show the available carbon-14 values and their locations within the Colorado River Basin area. Table 3 lists a summary of carbon-14 data and the simple apparent age for hydrographic areas, KSV well KPW-1 as well as Big Muddy, Rogers and Blue Point springs. Most of the apparent ages are in the 14,000 to 35,000 years before present range. The KSV well, KPW-1, has one of the oldest apparent ages at 29,900 years. Assuming that the apparent ages are somewhat true, and in this case it may well be, it is not probable that KSV groundwater represented by KPW-1 with this age could represent a significant contribution to the flow at Big Muddy Springs. Again assuming that the apparent ages are somewhat true, the average apparent age for CSV of 20,800 years is essentially the same as MRSA which would support the above second major groundwater flowpath to the south.

Table 3. Carbon-14 percent modern carbon (pmc) values and apparent ages for hydrographic areas, KSV well KPW-1, major springs in Pahranagat Valley as well as Big Muddy, Rogers and Blue Point springs.

Hydrographic Area/Well/Spring	Carbon-14 (pmc)	Apparent Age (Years Before Present)
Pahranagat Valley, Major Springs	6.3-8.4	20,300-21,700
KPW-1	2.7	29,900
Coyote Springs Wells	4.2-17.9	14,200-26,200
Garnet Valley Wells	3	29,000
MRSA	8.4	20,600
Big Muddy Springs	7	22,000
Rogers Spring	1.6,2.4	30,900-34,200
Blue Point Spring	7.2,5.4	21,600-24,100

A longer travel time is estimated with the same assumption applied to travel time from CSV to Garnet Valley of 8,000 years. A similar assumption would mean a travel time from Big Muddy Springs to Rogers Spring on the order of about 10,000 years. The difference between Rogers Spring and Blue Point Spring apparent ages bring a common source to each spring into question. The difference could be a somewhat true age but may be related to either mixing differences between the water arriving at each spring or simply significantly more recent organ carbon present within the Blue Point Spring than Rogers Spring. The apparent ages indicate that the groundwaters within the Colorado River Basin flowpath are not young but are within the range of groundwater ages of groundwater in other basins in the southwestern U.S. Furthermore, travel time between hydrographic areas is probably on the order of thousands of years.

FLUORIDE

Fluoride is commonly elevated in groundwater associated with volcanic rocks. Figures 24 and 25 show the fluoride concentrations and their locations. Fluoride has an average concentration of 1.6 mg/L for the 63 analyses that include fluoride. Fluoride ranges from 0.1 to 6.1 mg/L with three analyses exceeding the current drinking water standard of 4.0 mg/L: groundwater from the KSV well KPW-1 with 6.1 mg/L; Little Ash Spring in the Pahranagat Valley, 4.8 mg/L; and the CSV well CSVM-4 downgradient of KPW-1 with 4.6 mg/L. All of the remaining springs and wells have less than 3 mg/L. The fluoride concentrations support groundwater flow from both Pahranagat and KSV into the CSV by an overall elevated concentration probably related to both volcanic rocks from the caldera complex and the tuffaceous sediments deposited within the basins during and following the development of the caldera complex. As shown on Figure 26, dissolved fluoride concentrations are generally controlled to less than about 2 mg/L by calcium both as a dissolved form and particularly within carbonate rocks by the precipitation of the calcium-fluoride mineral fluorite. Groundwater with less than about 100 mg/L calcium has the highest fluoride concentration. The elevated calcium concentrations above 400 mg/L include Rogers, Blue Point, Corral and VF-2 springs that also have highly elevated TDSS.

ARSENIC

An elevated arsenic concentration of 46 micrograms per Liter (µg/L) is reported for the KSV groundwater from KPW-1. There are too few arsenic data reporting arsenic concentrations to evaluate the arsenic concentrations throughout the area but the dissolved arsenic concentration is often elevated in water associated with volcanic rocks. Other groundwater samples analyzed for this investigation indicate that groundwater in the CSV probably ranges from about 10 to 20 µg/L. Bateman (1976) included additional arsenic concentrations in some groundwaters from this segment of the Colorado River Basin. Ash Spring in Pahranagat Valley contained 30 µg/L; Little Ash Spring contained 20 µg/L; and groundwater from a well in Pahranagat Valley is reported to contain 250 µg/L (Alamo Farmstead System Well). Below CSV, Pederson Warm Spring in the Muddy Area contained 20 µg/L and the Bhemer Well downgradient of Big Muddy Springs is reported to contain 2.8 mg/L (2800 µg/L) arsenic.

These relationships indicate a high probability that groundwater in this area contains dissolved arsenic concentrations in excess of the new arsenic drinking water standard of 10 µg/L arsenic. The arsenic probably originates from the volcanic rocks and volcanic sediments through which the part of the groundwater flows.

SUMMARY

Groundwater from the KSV well KPW-1 is a relatively old and warm regional carbonate aquifer groundwater with a sodium-bicarbonate water chemistry type. Along with the age, this water chemistry type is unique for the regional carbonate groundwater in this area. It is both older than and has a higher TDSS than the CSV. However, these signatures are considerably attenuated within the CSV. The δD for this groundwater identifies this groundwater as being regional carbonate groundwater that is mixed with about 18 percent recharge water. A comparison of these chemical and isotopic relationships with Big Muddy Springs and particularly Rogers Spring and Blue Point Spring indicates that the groundwater from KPW-1, assumed representative of KSV groundwater, is too strongly attenuated within CSV to be identifiable in these springs.

Mixing relationships between the regional carbonate groundwater and recharge water of younger age estimates a regional groundwater flowpath moving from the Pahranagat Valley south through the CSV that includes groundwater flow from KSV. Regional groundwater flow below CSV separates into two major groundwater flowpaths: one moving south through Garnet Valley and a second moving south through California Gulch. It is unclear if Rogers Spring and Blue Point Spring groundwater are on a weak secondary groundwater flowpath from the MRSA or from the Virgin River-Mesquite flowpath or a mixture of the two.

The regional groundwater appears to contain an average of about 60 percent regional carbonate groundwater and 40 percent recharge water as it moves through these hydrographic areas. Estimated percentages of regional carbonate groundwater indicate that the percentage of recharge water increases with distance below Pahranagat Valley. Big Muddy Springs is estimated to be comprised of 60 percent regional carbonate groundwater while Rogers Spring and Blue Point Spring are estimated to contain 60 percent recharge and only about 40 percent regional carbonate groundwater.

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Figure 1a

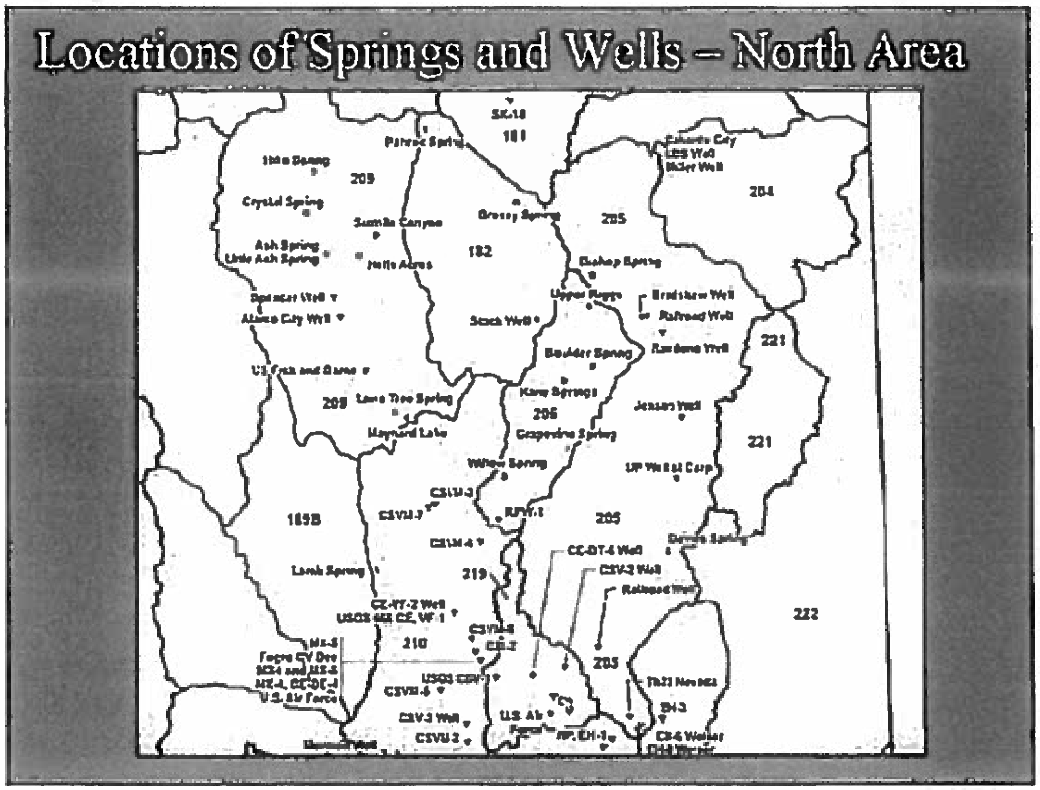

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Figure 1b

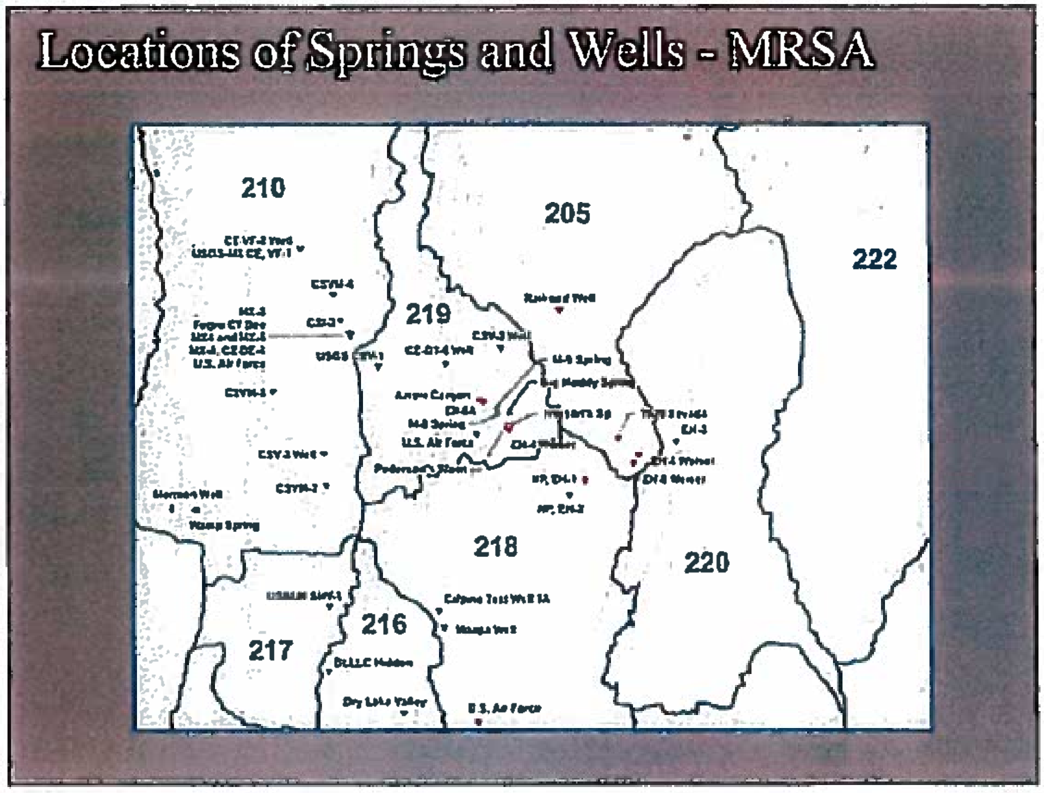
Locations of Springs and Wells - MRSA
210
205
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Figure 1c

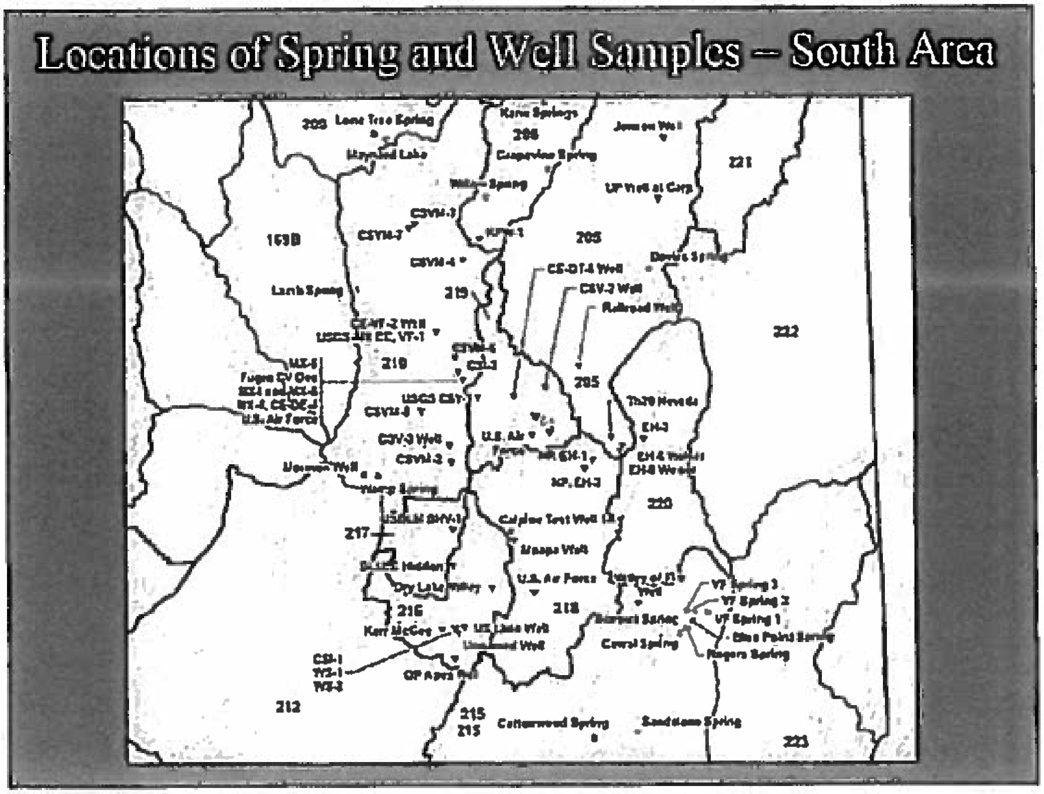

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Figure 2a

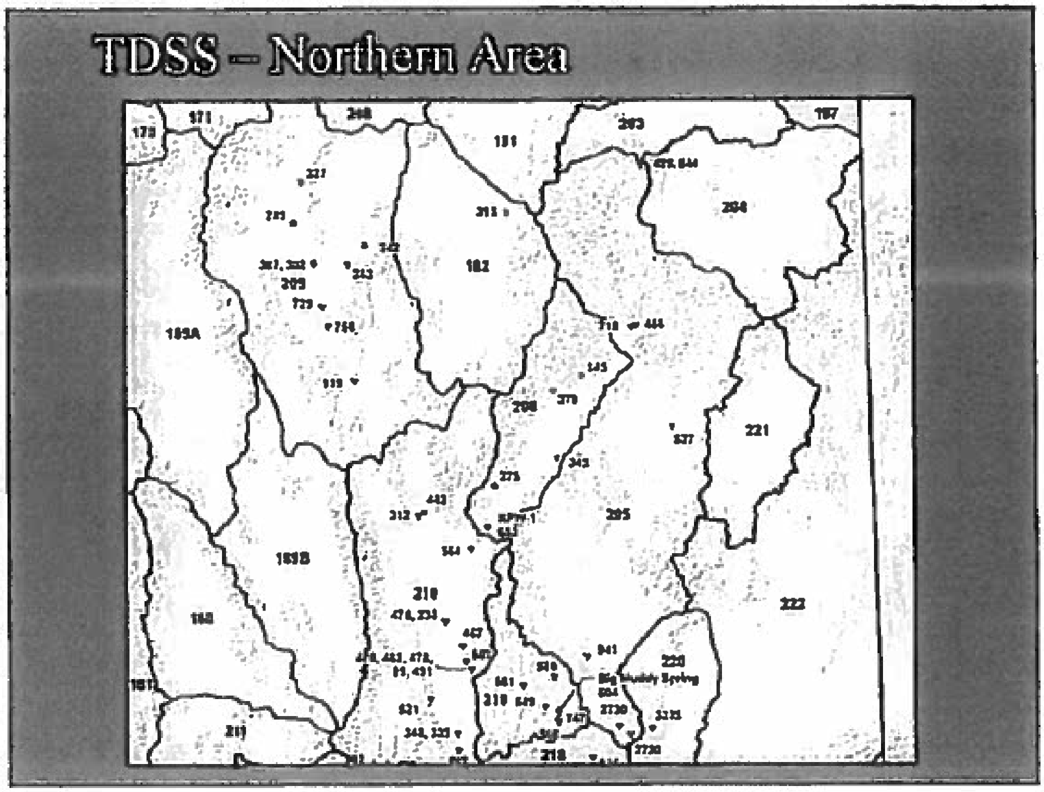


Figure 2b

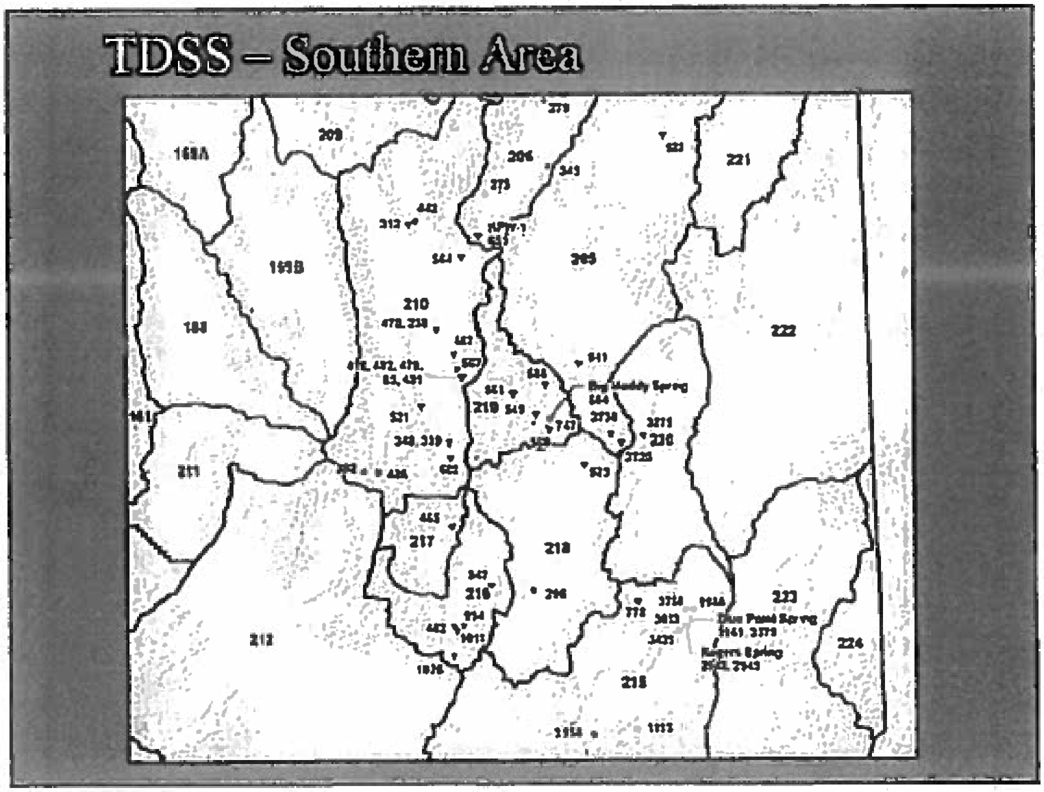
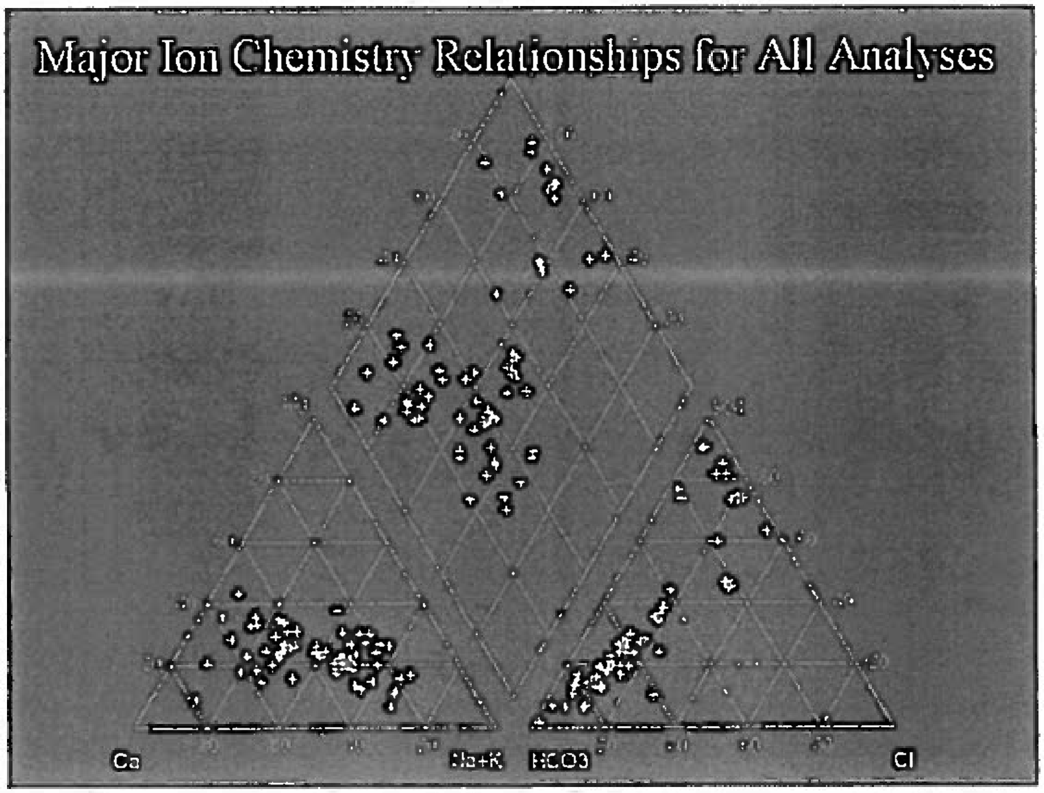


Figure 3



Major Ion Chemistry Relationships for All Analyses
Ca
Na+K
HCO3
Cl

Figure 4

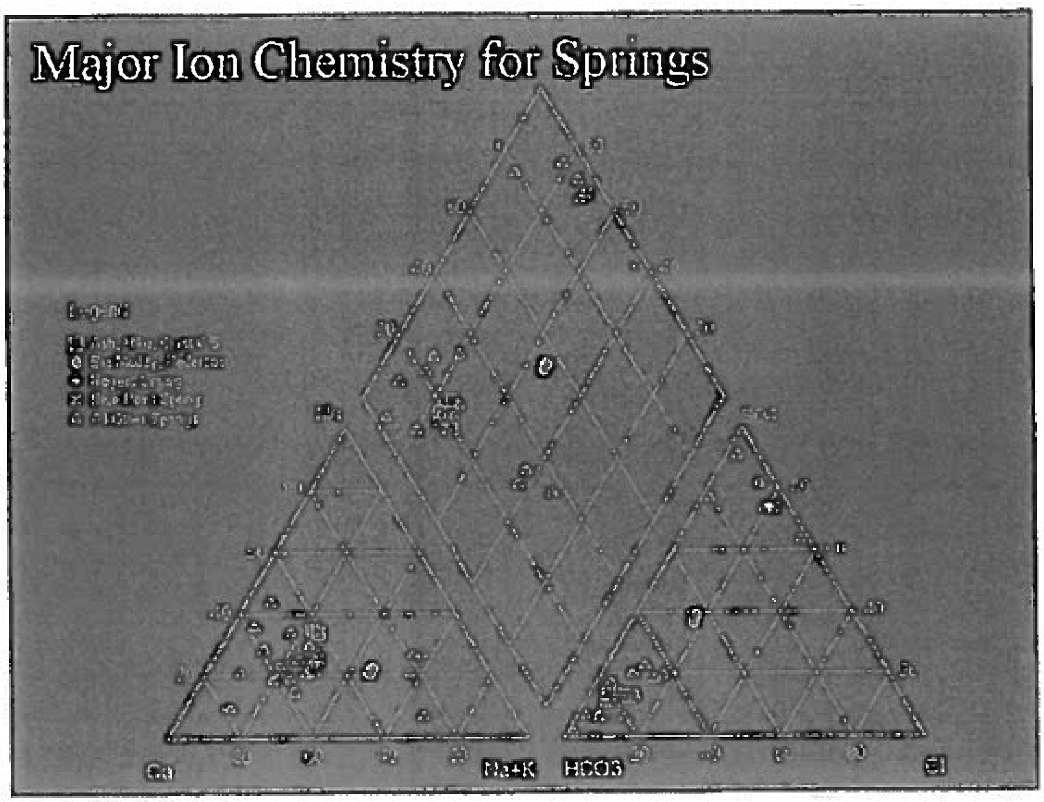


Figure 5

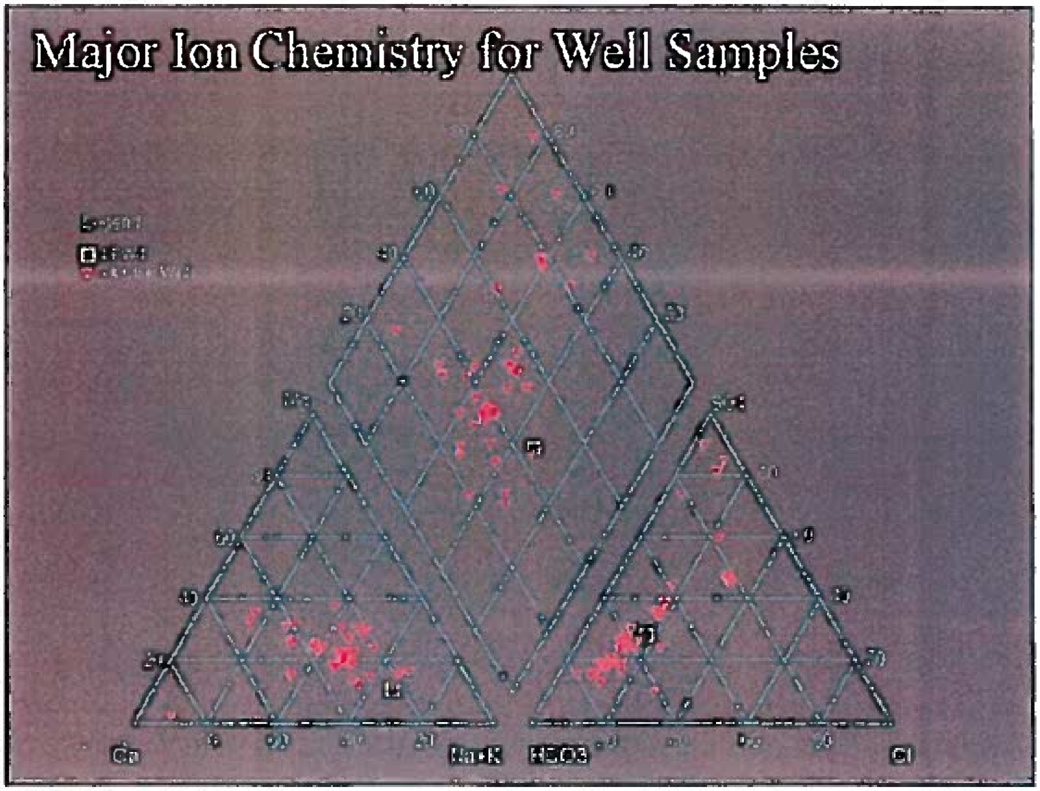


Figure 6

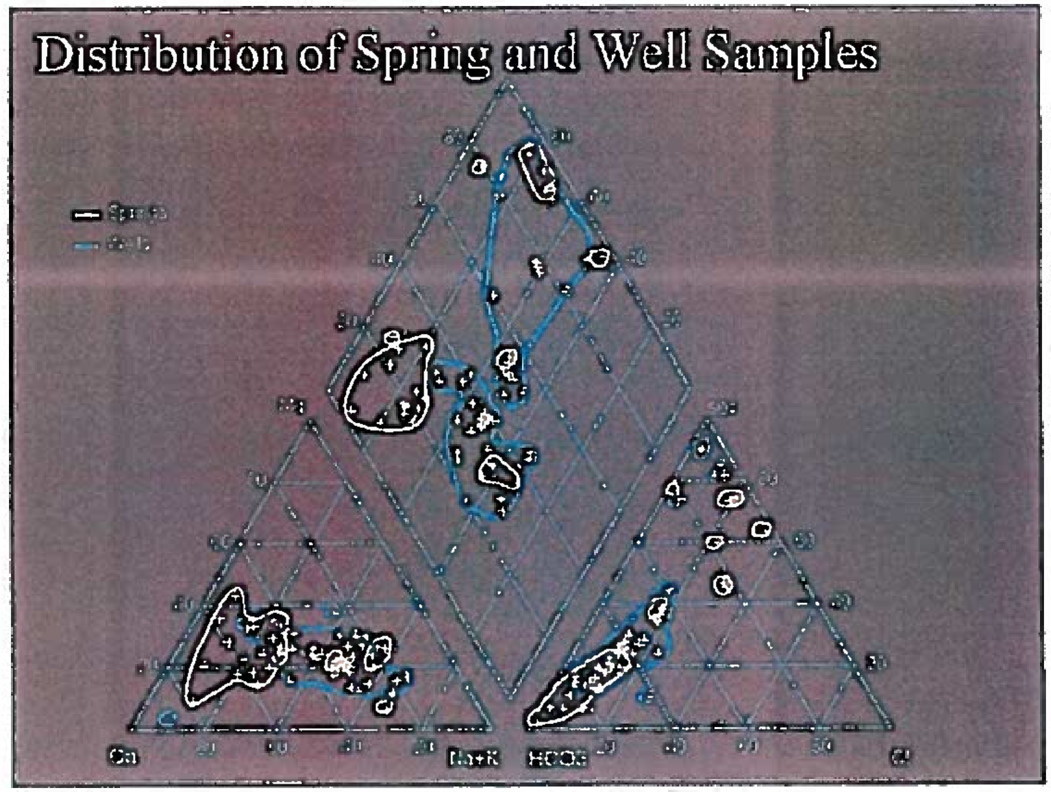
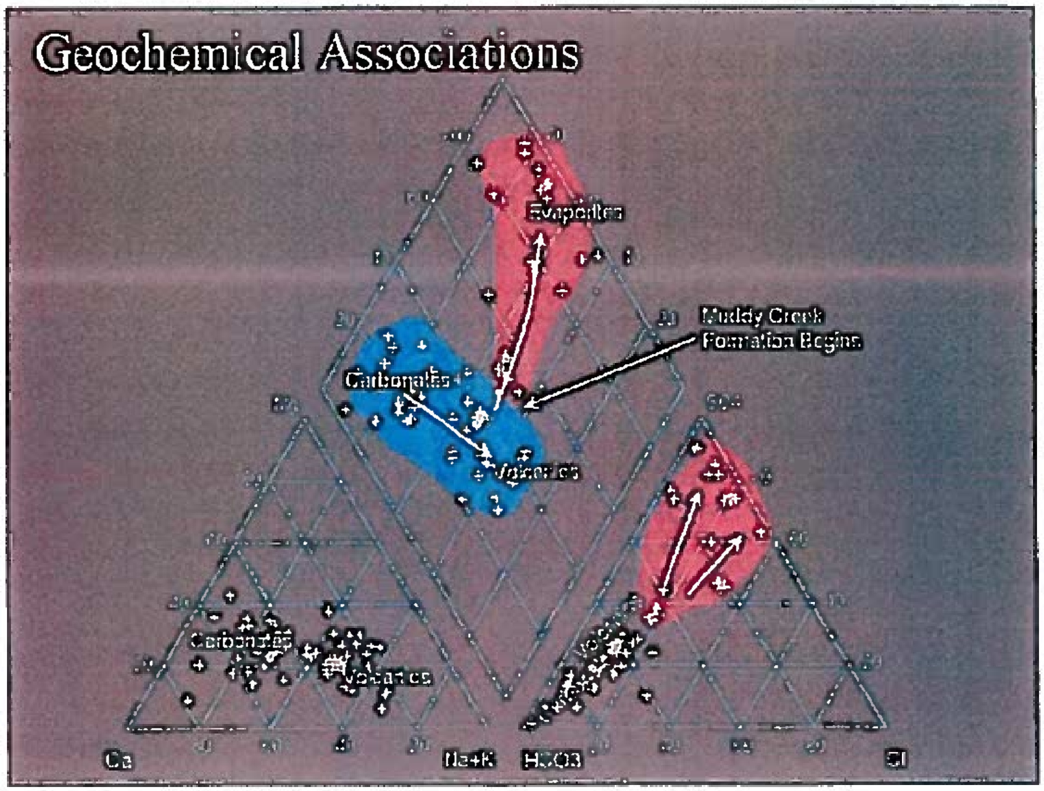


Figure 7



Geochemical Associations
Evaporites
Muddy Creek
Formation Begins
Carbonates
Volcanics
Carbonates
Volcanics
Ca
Na+K
HCO3
Cl
SO4

Figure 8

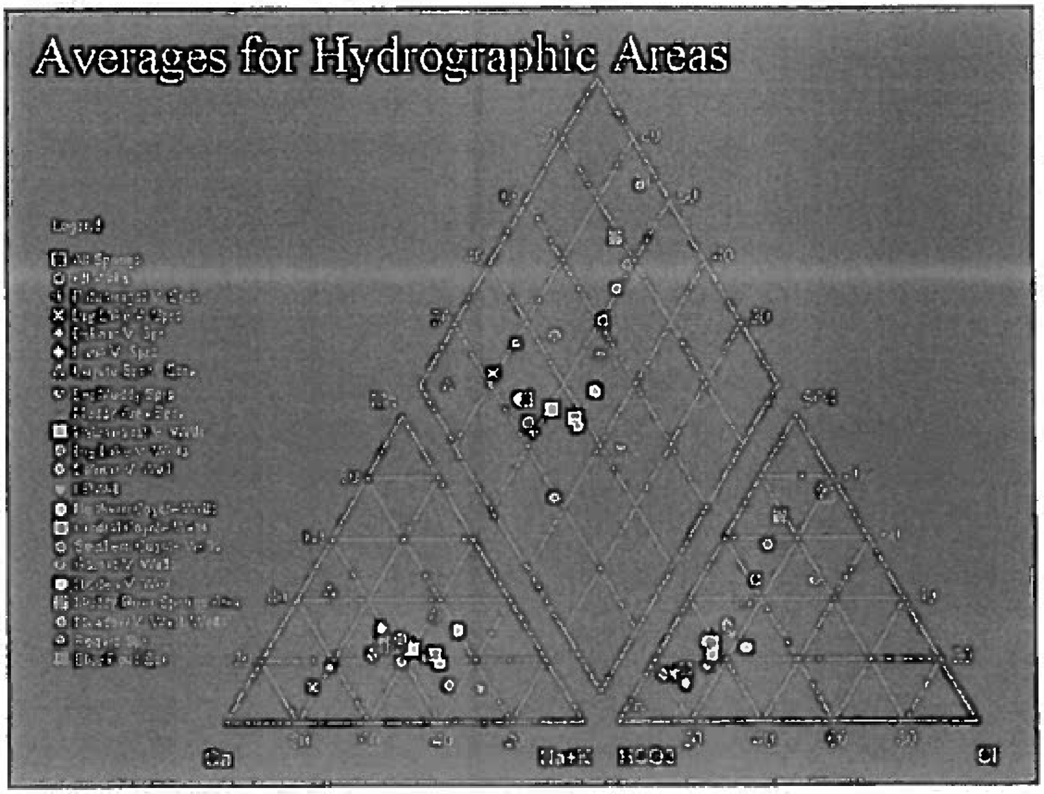


Figure 9

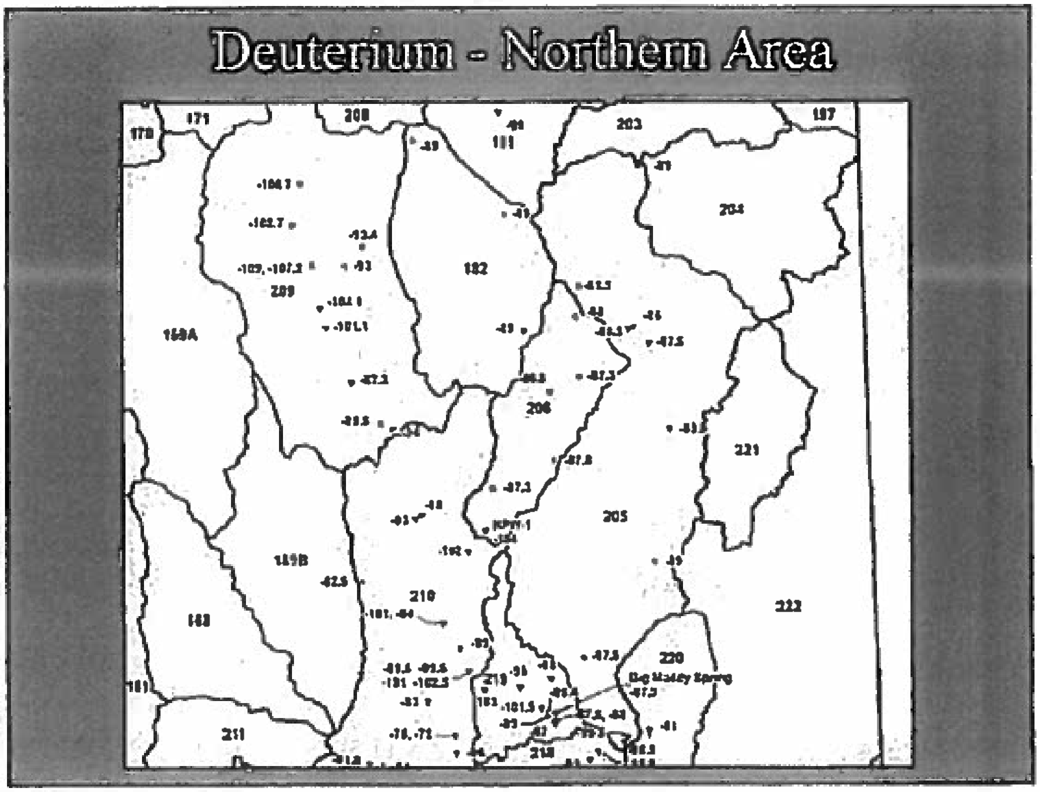

Deuterium - Northern Area
203
197
204
182
206
205
221
210
220
222
211

Figure 10

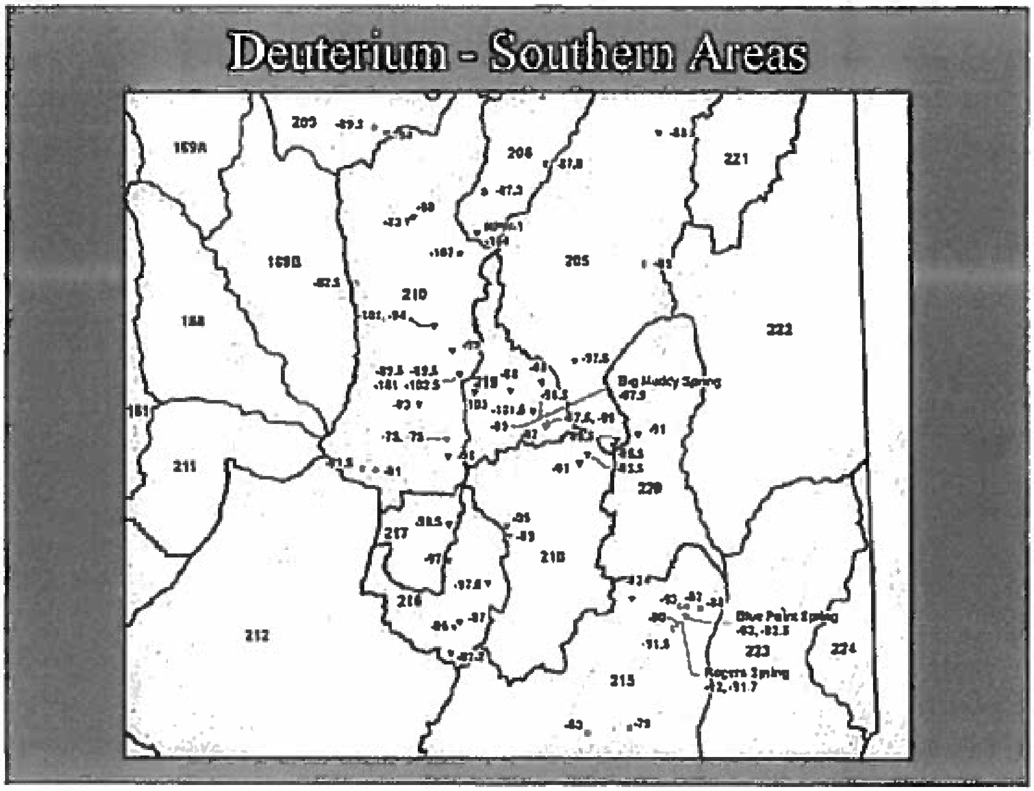
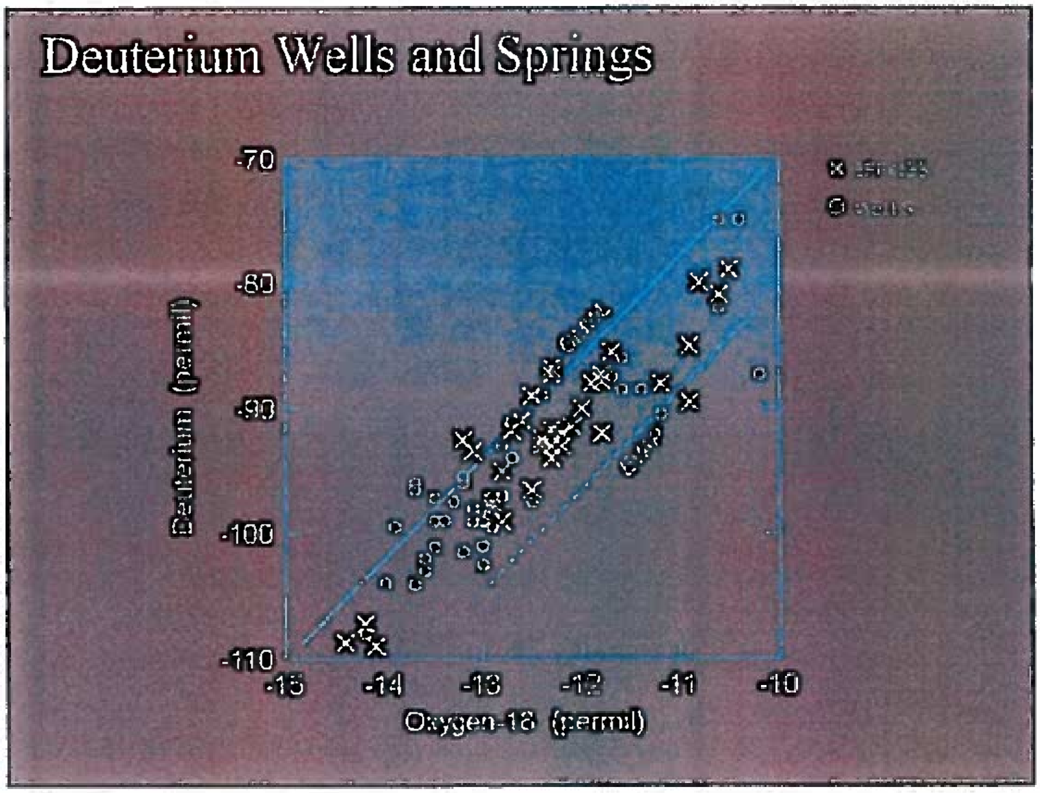


Figure 11



Deuterium Wells and Springs
-70
-80
-90
-100
-110
Deuterium (permil)
-15
-14
-13
-12
-11
-10
Oxygen-18 (permil)

Figure 12

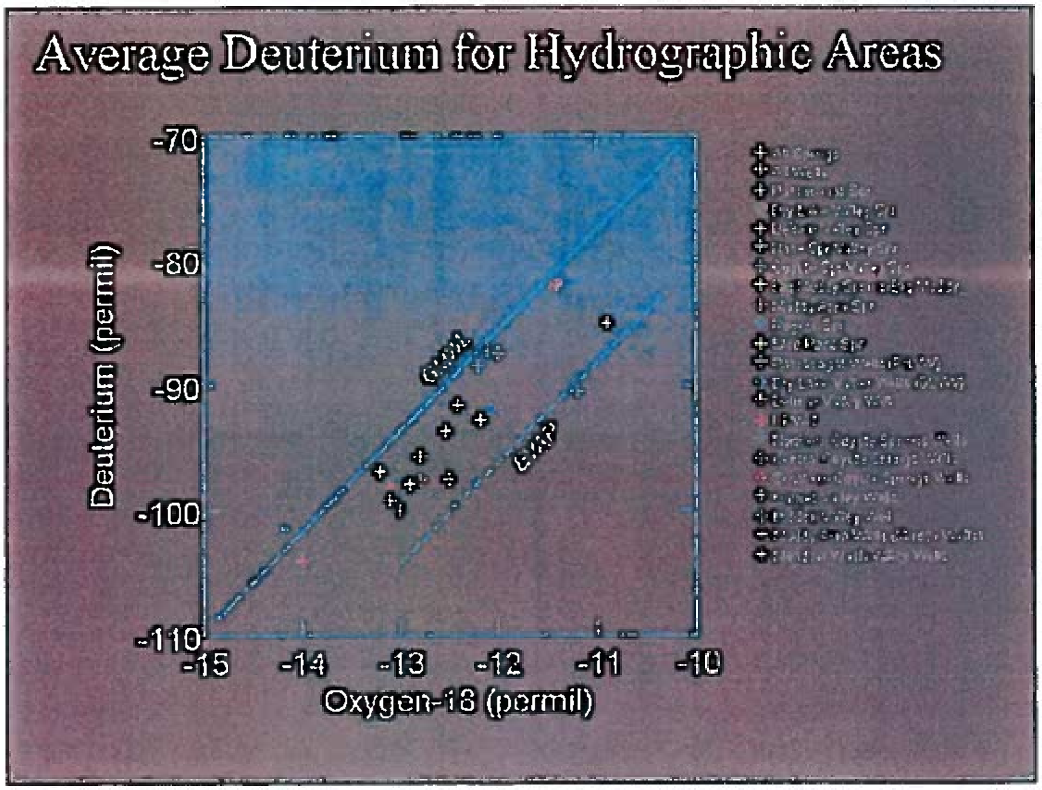
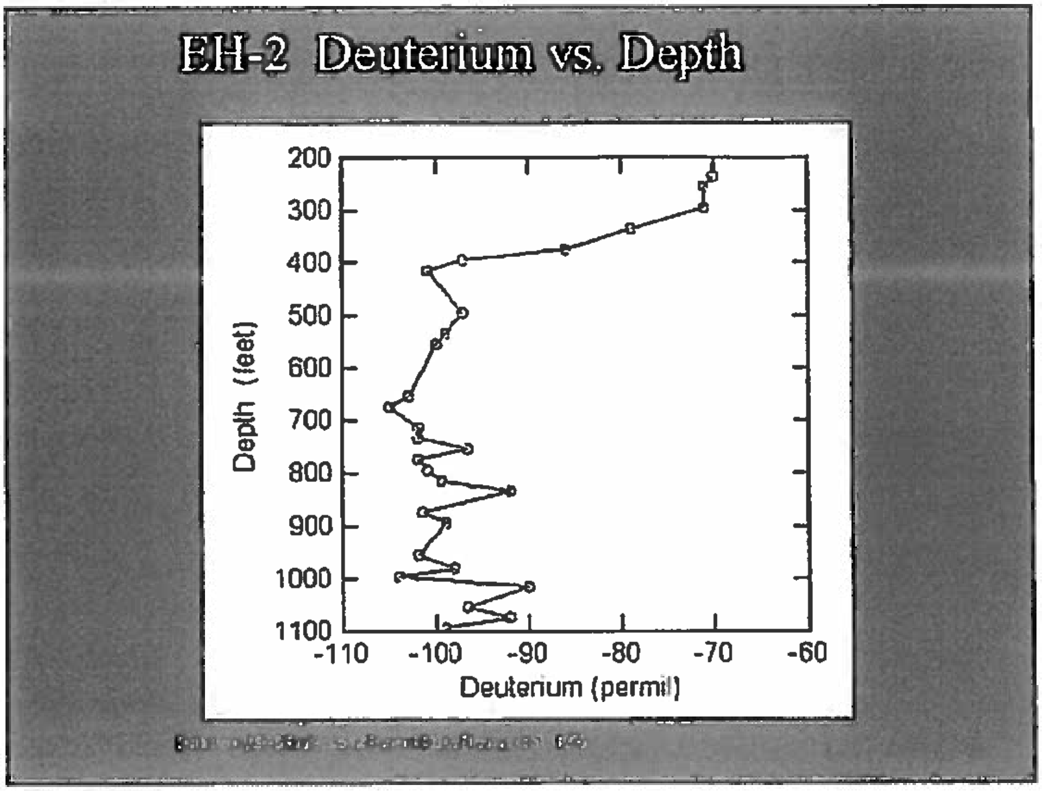

Average Deuterium for Hydrographic Areas
Deuterium (permil)
-70
-80
-90
-100
-110
-15
-14
-13
-12
-11
-10
Oxygen-18 (permil)

Figure 13



SE ROA 36333

JA_21121

Figure 14

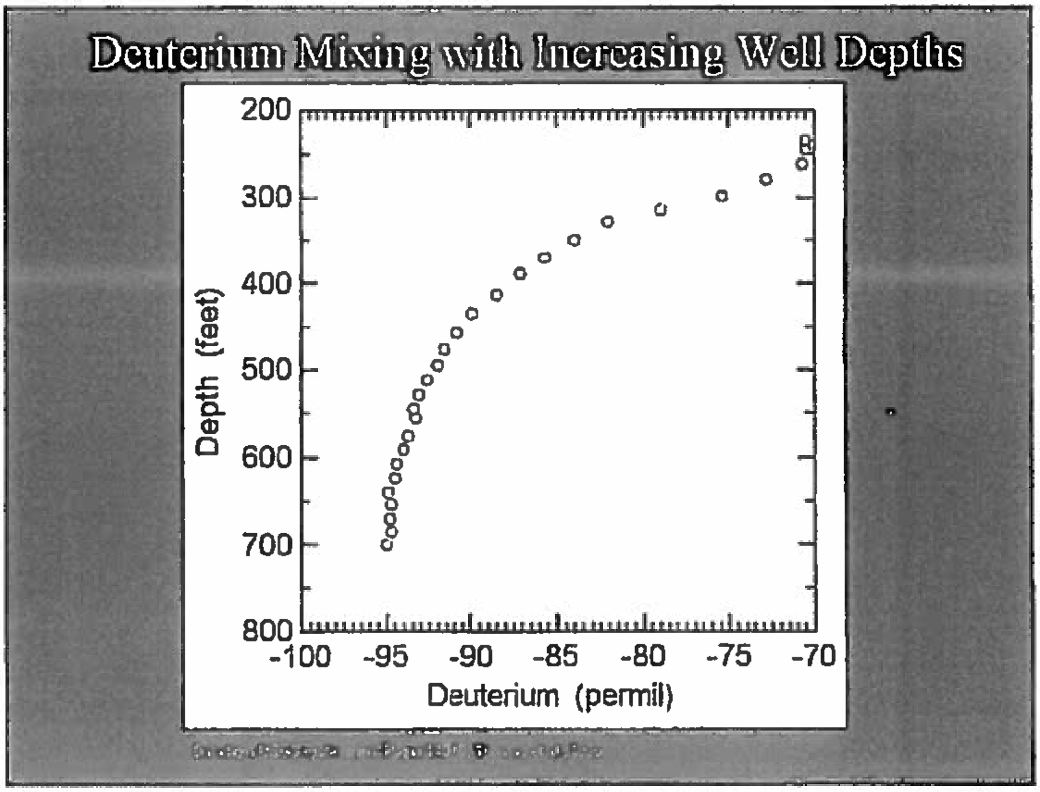

Deuterium Mixing with Increasing Well Depths
200
300
400
500
600
700
800
Depth (feet)
-100
-95
-90
-85
-80
-75
-70
Deuterium (permil)

Figure 15

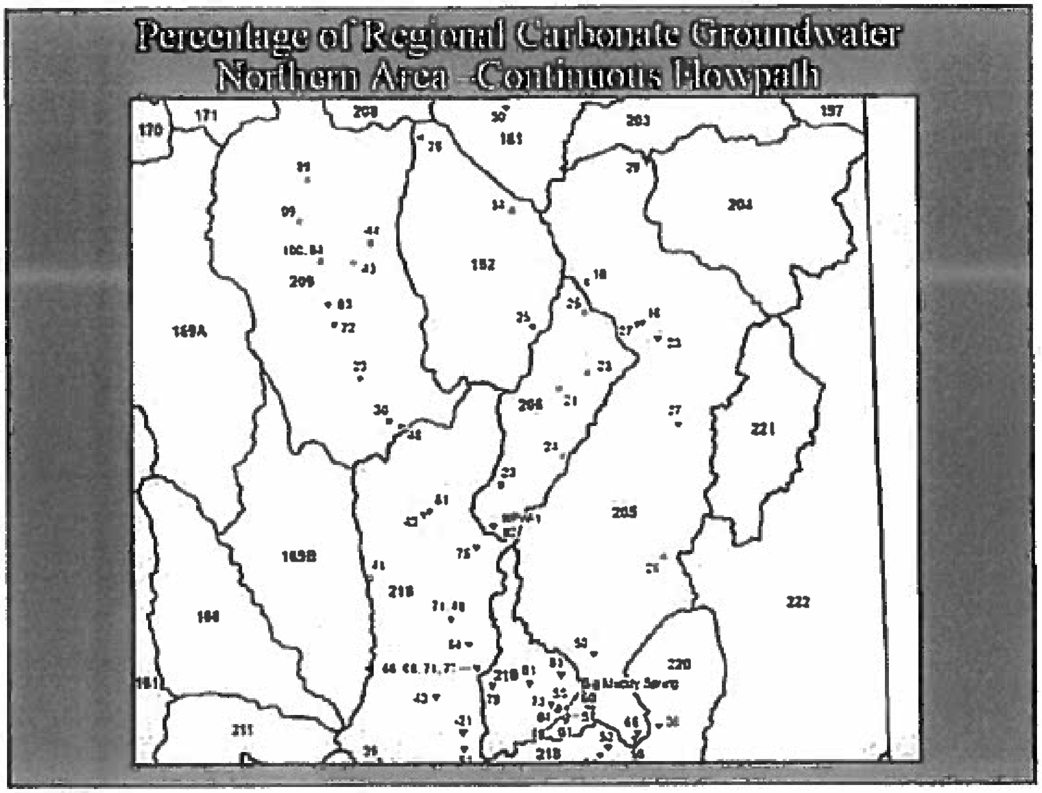

Percentage of Regional Carbonate Groundwater
Northern Area -Continuous Flowpath

Figure 16

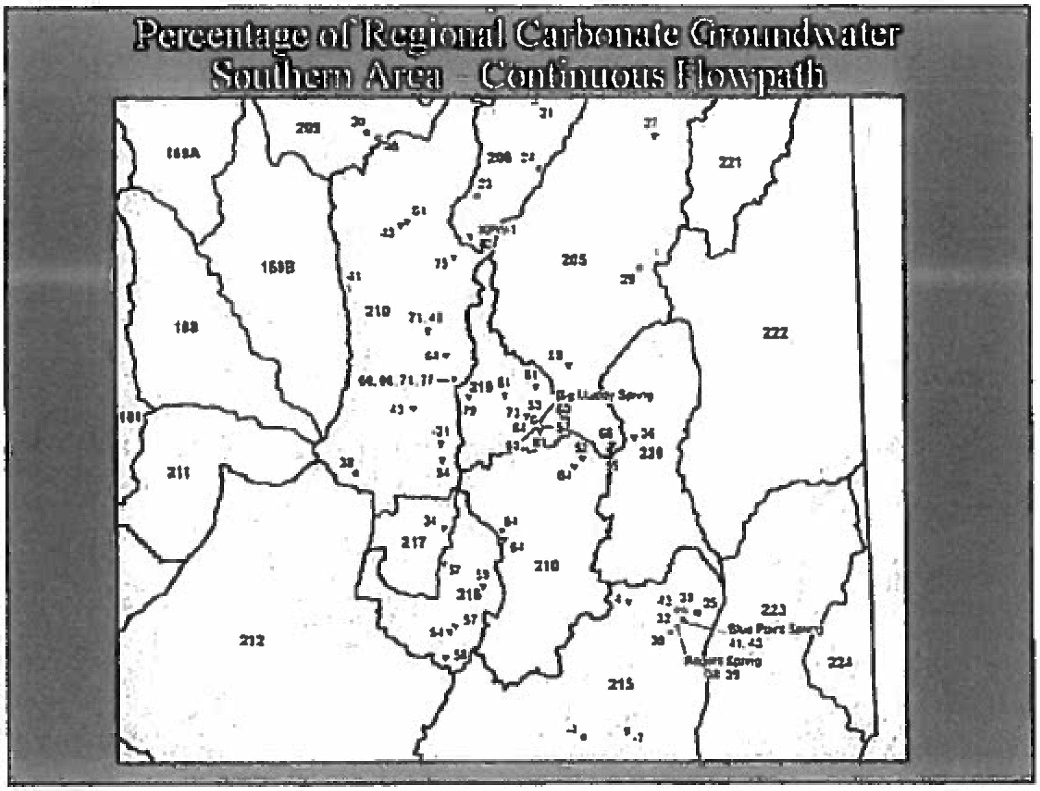

Percentage of Regional Carbonate Groundwater
Southern Area – Continuous Flowpath

Figure 17

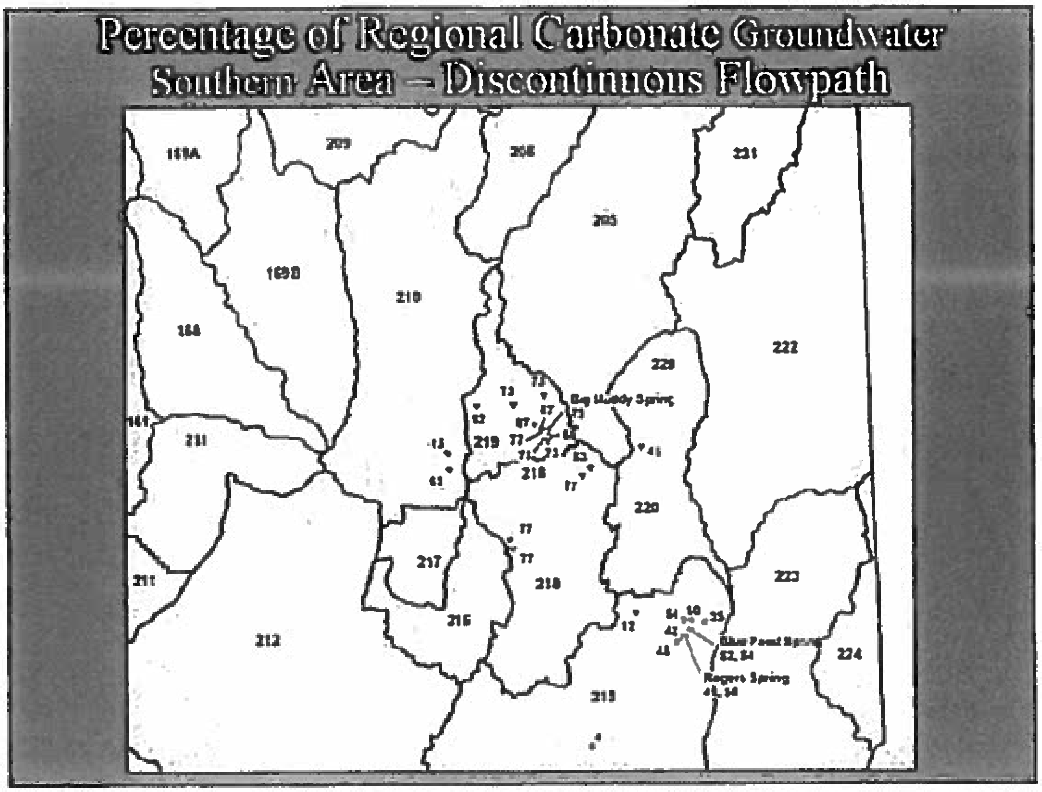

Percentage of Regional Carbonate Groundwater
Southern Area – Discontinuous Flowpath
210
222
220
219
217
218
216
215
212
224
Big Muddy Spring
Rogers Spring

Figure 18

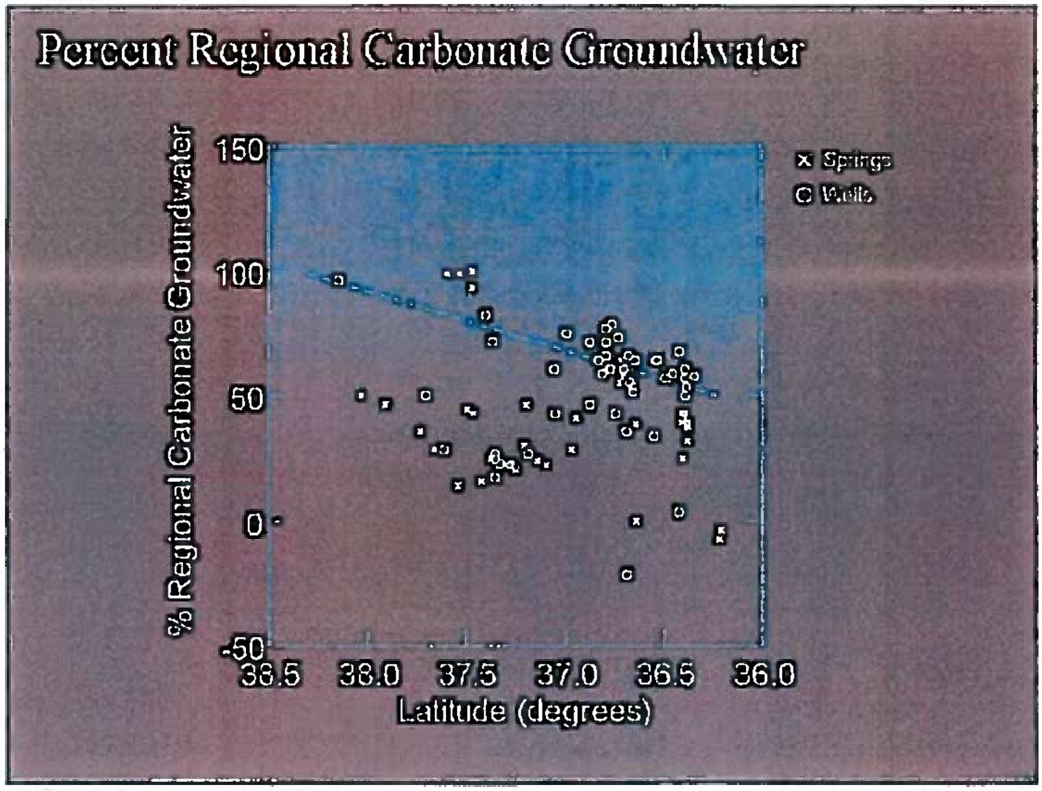

Percent Regional Carbonate Groundwater
% Regional Carbonate Groundwater
150
100
50
0
-50
38.5
38.0
37.5
37.0
36.5
36.0
Latitude (degrees)
Springs
Wells

Figure 19

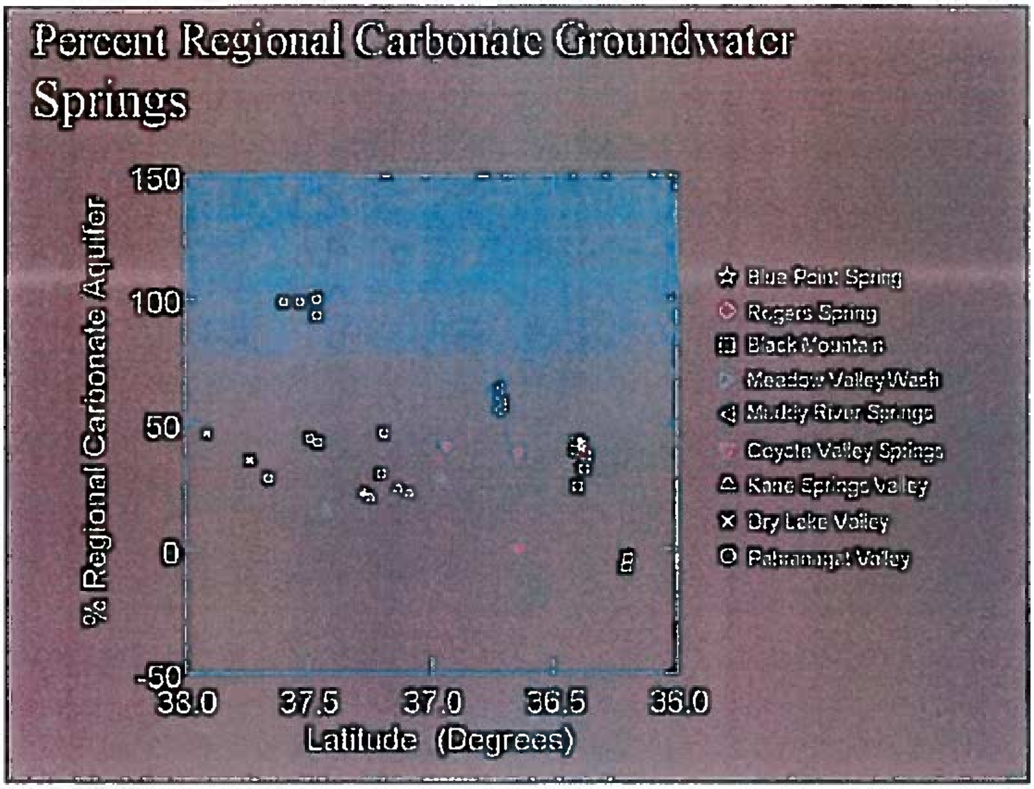
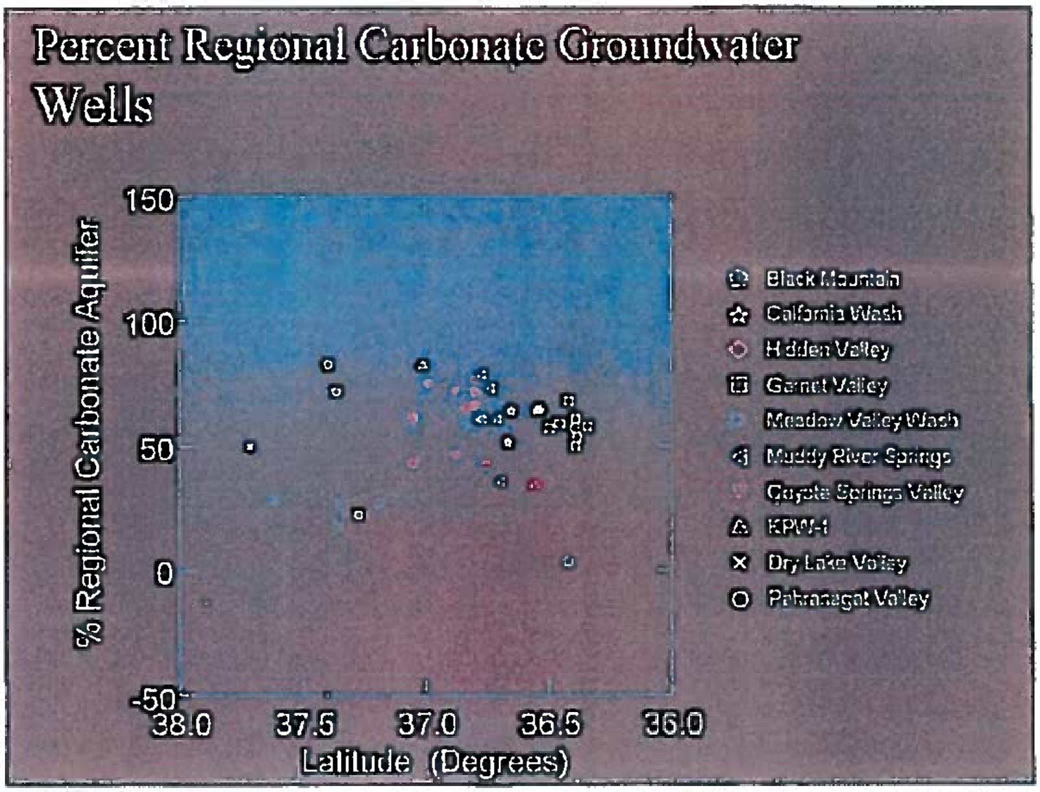

Percent Regional Carbonate Groundwater Springs
% Regional Carbonate Aquifer
150
100
50
0
-50
38.0
37.5
37.0
36.5
36.0
Latitude (Degrees)
Blue Point Spring
Rogers Spring
Black Mountain
Meadow Valley Wash
Muddy River Springs
Coyote Valley Springs
Kane Springs Valley
Dry Lake Valley
Pahranagat Valley

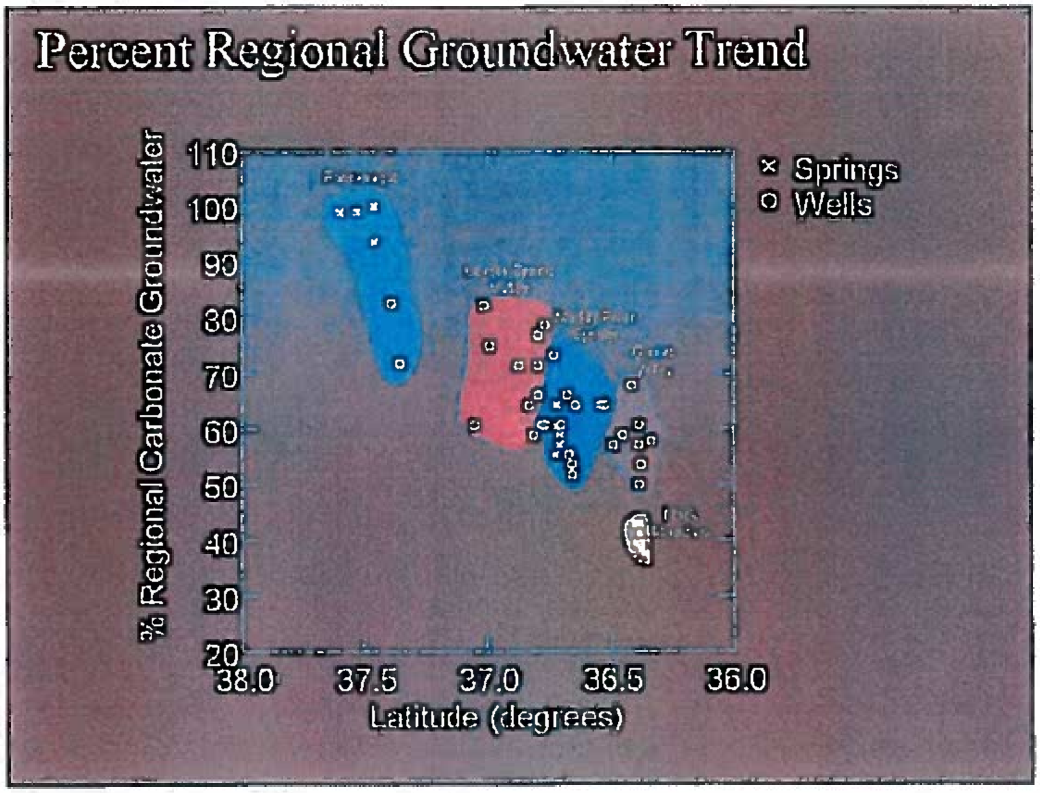
Figure 20



SE ROA 36340

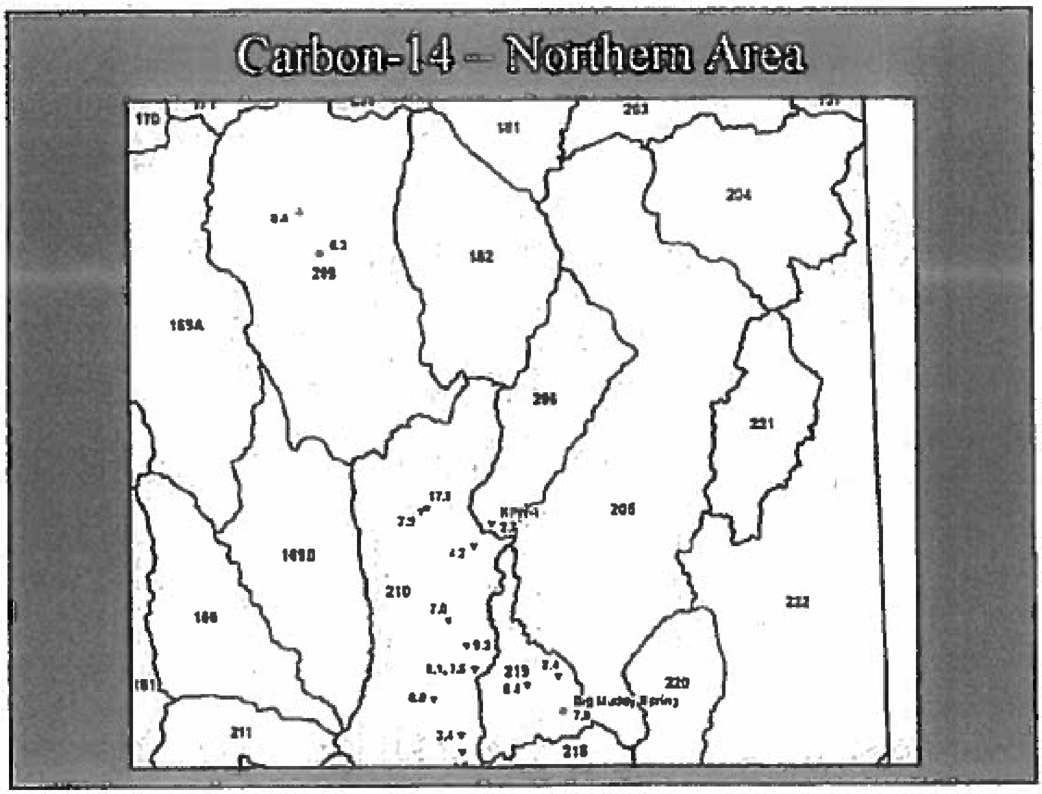
JA_21128

Figure 21



Percent Regional Groundwater Trend
% Regional Carbonate Groundwater
110
100
90
80
70
60
50
40
30
20
38.0
37.5
37.0
36.5
36.0
Latitude (degrees)
Springs
Wells

Figure 22


Carbon-14 – Northern Area
170
204
182
205
210
220
211
218
17.3
7.0
3.4
Big Muddy Spring

39

Figure 23

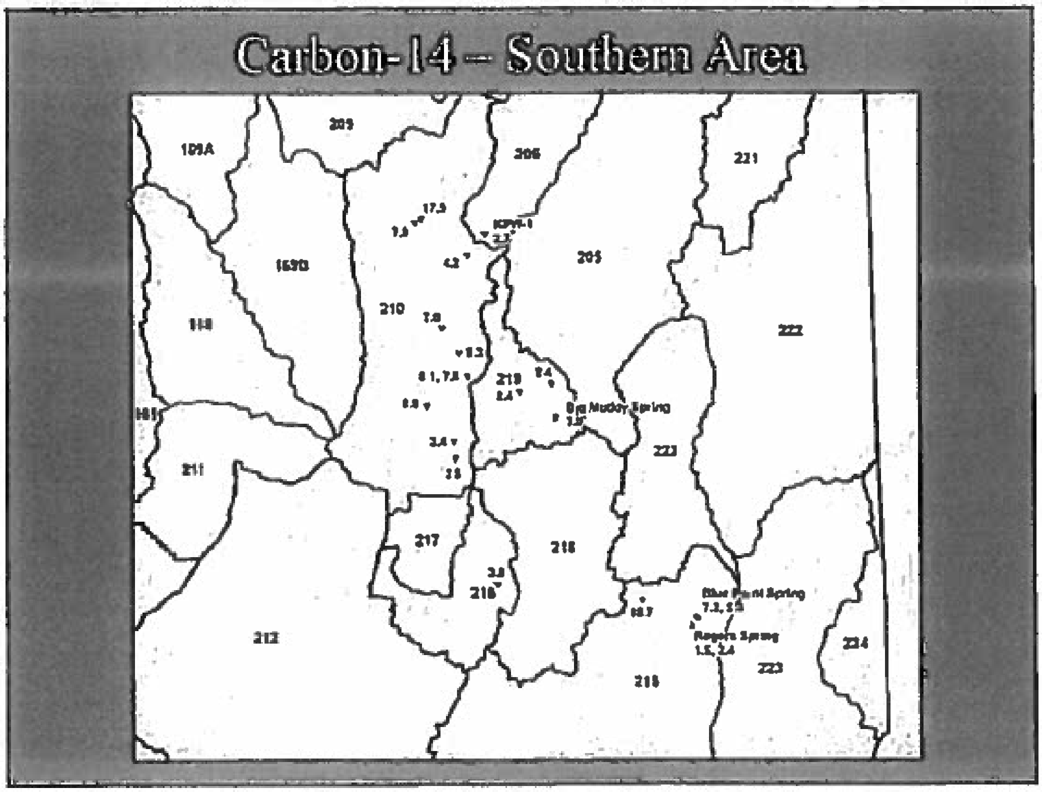

Carbon-14 – Southern Area
209
206
221
205
222
210
211
212
217
218
215
223
224
Big Muddy Spring
Blue Point Spring
Rogers Spring

Figure 24

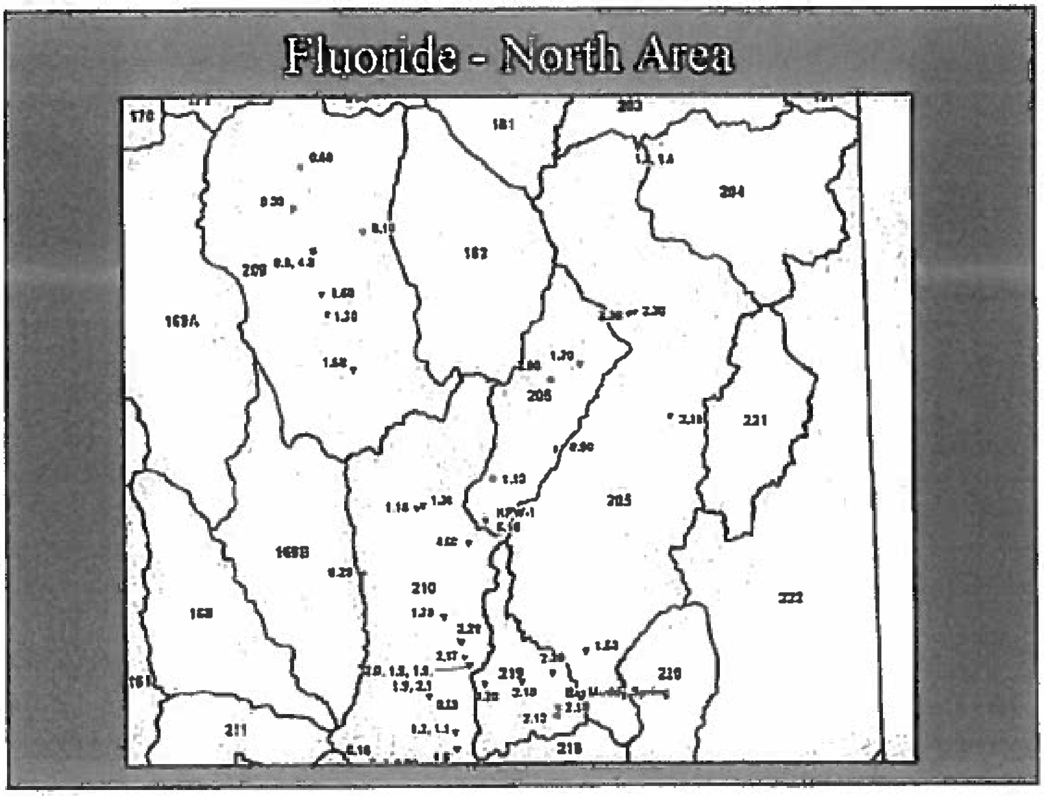
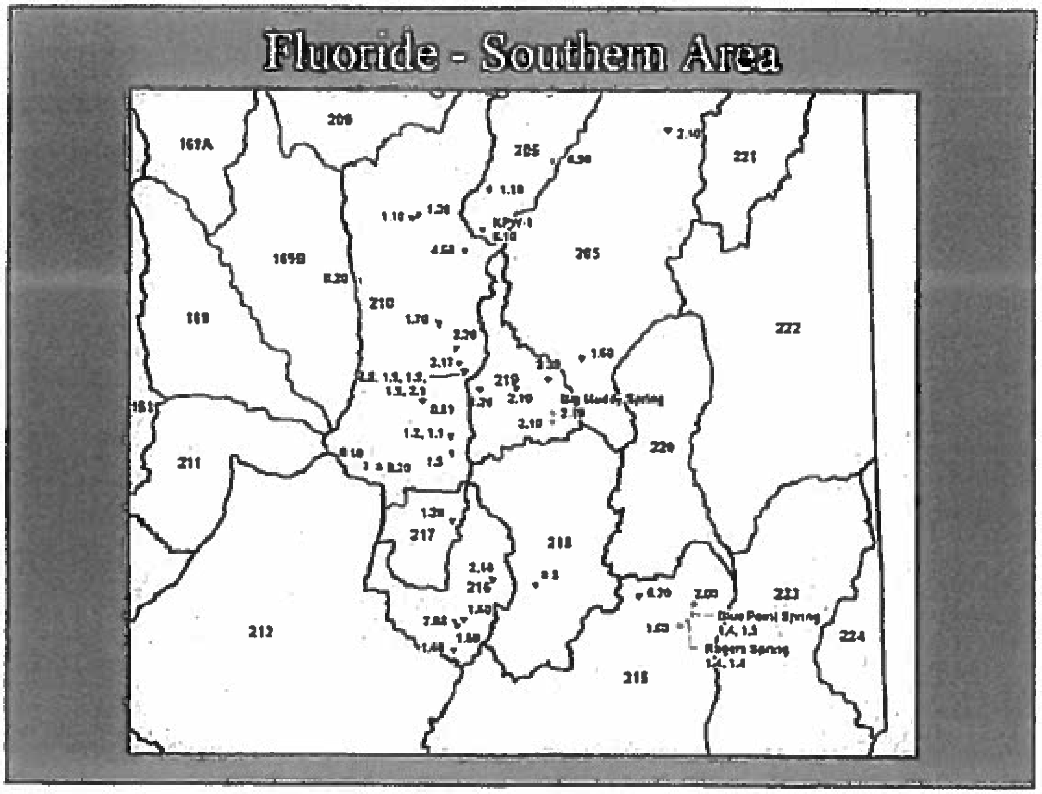


Figure 25


Fluoride - Southern Area
169A
169B
210
205
221
222
211
212
217
216
218
219
220
223
224
215
KPW-1
Big Muddy Spring
Blue Point Spring
Rogers Spring

Rebuttal Submittal

by

Lincoln County Water District and Vidler Water Company

to the

Interim Order #1303 Reports

Submitted on July 3, 2019

Prepared for:

Nevada State Engineer
Division of Water Resources
Department of Conservation and Natural Resources
901 S. Stewart St., Suite 2002
Carson City, Nevada 89701

Prepared by:

Lincoln County Water District
1005 Main Street, Suite 103
P.O. Box 936
Panaca, Nevada 89042

and

Vidler Water Company
3480 GS Richards Blvd., Suite 101
Carson City, Nevada 89703

Submitted August 16, 2019

Preface

Lincoln County Water District and Vidler Water Company (Lincoln/Vidler) respectfully submit this rebuttal response that rebuts statements made in reports submitted to the Nevada State Engineer (NSE) regarding Interim Order #1303. This rebuttal submittal includes responses from the following:

- Greg Bushner, RG, Vidler Water Company, Lincoln/Vidler (Attachment A),
- Peter Mock, PhD, RG, of Peter Mock Groundwater Consulting, Inc. (Attachment B),
- Thomas Butler, PG, CHG, CEG, of Stantec Consulting Services, Inc. (Attachment C),
- Todd Umstot, of Daniel B. Stephens & Associates (Attachment D), and
- Norman Carlson, of Zonge International, Inc. (Attachment E).

A report or a section of a report not rebutted should not be interpreted as Lincoln/Vidler's agreement with the report or section of a report submitted to the NSE on July 3, 2019.

VIDLER
WATER. QUALITY. LIFE.

Attachment A

Rebuttal Submittal to Reports Submitted in Response to Interim Order #1303

Prepared by:

Lincoln County Water District

1005 Main Street, Suite 103

P.O. Box 936

Panaca, Nevada 89042

And

Vidler Water Company

3480 G.S. Richards Blvd., Suite 101

Carson City, Nevada 89703

August 16, 2019

AMERICAN INSTITUTE OF HYDROLOGY
Certificate Number 1125
Greg Bushner
Professional Hydrogeologist

Expires January 15, 2020

3480 GS Richards Blvd., Suite 101 • Carson City, NV 89703 • 775.885.5000 • Fax: 775.885.5005

VIDLER
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Introduction

Lincoln/Vidler are providing comments to reports submitted by other entities in response to the NSE's IO #1303. Lincoln/Vidler are providing comments on the following reports:

- Las Vegas Valley Water District and Southern Nevada Water Authority's report dated June 2019,
- Moapa Valley Water District's letter dated July 1, 2019,
- National Park Service's report dated July 3, 2019
- Center for Biological Diversity's Technical Memorandum dated July 1, 2019,
- Great Basin Network's letter dated June 27, 2019,
- Moapa Band of Paiutes report dated June 27, 2019,
- City of North Las Vegas's submittal by Interflow Hydrology, Inc., dated July 2, 2019, and
- U.S. Fish and Wildlife Service's report dated July 3, 2019
- Coyote Springs Investment, LLC's report dated July 3, 2019

The following attachments are provided along with Lincoln/Vidler's rebuttal comments:

- *Attachment A-1:* Technical Memorandum from Peter Mock of PMGC, Inc, to Greg Bushner, Vidler Water Company, Subject: A brief overview of an two simulations using the model described in: "Development of a Numerical Groundwater Flow Model of Selected Basins within the Colorado Regional Groundwater Flow System, Southern Nevada, Version 1.0," prepared for the National Park Service, U.S. Fish & Wildlife Service and Bureau of Land Management, by Tetra Tech, Inc., of Louisville, Colorado, dated September 28, 2012.
- *Attachment A-2:* U.S. Department of the Interior Fish and Wildlife Service Biological Opinion dated October 29, 2008, File Nos. 84320-2008-F-0007 and 84310-2008-I-0216.
- *Attachment A-3:* Vertical Profile through selected carbonate wells in study area, reproduced from CH2M Hill 2006a.
- *Attachment A-4:* Localized Cross Section through KMW-1, Kane Springs Valley reproduced from URS 2006a.

Comments in italics are direct quotations from other reports that are rebutted. The following text provides Lincoln/Vidler's comments by report.

Lincoln/Vidler's Rebuttal Comments to the Las Vegas Valley Water District and Southern Nevada Water Authority's June 2019 Report.

1. *Page ix, Abstract, paragraph 4, section (a):* LCWD/VWC concur with the statement made by LVVWD and SNWA on page ix of the Abstract that "*...the geographic boundary of the LWRFS* [Lower White River Flow System] *as defined by the NSE is appropriate....*"

2. *Page1-1, Section 1.0, Introduction, paragraph 1:* The statement made at the end of this paragraph that "*...the adjacent Kane Springs Valley* [KSV] *which is included in this assessment because it is tributary to the LWRFS and contributes to the local recharge.*" is factually incorrect. KSV is a separate hydrographic basin as defined by the Nevada Department of Water Resources, and therefore has its own defined perennial yield. There is no "local recharge" from KSV to the LWRFS. There is however, local recharge that occurs ***within*** KSV that contributes to the hydrologic system within the valley and that becomes the perennial yield of KSV.

   Lincoln/Vidler, beginning over a decade ago in October 2007, have been collecting basin-specific data through the use of totalizing rain gages, tipping bucket rain gages, runoff event data loggers, and chloride collectors. We continue to collect and submit these data, to the Nevada State Engineer (NSE) and interested parties, in an effort to better understand and quantify recharge occurring in KSV and to share that technical foundation transparently with others. Based on analysis of the ongoing basin-specific data collection effort, there is unappropriated water available in KSV. This is due to the fact that recharge values clearly show that there is more water available under Nevada State Law than has been appropriated. Much like Cave Valley, Dry Lake Valley, and Delamar Valley, groundwater appropriated in KSV is also recharged within the basin (NSE 2014). Based on a preliminary analysis of these data, estimates of in-basin recharge are between approximately 4,700 to 7,500 acre-feet/year (ac-ft/yr) from the chloride mass balance analysis method and approximately 7,100 to 11,000 ac-ft/yr from the watershed model (T. Umstot (DBS&A), unpublished data and analysis, 2019).

3. *Page 1-3, Section 1.1.2, Order 1169:* Although this is not directly related to the requested information of the NSE's Interim Order (IO) #1303, it is noted that Lincoln/Vidler were not included in the NSE's Order 1169. Lincoln/Vidler are not a party to, nor have they

ever been participants in the Order No. 1169 aquifer test proceedings. The NSE never requested that Lincoln/Vidler provide a report on the outcome of the Order No. 1169 aquifer test results; hence none was ever developed.

4. *Page 1-4, Section 1.1.3, 2006 Memorandum of Agreement:* Lincoln/Vidler are not a part to, nor are they a signatory in the 2006 Memorandum of Agreement, and thus, Lincoln/Vidler are not bound by this agreement.

5. *Page 2-1, Section 2.0, Sources of Information, Section 2.1.1, SNWA (2013b):* Lincoln/Vidler concur with the statement made by SNWA that "*The aquifer test* [referring to the NSE Order 1169 Aquifer test] *confirmed that extensive hydraulic connectivity exists in the carbonate aquifer. However, the presence of boundaries and spatial variations in hydraulic conductivity affect the carbonate aquifer's response depending on location. For example,* ***no discernible responses*** [emphasis added] *were observed north of the Kane Springs Fault....*"

   This observation is validated by the new geophysical data that Lincoln/Vidler and CSI have collected in response to the IO #1303 request by the NSE for new data regarding the boundary of the LWRFS. Lincoln/Vidler documented through the use of geophysics that a distinct change in lithology occurs in northern CSV that explains differences in water levels in wells completed in the regional deep carbonate aquifer (RDCA). It should also be noted that the wells drilled by Lincoln/Vidler located in KSV are on the northwest side of the Willow Springs Fault, interpreted to be the western most boundary of the Kane Springs Wash Fault Zone.

6. *Page 2-2, Section 2.0, Sources of Information, Section 2.1.1, USFWS, Bureau of Land Management (BLM), and NPS (2013):* As previously stated before, Lincoln/Vidler have the following comments on the numerical groundwater flow model developed by Tetra Tech (2012) and its use.

   Lincoln/Vidler take issue with this reference to the Tetra Tech model development and predictive scenarios for several reasons and any reliance on it. The Tetra Tech model has not been through a rigorous peer-review process and Lincoln/Vidler have identified several additional issues with the Tetra Tech model including:

   - The steady-state flow is almost completely out of alignment with available measurements,

- There are no data that provide in-situ information on the rate and propagation of drawdown out from production wells in KSV,
- It has never been subjected to evaluation by the Technical Review Team,
- It is based on the no longer supported HUF MODFLOW numerical groundwater flow model package that averages out the strong formation breaks known to occur throughout the modeled area, and
- For whatever reason, the model does not measure the effects of pumping by Lincoln/Vidler, but uses assumptions that include the maximum pumping rate of the pending applications in all of the basins, which is completely unrealistic.

Lincoln/Vidler have previously commented on the Tetra Tech model (2012) and those comments are provided as Attachment A-1 to this rebuttal report. Additional rebuttal to the NPS and its reliance and uses of this model can be found in Attachment B by Dr. Peter Mock of Peter Mock Groundwater Consulting, Inc included with this rebuttal submittal.

7. *Page 2-3, Section 2.0, CSI (2013):* Lincoln/Vidler agree with the statement made by CSI in 2013 that "*The Kane Springs Fault acts as a groundwater barrier to groundwater flowing from north to south in Coyote Spring Valley and may also serve as a barrier to pumping from wells located north of the fault.*" This is supported by the new geophysical data Lincoln/Vidler have collected in northern CSV.

8. *Page 3-2, Section 3.3.1 Structural Setting, Thrust Faults:* Lincoln/Vidler agree with the statement by SNWA regarding thrust faults by stating "*...these faults have juxtaposed the carbonate-rock sequence with low permeability rocks that are older (e.g. Gass Peak Thrust in the southern Sheep Range) or younger (e.g. muddy Mountain Thrust). In these areas, this juxtaposition effectively truncates the extent of LWRFS. The thrust fault themselves may also act as barriers to groundwater flow (Page et al., 2005).*"

   Lincoln/Vidler have identified the occurrence of thrust faults as well as the lack of thrust faults where they were previously thought to occur through the use of the geophysical data that has been collected in northern CSV (Lincoln/Vidler 2019). This data should be used by the NSE to further refine the boundary of the LWRFS in northern CSV.

9. *Page 3-4, Section 3.3.1 Strike-Slip Faults, last sentence top of page:* Based on the geophysical data collected in northern CSV and previously in southern KSV, the

difference in water level data from wells in southern KSV and northern CSV, geochemistry data, and groundwater temperature data, we know that "... *the Kane Springs Wash Fault Zone may act as a partial barrier to flow, impeding flow across the fault from north to south.*" Lincoln/Vidler agree with this statement.

10. *Page 3-4, Section 3.3.2, Delamar Mountains:* There is opportunity for groundwater to flow through the Pahranagat Shear Zone in Delamar Valley through the lower portion of KSV where the Tertiary caldera complex is not present. The higher precipitation rates that occur on the Tertiary caldera complex located in the Delamar Mountains would likely create perennial or at a minimum intermittent streams in this are if there were such barriers to groundwater flow. Refer to Attachment B by Dr. Peter Mock of Peter Mock Groundwater Consulting, Inc included with this rebuttal submittal.

11. *Page 3-11 and continued on Page 3-13, Section 3.4.2.2, Occurrence and Movement, 4th paragraph in that section and the rest of that paragraph and the next paragraph on page 3-13:* Lincoln/Vidler would add that through the use of the new geophysical data collected in response to the NSE's IO #1303, there exists a fault occurring in northern CSV. This fault is termed the Northern LWRFS Boundary Fault and bounds higher resistivity carbonates of the RDCA that occur in southern Delamar Valley and northern CSV juxtaposed against low resistivity zones that may indicate a thick sequence of Mesozoic sediments or Tertiary volcanic rocks or Tertiary alluvial basin fill cover. This geophysical data shows the geologic conditions that explain the differences in heads between the wells in southern KSV and northern CSV versus the rest of the LWRFS (Lincoln/Vidler 2019).

12. *Page 5-4, Section 5.1.3 MRSA Surface-Water Diversions, top of page last sentence of section:* Lincoln/Vidler agrees that this statement sums up the effects to the Muddy River Springs Area (MRSA): "*...the difference between the pre-development baseflow and the natural flow record must be mostly associated with groundwater production within the MRSA.*" and should be the focus of how to manage the area.

13. *Page 5-6, Section 5.2.1, Comparison of Hydrologic Responses:* Lincoln/Vidler do not agree with the interpretation of the hydrograph data from wells KMW-1 and CSVM-4 as being "*similar to those of other wells in the basin, but appear to be slightly attenuated by the Kane Springs Fault.*" The general trend of the hydrographs of CSVM-4 and KMW-1 do show the response of water levels to the extreme precipitation event that occurred in

2005. This event is also seen in the water level response from wells throughout the LWRFS. However, the water level response in wells KMW-1 and CSVM-4 do not show the seasonal pumping response of water levels in all of the other wells provided in Figure 5-5, and also well CSVM-1 in Figure 5-4. This is distinctly different from a "slight attenuation" due to the Kane Springs Fault Zone.

14. *Page 5-17, Section 5.2.3.2, Recovery Period:* Lincoln/Vidler agree with the factors that influence the recovery period of the NSE Order 1169 aquifer test, the extreme precipitation event that occurred in 2005 is captured in the water level data in every hydrograph from wells in the LWRFS and surrounding basins. While the hydrologic system was recovering from this event, the Order 1169 aquifer test was initiated, and where the actual drawdowns from the aquifer test pumping reached a particular well, the recovery from the extreme precipitation event compounded the downward water level trend at that well. This factor clearly also obscured the ability to identify the recovery from the aquifer test. The other issue from the hydrographs as noted above is that the seasonal responses are more likely due to seasonal groundwater pumping throughout the area versus "recharge pulses."

15. *Page 6-1, Section 6.1, Qualitative Assessment of Historical Responses, middle of paragraph in this section*: Lincoln/Vidler disagree with the statement that there is a "*...lack of any significant recovery response after the completion of the Order 1169 aquifer test and the fact that the system has yet to recover to pre-test levels....*" The Order 1169 aquifer test was conducted at a time of declining water levels in the hydrologic system where additional drawdown from the test is imposed on the dissipation of temporarily higher water levels due to the extreme precipitation event in 2005. The hydrographs show a declining water table before the 2005 event where this event pervasively impacted the hydrologic system in the LWRFS basins and surrounding basins. It's not that significant recovery did not occur; it is simply that the recovery occurred coincident with the hydrologic system recovering from the 2005 precipitation event.

16. *Page 6-3, Section 6.1.1, Implications of Continued Pumping, first paragraph, second sentence:* This sentence states and makes the assumption that the MRSA "*...constitutes the majority, if not all, of the discharge from the [carbonate] flow system.*" Lincoln/Vidler disagree with this statement, see U.S. Geological Survey Scientific Investigations Map 3434 (Wilson 2019) provides a potentiometric map of the upper

RDCA in the LWRFS based on existing well data in this area. This map shows groundwater flowing from recharge areas in the western portion of the LWRFS (i.e., the Sheep Range and the Las Vegas Range) and based on the water level contours groundwater flow east towards Lake Mead and surrounding hydrographic basins to the north. It does not indicate a significant discharge area in the MRSA. Lincoln/Vidler do not disagree that the springs in the MRSA are supported by discharge from the RDCA, we simply think as supported by this US Geological Survey publication that not all of the flow from the LWRFS discharges in this area and in fact a large portion of the flow may discharge elsewhere in the system.

Lincoln/Vidler's Rebuttal Comments to the Moapa Valley Water District's July 1, 2019 Letter.

It should be noted that this is not a technical report from Moapa Valley Water District (MVWD) nor is there any new data, information, or analysis. Lincoln/Vidler's comments are provided below.

1. *Page 1, Section A, Paragraph 3:* Lincoln/Vidler explicitly disagrees with the statement that the LWRFS include KSV. There is little if any justification for this as is documented in Lincoln/Vidler's Report prepared in response to the NSE Interim Order #1303 titled "Lower White River Flow System Interim Order #1303 Report Focused on the Northern Boundary of the Proposed Administrative Unit," submitted to the NSE on July 3, 2019 (Lincoln/Vidler 2019).

   There is no direct connection that can be drawn between the change in water levels in KMW-1 and the Order 1169 aquifer test. Groundwater levels in KMW-1 have been declining steadily since the well was constructed in 2006 at an average rate of 0.1 foot/year. What significantly impacted the groundwater level in this well was the over-arching impact of the 2005 precipitation. The MVWD offers no data, analysis, or credible science to support statements made that there was a response seen in well KMW-1 from the NSE Order 1169 aquifer test.

2. *Pages 1and 2, Section A, fourth paragraph:* Lincoln/Vidler agree that there is inter-basin flow from KSV to CSV similar to the occurrence of inter-basin groundwater flow from Pahranagat Valley and Delamar Valley to CSV. The simple fact that there is inter-basin groundwater flow does not mean that KSV should be included in the proposed

administrative unit of the LWRFS. The NSE's groundwater appropriation system is based on a basin-by-basin perennial yield analysis that is used to manage each groundwater basin. Lincoln/Vidler are entitled to pursue the full perennial yield available in KSV per our pending groundwater applications.

3. *Page 2, Section A, first full paragraph:* Although there may be an inter-basin groundwater flow between KSV and CSV, there is much geologic structure that changes in the northern portion of CSV as documented in Lincoln/Vidler's report to NSE addressing his issues identified in IO #1303. There is an extensive fault that occurs in northern CSV as documented by the new geophysical data submitted in Lincoln/Vidler's report. The Northern LWRFS Boundary Fault identifies a significant change in lithologic characteristics from southern KSV and northern CSV where carbonate rocks occur to the north of this fault and to the south of the fault where lower permeability Tertiary basin fill materials occur. This change in geologic structure in northern CSV is what controls the flow of groundwater into the LWRFS and also controls the effects of any hydrologic impacts from KSV to northern CSV.

   The NSE should deny the request by the MVWD that KSV be added to the proposed "Super Basin," see Lincoln/Vidler's July 3, 2019 report submittal.

4. *Page 3, Section B, Influence of Climate, first full paragraph:* While Lincoln/Vidler do not disagree with the analysis of the hydrographs that show the effects of above average precipitation in 2004 and 2005, it should also be noted that these effects also occurred in monitor wells KMW-1 in southern KSV and CSVM-4 in northern CSV.

5. *Page 4, Section C, The long-term annual quantity of groundwater that may be pumped from the Lower White River Flow System, including the relationships between the location of pumping on discharge to the Muddy River Springs, and the capture of the Muddy River flow, second paragraph:* There is an obvious typo in this paragraph as there are only 6 basins that are proposed to be included in the LWRFS.

6. *Page 5, Section D, the effects of movement of water rights between alluvial wells and carbonate wells on deliveries of senior decreed rights to the Muddy River, first paragraph:* The same typo is made in this paragraph as there are only 6 basins that are proposed to be included in the LWRFS as per IO #1303.

7. *Page 6, Section E, under sub-title Municipal Use as the Preferred Use in the LWRFS basins, second paragraph bullet 1:* The same typo is made in this paragraph as there are only 6 basins that are proposed to be included in the LWRFS as per IO #1303.

8. *Page 7, last sentence of the first paragraph*: This sentence states: "*Based on SNWA's (2013) and Johnson's (2019) conclusions that carbonate pumping has minimal or no impact on Muddy River flows above the Moapa gage, the District has met its obligation to protect dace habitat and senior water rights.*" Apparently SNWA has evolved in their conclusion that carbonate pumping has minimal or no impact on Muddy River flow above the Moapa gage. Page 5-6 of SNWA's submittal to the NSE in response to IO#1303 states "*Based on the accounting depicted in Figure 5-4, the MRSA carbonate production wells have depleted MR* [Muddy River] *streamflow approaching a 1:1 basis.*"

Lincoln/Vidler's Rebuttal Comments to the National Park Service's July 3, 2019 Report Titled: Prediction of the Effects of Changing the Spatial Distribution of Pumping in the Lower White River Flow System.

1. *General Comment:* The continued use of the Tetra Tech model by the National Park Service (NPS) to evaluate groundwater pumping effects in the LWRFS and other groundwater basins in the vicinity of the MRSA and also outside of this area is an exercise in futility. Lincoln/Vidler re-iterate our previous concerns regarding this model and it's use as we stated previously in our correspondence to the NSE (Attachment A-1).

   The most significant issue is that this model has not been accepted by the scientific community through a rigorous peer-review process. The same standard should apply to the consultants of the Department of Interior (DOI) bureaus (defined as the NPS, Bureau of Land Management [BLM], and U.S. Fish and Wildlife Service [USFWS]) as was applied to Lincoln/Vidler with the requirement of a peer-review of all of our scientific investigations for the NSE's acceptance of our Tule Desert submittals. This included a numerical groundwater modelling effort, a geochemical report, and an in-depth basin-specific recharge analysis, see US Geological Survey Open File Report 2008-1354 (Berger and others, 2008). Either a rigorous peer review should be required of this numerical model and geochemical report before they can be used for this assessment or the NSE should publicly state he decline to use the NPS report and model.

2. *Page 7, Section 2.3, 2013 Post Audit Summary and Conclusions, Last Paragraph:* The critically flawed Tetra Tech model that is relied upon for the basis of this current analysis admittedly falls short of the request by the NSE IO #1303 which states that "*... the State Engineer finds that input by means of reports by the stakeholders in the interpretation of the data from the aquifer test and from the years since the conclusion of the aquifer test is important to fully inform the State Engineer prior to setting a limit on the quantity of groundwater that may be developed in the LWRFS or to developing a long-term Conjunctive Management Plan for the LWRFS and Muddy River.*" (NSE 2019, page 11, paragraph 2). By their own admission, the NPS did nothing to advance their modeling effort or to incorporate new data that has been collected since the end of the Order 1169 pumping test. The NPS specifically states "*The data collected during 2012 and the six years since the completion of the Order 1169 pumping test could be used to improve the calibration of the model to the observed effects of pumping in Coyote Spring Valley and neighboring LWRFS basins.... This additional work was beyond the scope and timeframe for the modeling simulation effort conducted as part of this report.*"

It is not clear why the additional work was not performed in light of NPS' request for an extension of time to July 3rd to submit its report, the IO #1303 was issued in January of this year, and therefore NPS had time to plan for and update its model with new data. Also, NPS has had the results of the Order 1169 aquifer test since 2012.

3. *Page 14, Section 3.2, Current Predictive Scenarios Evaluated, Simulation 3, third full paragraph:* Lincoln/Vidler disagree and flat out reject the use of this model to simulate pumping effects in KSV, or the rest of the LWRFS for that matter, and including other areas such as Tule Desert, Virgin Valley, and Clover Valley, which by the way are not at issue in the NSE's IO #1303. The problem is that while the NPS funded the work of Page and others (2006, 2011) that now stands as a widely-accepted interpretation of the geologic structure, they did not make sure that Tetra Tech incorporated this structure into the Tetra Tech model effectively. Until this is done, this model is unreliable for use as a predictive tool.

4. *Page 14, Section 3.2, Current Predictive Scenarios Evaluated, Simulation 3, fourth full paragraph:* In addition to the comment made above, by the NPS's own admission "*The largest model residuals are in high gradient areas, where model errors can result in large differences, in the Clover Mountains where the volcanic stratigraphy is greatly*

simplified, and in the Tule Desert where some of the structural complexity may not be incorporated in the geologic model and the model grid is relatively coarse." See Page 5, Section 2.1 2012 Groundwater Model Calibration, of the July 3, 2019 NPS report.

Lincoln/Vidler's water rights in Tule Desert are not within the scope or purview of NSE's IO #1303, nor for that matter are Virgin Valley Water District's. Any reference or model prediction made by the NPS to Tule Desert or Virgin Valley should be ignored by the NSE as it is un-responsive to his request in IO #1303.

5. *Page 15, Section 4.1 Model Setup, first paragraph top of page:* For a boundary condition the lake stage elevation representing Lake Mead is too high. Lake Mead's average stage elevation is 1095 feet for the time period 2011 through 2017, not 1,133 feet as reported. If the data were actually incorporated as stated, then the predictive runs would have a stage height of 1,133 feet or approximately 37 feet higher than the updated simulations. The difference in stage elevations for 2011 through 2017 ranged from a high of 1,121 feet (2012) to a low of 1,077 feet (2016) which is over a 56-foot difference from an elevation of 1,133 feet. If the model was updated to incorporate new data, this isn't even close to accurate. This type of boundary condition would have a widespread impact on the overall heads in the model.

6. *Page 22, Section 5.2.1.2, Kane Springs Valley (HA 206):* Lincoln/Vidler disagree with the conclusion that the water levels in monitor wells CSVM-4 and KMW-1 show drawdown caused by the pumping during the Order 1169 aquifer test (Lincoln/Vidler 2019).

Lincoln/Vidler's Rebuttal Comments to the Center for Biological Diversity's Technical Memorandum by Tom Myers, Ph.D., dated June 1, 2019.

1. *Page 2, Paragraph 1, referencing Figure 1:* This is a poor reference to the LWRFS administrative unit groundwater basins. Not included in the LWRFS basins are Kane Springs Valley, Lower Meadow Valley Wash, and Lower Moapa Valley.

2. *Page 2, Item #2:* KSV should not be included as part of the LWRFS, and not just because of the difference in water level between CSVM-4 and KMW-1. There are several reasons that KSV should continue to be excluded from the proposed LWRFS administrative unit by the NSE, including but not limited to the following reasons set forth below:

a. Groundwater elevation data show distinctive differences in heads between KSV/northern CSV and the southern portion of CSV, which are confirmed by the geologic structures that occur in KSV and northern CSV.
b. There is no discernable trend/pattern in water levels overtime between production well KPW-1 and pumping trends.
c. New geophysical data collected in northern CSV identified a very large fault structure at the end of the Delamar Mountains which would affect groundwater flow from KSV into northern CSV. This fault is deemed the Northern LWRFS Boundary Fault.

To review all of the supportive data refer to the Lincoln/Vidler report submitted to the NSE on July 3, 2019, titled *Lower White River Flow System Interim Order #1303 Report Focused on the Northern Boundary of the Proposed Administrative Unit*.

3. *Page 15, Figure 12:* This figure provides a very weak argument that there are any effects from the Order 1169 aquifer test on well CSVM-4. There is no significant change in head at this well and as stated before any change in head is attributable to hydrologic effects other than pumping. For further comment on the correlation of groundwater elevations to the Order 1169 aquifer test see Attachment D, a technical memorandum by Todd Umstot of Daniel B. Stephens & Associates.

4. *Page 17, Last sentence of third full paragraph:* Lincoln/Vidler interpret CSVM-4 to be located in the same structural block in northern CSV that KMW-1 is located in within southern KSV. However, a complicating factor is the Kane Springs Wash Fault Zone, the western boundary of which is intersected by both of these wells CSVM-4 and KMW-1. There is a gradient in northern CSV that is inconsistent with the data from wells throughout the central and lower portion of CSV.

5. *Page 19, second paragraph:* Lincoln/Vidler assert that northern CSV should continue to be excluded from the LWRFS based on the structural geology as identified by the geophysics that we have collected in this area. Lincoln/Vidler do believe as identified in our July 3rd report submittal that there is a significant fault that occurs and juxtaposes highly transmissive carbonate rocks with significantly lower transmissive sediments in

this area. This would inhibit the flow of groundwater south into the central and southern portions of CSV.

6. *Page 19, second paragraph:* Lincoln/Vidler disagree that the perennial yield is low. What is the basis of this assertion, i.e., where is the data that Dr. Myers used to make this statement? Lincoln/Vidler have been collecting in-basin precipitation, runoff, and chloride data for over a decade. Based on this data we estimate that the available recharge in KSV ranges from 4,700 acre-feet/year (ac-ft/yr) to approximately 11,000 ac-ft/yr depending on the method use. SNWA independently derived an annual recharge value of 4,329 acre-feet (SNWA 2009).

7. *Page 19, second paragraph:* It would take a very long time for drawdowns in the carbonate system to propagate south into CSV from the location of a pumping well in KSV. This is due both to the large distance and intervening geologic structures, and in particular to the Northern LWRFS Boundary Fault, identified by the geophysical investigation Lincoln/Vidler conducted in response to the NSE's IO #1303, that exists in northern CSV and that separates northern CSV and KSV from the rest of the LWRFS.

8. *Page 19, second paragraph:* Lincoln/Vidler disagree that the groundwater source in KSV is limited and not sustainable. Again, where is the data to support this statement? What does the statement "*...KSV is not a sustainable means of increasing the available water in LWRFS.*" mean? The water resources of KSV have been studied extensively by Lincoln/Vidler (CH2M Hill 2006a, CH2M Hill 2006b, URS 2006a, URS 2006b) as well as the geological setting through several geophysical investigations conducted in the basin. KSV is a distinct groundwater basin delineated by the Nevada Department of Water Resources that is managed separately according to Nevada Water Law and should continue to be managed separately and not as part of the LWRFS.

9. *Page 19, third paragraph:* Lincoln/Vidler conducted a geophysical investigation in northern CSV that identified a fault structure, called the Northern LWRFS Boundary Fault, effectively limiting the flow of groundwater flowing south through CSV as well as propagation of drawdowns. Refer to the July 3rd Lincoln/Vidler report to the NSE in response to IO #1303.

10. *Page 19, third paragraph:* There is no data to suggest that groundwater development in KSV and northern CSV would decrease flow to springs and downgradient water rights. Dr. Myers does not cite to any data supporting his statements.

11. *Page 26, Conclusion, paragraph 2:* Lincoln/Vidler disagree with this conclusion that KSV should be managed as part of the LWRFS. The "flat water table" referred to in this paragraph is referencing the water table between KSV and northern CSV as documented from the water levels in both monitor wells KMW-1 and CSVM-4. The potentiometric surface between these two wells is not flat (a difference in head of approximately 6 feet) and compared with the rest of the proposed LWRFS administrative unit of approximately 50 feet and that truly represents a consistent head across that majority of the proposed LWRFS basins (Lincoln/Vidler 2019). There is a reason that the water table elevation is not consistent from all of CSV into KSV and that's because of a significant change in geologic structure that is identified by new geophysical data collected by Lincoln/Vidler that is interpreted to be the Northern LWRFS Boundary Fault that extends trending east-west at the base of the Delamar Mountains (Lincoln/Vidler 2019).

    The Center for Biological Diversity does not provide any evidence to support their assertion that water pumped from KSV would quickly contribute to the depletion of the carbonate aquifer in CSV and in the MRSA, over 20 miles from the southern boundary of KSV, if measured by line-of-sight.

Lincoln/Vidler's Rebuttal Comments to the Great Basin Network's June 27, 2019 Letter.

It should be noted that this is not a technical report nor is there any new data, information, or analysis. Lincoln/Vidler's comments are provided below.

1. *Pages 1 & 2 (note that there are no page numbers on this letter), third full paragraph and Section 2(a) extending to the top of the next page:* Lincoln/Vidler disagree that the LWRFS administrative unit should include all of the groundwater basins in the White River Flow System (WRFS). This is completely counter to Nevada Water Law that is based on a basin-by-basin system of groundwater appropriation of the perennial yield of each groundwater basin. Groundwater rights holders and applicants expend a huge effort in collecting the best scientific information in support of their groundwater rights and applications. This directly correlates to extensive time and money being expended. If Nevada Water Law is changed and the entire WRFS was included in the administration

of the LWRFS basins, this means that no water would be available from upgradient groundwater basins and the counties where these basins occur would not have the ability to utilize water for economic development in their county.

2. *Page 2, Section 2(c):* See above comment.

Lincoln/Vidler's Rebuttal Comments to the Moapa Band of Paiutes Report by Mifflin & Associates, Inc. dated June 27, 2019.

1. *Page 54, Appendix III, second full paragraph:* The calculation of groundwater travel times is not reasonable. The distance between Preston Big Spring in the northern White River Valley Basin (HA 207) to Crystal Spring in Pahranagat Valley (HA 209) is approximately 100 miles by a line-of-sight measurement. So, if it only takes 25 years for groundwater, under a non-pumping gradient, to flow 100 miles, that means that the groundwater is flowing at 4 miles per year, or 21,120 feet per year. This groundwater flow rate is two to three orders of magnitude too high for the RDCA. The average groundwater flow velocity can be calculated using the hydraulic gradient times the hydraulic conductivity divided by the effective porosity. These values are 0.00631 ft/ft (calculated from Figure 3 of Lincoln/Vidler 2008), 3 to 5 ft/day (Mock 2008), and an assumed effective porosity of 0.10, respectively. Using these data to calculate the average groundwater velocity of the RDCA yields a groundwater flow rates ranging from 69 ft/yr to 115 ft/yr. Refer to Attachment B by Dr. Peter Mock of Peter Mock Groundwater Consulting, Inc included with this rebuttal submittal.

2. *Page 59, Appendix III, third full paragraph:* The model developed by Mifflin and Associates, Inc. (MAI) presented in this report cannot be used for any predictive analysis. The MAI model completely ignores the geologic structures throughout eastern Nevada that have a huge effect on the flow and travel time of groundwater thought the RDCA. It also ignores and does not calibrate to existing groundwater temperature data from within KSV. And as stated above, the groundwater travel times are completely unrealistic.

3. *Page 60, Critique of the Model, first full paragraph*: One cursory review of a geologic map, i.e., Page et al (2006) and associated geologic cross-sections, or Rowley and others (2017) and associated cross-sections all show basement rocks that are exposed throughout the basin and range physiographic province of eastern Nevada. This model completely ignores the geology so this critique applies to the entire model domain.

4. *Pages 7 through 11, Figures 2 through 9*: All of these hydrographs of water level changes from wells throughout the LWRFS and the one for KSV ignore the extreme precipitation event that occurred in 2005 (see Lincoln/Vidler 2019). Hydrographs for wells CSVM-4, MX-4, TH-2, and SHV-1 shown in these figures all show data starting in 2006 and ignore the huge precipitation event, over 300% of average, that occurred in 2005. Hydrographs for wells BM-DL-2 and GV-1 provide data prior to 2006 and the 2005 precipitation event is clearly shown on the hydrograph. However, the authors chose to ignore the water level trend prior to the event occurring. If the data is used prior to 2005 then the trend is still declining but not at a third of a foot per year. These graphs portray a more severe condition than is actually occurring in the LWRFS.

Lincoln/Vidler's Rebuttal Comments to the City of North Las Vegas's Submittal by Interflow Hydrology, Inc., Technical Memorandum RE: Garnet Valley Groundwater Pumping Review for APEX Industrial Complex, City of North Las Vegas, Clark County, Nevada, dated July 2, 2019.

1. *Page 8, first paragraph*: Lincoln/Vidler generally agree with the statement made in this paragraph regarding known barriers to groundwater flow, however through the use of CSAMT geophysical studies in southern KSV and northern CSV, Zonge International, Inc., have identified structures that exist and explain the differences in water levels seen in wells in southern KSV and northern CSV, as compared to the rest of the LWRFS. This structure has been identified as a fault named the Northern LWRFS Boundary Fault. Lincoln/Vidler have identified that the high resistivity carbonates of the RDCA are juxtaposed to lower permeable geologic formations to the south which do form a barrier to groundwater flow. Lincoln/Vidler do agree that this barrier is not impermeable but impedes the flow of groundwater into the rest of the LWRFS and would also reduce the effects of any pumping in the LWRFS to KSV and vice versa. Refer to Attachment B by Dr. Peter Mock of Peter Mock Groundwater Consulting, Inc included with this rebuttal submittal.

Lincoln/Vidler's Rebuttal Comments to the U.S. Fish and Wildlife Service's July 3, 2019 Report.

1. *General Comment:* The U.S. Department of the Interior Fish and Wildlife Service issued a biological opinion (BO) on October 29, 2008, for the Kane Springs Valley Groundwater Development Project in Lincoln County, Nevada (File Nos. 84320-2008-F-

0007 and 84320-2008-I-0216). This biological opinion is provided to these rebuttal comments in Attachment A-2. The finding on page 37 of the BO sums up the conclusion from the USFWS on impacts to the MRSA, and on the Moapa Dace, of the proposed Kane Springs Valley Groundwater Development Project, as follows:

> *"After reviewing the current status of and environmental baseline for the Moapa dace, the effects of the project, and the cumulative effects, it is the Service's biological opinion that the action, as proposed and analyzed, is not likely to jeopardize the continued existence of the endangered Moapa dace. The project could contribute to groundwater level declines and spring flow reductions; however, implementation of the project's conservation actions will minimize these impacts."*

Based on this BO, any reference that the USFWS makes to the addition of KSV to the proposed administrative unit should be ignored as the USFWS has already made a determination in this case. Lincoln/Vidler are still providing comments on the USFWS report but all of our comments below should be viewed in light of this determination.

2. *General Comment:* The USFWS should identify the author(s) of this report and the sections of text they are responsible for, if there is more than one author.

3. *Page 20, Under Heading Kane Springs Valley and first paragraph under heading The 2007 Finding:* The new geophysical investigation conducted by Zonge International, Inc., for Lincoln/Vidler, found that there is a significant fault structure named the Northern LWRFS Boundary Fault, as documented in Lincoln/Vidler's July 3, 2019 report submittal to the NSE. This validates the 2007 finding by the NSE in Ruling #5712 that

   > *"...carbonate water levels near the boundary between Kane Springs Valley and Coyote Spring Valley are approximately 1,875 feet in elevation, and in southern Coyote Spring Valley and throughout most of the other basins covered under Order No. 1169, carbonate-rock aquifer water levels are mostly between 1,800 feet and 1,825 feet. This marked difference in head supports the probability of a low-permeability structure or change in lithology between Kane Springs Valley and the southern part of Coyote Spring Valley."*

The validation of the existence of a fault structure in northern CSV and the original assessment was based on data from wells KMW-1 in KSV and CSVM-4 in CSV and water levels in other wells further to the south in the LWRFS, site specific data, and not generalized locations. There is no reasonable professional doubt of the existence of this fault structure based on the new geophysical data (Lincoln/Vidler 2019). Figure 3-4 (Lincoln/Vidler 2019) shows the geologic completions for each well and heads for wells throughout the LWRFS (Attachment A-3). Attachment A-3 was taken directly from the 2006 presentation to the NSE by CH2M Hill (2006a) during the first hearing on Lincoln/Vidler's groundwater applications in KSV.

The geophysical data collected by Lincoln/Vidler illustrates why there are changes in heads in southern KSV and northern CSV compared to the rest of the LWRFS. This is new data and the water level data were never based on "generalized" well locations as suggested by the U.S. Fish and Wildlife Service (USFWS).

4. *Pages 20 and 21, under heading 'The 2007 Finding', third paragraph that continues to the top of the next page*: No reasonable professional doubt remains as to what is causing the differences in water level from KMW-1 to CSVM-4, and from CSVM-4 to CSVM-6. Well KMW-1 is drilled on the upthrown side of the Willow Springs Fault (Figure 3-3, Lincoln/Vidler 2019), and well CSVM-4 is drilled into the carbonate formation on the eastern side of the extension of the Kane Springs Wash Fault Zone in northern CSV (Figures 4-4 and 4-7, Lincoln/Vidler 2019). This is based on the geologic log of KMW-1 (URS 2006), the geophysics collected in 2012, and the new geophysical data collected in 2019.

   Regarding the differences in water levels between wells CSVM-4 and CSVM-6, new geophysical data was collected by CSI as reported by them in their July 3, 2019 submittal to the NSE. Well CSVM-6 is located between two faults just north of a highly resistive block of carbonate rocks (Figures 10 and 11, Reich and Moran, 2019). The geophysics of northern CSV shows numerous faults between well CSVM-6 and wells CSVM-4 (Figure 4-7, Lincoln/Vidler 2019).

5. *Page 21, first full paragraph and Figure 6 (page 65)*: the Kane Springs Wash Fault is mis-labelled on Figure 6. What's labelled as the Kane Springs Wash Fault on Figure 6 is actually the Willow Springs Fault (Swadley et al, 1994).

6. *Page 21, first full paragraph referencing Figures 7, 8, and 8a:* The problem with all of these hydrographs and correlating effects of pumping from the Order 1169 aquifer test is that the test occurred during a period of time in the hydrologic system when the overall water level trend was downward which is attributable not to the pumping in the LWRFS, but the dissipation of the extreme precipitation event that occurred in 2005. If the 2005 precipitation event is considered then there is no impact from the Order 1169 aquifer test on water levels in well CSVM-4 (Figure 3-9, Lincoln/Vidler 2019).

7. *Page 21, first full paragraph*: Lincoln/Vidler disagrees with the statement made by the USFWS that "*Based on the continuity of water level responses across this portion of the carbonate aquifer, any changes in lithology or discrete low permeability structures present in the carbonate aquifer between KMW-1 and central CSV are not sufficiently impermeable to preclude or significantly minimize the impacts of carbonate pumping in KPW-1 on carbonate water levels in CSV....*" Unlike most of the participants, Lincoln/Vidler have collected current geophysical data in northern CSV which shows that there is a significant fault structure, named the Northern LWRFS Boundary Fault, that exists in northern CSV and that provides a significant limiting control to groundwater flow. These data are supported by water level data from wells in KSV and throughout the CSV that illustrate the effects of the fault structure on heads in these areas. We believe an authentic, realistic scientist will understand the value of good, reliable, repeatable data that has been proven to accurately identify geologic structures to help update former hypotheses once held.

8. *Page 21, second full paragraph*: The statement by the USFWS that "*...to the extent that the completion of KMW-1 relative to the KSWF zone is unclear...*" is a patently false statement. We know exactly where the Kane Springs Wash Fault Zone is and exactly what the dip of the fault is because Lincoln/Vidler drilled through it during the construction of monitor well KMW-1. In addition to the downhole geophysics conducted on the well bore of KMW-1, the geologic log of well KMW-1 (URS 2006), and the CSAMT geophysics collected in 2012 show the Willow Springs Fault, which is an extension of the Kane Springs Wash Fault in the vicinity of the wells. (Figure 3-3 [Lincoln/Vidler 2019], Attachment A-4) shows the geologic interpretation of the location where KMW-1 and KPW-1 were drilled.

9. *Page 22, first full paragraph*: The USFWS provide no data to support or substantiate the statement that pumping on the east side of the Kane Springs Wash Fault Zone would

impact water levels in central CSV. This is especially glaring since they have mis-labelled the fault on the west side of KSV as the KSW fault.

10. *Page 22, second full paragraph*: There is a big "wedge" of high resistive carbonate rocks that occur in northern CSV and that run into lower resistive and much less permeable lithology south of this feature (Figure 4-7, Lincoln/Vidler 2019). Also, based on this geophysical data the locations of faults as identified in the USFWS report are mis-located or not present in this area. The Kane Springs caldera complex is nowhere near monitor wells CE-VF-2 and CSVM-3 in CSV.

Well KMW-1 (and well KPW-1) intersects the upthrown block of the Kane Springs Wash Fault Zone. This has been known and this data publicly available since the 2006 NSE hearing on Lincoln/Vidler's groundwater rights applications in KSV.

11. *Page 22, under the heading Proposed KMW-1 Pumping Test*: The USFWS was an initial participant in the 2006 NSE Kane Springs water rights hearing and was well aware of the exhibits submitted during this hearing, including the well completion and testing report for wells KMW-1 and KPW-1 (URS 2006). The statement "*...a pumping test has reportedly been performed on KMW-1, the details and results of the test are not widely known or evaluated.*" Is disingenuous at best as the report has been publicly available since 2006. The USFWS continues to postulate about something that has been known for over a decade and that has been publicly available data almost since the day that it was collected.

12. *Pages 22 and 23, under heading 'Proposed KMW-1 Pumping Test'*: There is no need for an additional pumping test of well KMW-1 as the new geophysical data collected provides new information on what is indicated and known from water levels in wells KMW-1 and CSVM-4 as compared with the rest of the wells in the LWRFS. In addition to this new geophysical data, Lincoln/Vidler's support for excluding KSV from the LWRFS is also supported by other geochemistry data including but not limited to general chemistry, Carbon-14, and groundwater temperature data, and hydrologic data in the form of basin specific precipitation and runoff data (Lincoln/Vidler 2019). If it were so found by the proposed, very expensive pumping test, finding that drawdowns reach into KSV from nearby northern CSV pumping or vice versa is irrelevant to whether those drawdowns can reach the surface features within the MRSA and measurably reduce their flows.

13. *Page 28, Section 1.3.3 Boundaries and Boundary Conditions*: Why wouldn't the USFWS use the latest geologic data and information available for the assessment of the boundary conditions of the LWRFS as available by Rowley et al (2017)?

14. *Page 28, Under heading 'Pahranagat Shear Zone'*: Lincoln/Vidler disagree with the characterization of flow from the Pahranagat Shear Zone through Delamar Valley and KSV. The Kane Springs Wash caldera complex begins approximately 14 miles from the southern boundary of the KSV basin. This would not necessarily preclude inflow from the southern part of Delamar Valley to CSV. In fact, the same logic would hold true, i.e., if there is flow through the Pahranagat Shear Zone from Pahranagat Valley into Coyote Spring Valley then why would that change for the portion of the Pahranagat Shear Zone adjacent to Delamar Valley? The FWS provide no evidence of this change in boundary condition. Lincoln/Vidler also disagree that there is no inflow from Delamar Valley to KSV because of the "*...caldera complex and outcrop of basement rocks....*" This statement is not supported by any evidence. Also, examination of the geologic cross sections from Rowley et al (2017) indicates that the basement complex is not present near the surface in this area of Delamar Valley, see geologic cross-section B-B' (Rowley et al 2017). And finally, there is local in-basin recharge that occurs in and must then flow via groundwater flow out through the Delamar Mountains within KSV based upon data collected by Lincoln/Vidler (Lincoln/Vidler 2019).

15. *Page 30, third bullet*: The request by the NSE to define the boundaries of the LWRFS have nothing to do with Clover Valley or Tule Desert and any analysis regarding these basins should be ignored. Even though the USFWS reference Page et al (2005), there is no geophysical data provided to support its assertions in this bullet.

16. *Page 31, Section 1.3.2 Areal Extent of the LWRFS – Proposed Boundaries:* The USFWS stated on Page 31 that "The locations of likely no-flow boundaries on the LWRFS area as follows...: [first bullet] boundary of Delamar Valley with northern Coyote Spring Valley and Kane Springs Valley." Although their reasoning is flawed, i.e., "*...that groundwater flow is precluded by plutonic rocks of the KSW caldera complex....*" If this was truly the case then there would be no water available to pump from well KPW-1 (USR 2006); there also would be perennial or at least intermittent flowing streams in the Delamar Mounts portion of the caldera complex.

Based on the new geophysical data collected by Lincoln/Vidler in response to the NSE Order #1303 request, KSV and northern CSV should be excluded from the proposed LWRFS administrative unit. However, if KSV and northern CSV are truly no-flow boundaries, they should be excluded from the proposed LWRFS administrative unit. USFWS contradicts itself by stating on the one hand that KSV and northern CSV are no flow, yet on the other hand, USFWS wants to include them as part of the proposed LWRFS administrative unit.

17. *Page 33, first paragraph*: Lincoln/Vidler disagree with the statements made in the continuation of this paragraph. Pumping from the RDCA in the vicinity of well CSVM-4 in northern CSV is located in an area of the aquifer system that is separated by the Northern LWRFS Boundary Fault in northern CSV as discovered and documented by new geophysical data collected by Lincoln/Vidler in response to the NSE's Order #1303. This new information also explains the large discrepancies in water levels between wells in northern CSV and southern KSV and the central and southern portion of CSV. The FWS provide no data to substantiate the assertion made that these areas of northern CSV and southern KSV have continuous, thick blocks of carbonates.

18. *Page 38 top of page, first partial paragraph*: It should be noted that KSV is not part of the LWRFS.

19. *Page 45, first 3 bullets of Section 1.7:* Lincoln/Vidler disagree with each of these statements as made by the USFWS and have addressed each of these comments previously. See Responses to USFWS Report Nos. 3, 4, 6, 7, 8, 12, 16, and 17 above.

20. *Pages 39 through 45, Section 1.6, and pages 47 through 53, Section 2*: These sections are non-responsive to the NSE's request for additional information from Order #1303, and should be ignored.

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Attachment A-1

Technical Memorandum from Peter Mock of PMGC, Inc., to Greg Bushner, Vidler Water Company

Subject: A brief overview of an two simulations using the model described in: "Development of a Numerical Groundwater Flow Model of Selected Basins within the Colorado Regional Groundwater Flow System, Southern Nevada, Version 1.0," prepared for the National Park Service, U.S. Fish & Wildlife Service and Bureau of Land Management, by Tetra Tech, Inc., of Louisville, Colorado, dated September 28, 2012.

Memorandum

To: Greg Bushner/Vidler Water Company

From: Peter Mock/PMGC, Inc.

Date: November 7, 2012

Subject: A Brief Overview of and Two Simulations using the Model Described in: "Development of a Numerical Groundwater Flow Model of Selected Basins within the Colorado Regional Groundwater Flow System, Southeastern Nevada, Version 1.0, prepared for the National Park Service, U.S. Fish & Wildlife Service and Bureau of Land Management, by TetraTech, Inc. of Louisville, Colorado, dated September 28, 2012.

The report referenced above is one of two that you provided me in October of 2012. The other is a predictive simulations report. The MODFLOW input files for both reports were provided as well. The reports and MODFLOW input files arrived on one CD. I have not conducted a detailed, that is, sentence by sentence, review. I selected what I thought were key highlights and potential concerns with respect to evaluations of Tule Desert (and Clover, while we're at it) groundwater development.

This report describes the current status of what is now a decades-long effort in groundwater flow model construction. The Nevada State Engineer's deliberations early in the 1990s concerning proposed pumping from Coyote Springs Valley drew the attention of three bureaus within the U.S. Department of the Interior: the National Park Service, the U.S. Fish & Wildlife Service, and the Bureau of Land Management. After initial funding by the NPS alone, the three DOI Bureaus joined to share in the cost of this model. We have known this effort for the last decade as that of Geotrans, Inc., working for the National Park Service. They give references for two reports on that modeling with dates of 2001 and 2003, but curiously these two references are not given in the reference section. They make no mention of other model efforts in the region, except a notation late in the text that they are conducting one part of the work in a manner similar to that of SNWA.

Geotrans, Inc. has been a part of TetraTech since 1988 according to their website, but evidently only recently has the TetraTech name taken precedence on this project. The authors of the report are not given. I assume that Rick Waddell and Guy Romer are still the principal "architects" of this model.

__Brief Overview__

The model is a large one, encompassing the following Hydrographic Areas:

- Clover Valley - #204
- Lower Meadow Valley Wash - #205
- Kane Springs Valley - #206
- Coyote Spring Valley - #210
- Garnet Valley - #216
- Hidden Valley (North) - #217
- California Wash - #218
- Muddy River Springs Area - #219
- Lower Moapa Valley - #220
- Tule Desert - #221
- Virgin Valley - #222
- part of Black Mountains Area #215) north and east of the Las Vegas Valley Shear Zone
- part of Las Vegas Valley (#212) north of the Las Vegas Valley Shear Zone and east of the crest of the Sheep Range.

The report lists the following as the effort accomplished since the last model (Geotrans, Inc., 2003):

1. Added lower Virgin Valley and Clover Valley
2. New 3-D geologic framework model (still based on - and the reason for - Page's (USGS) work in 2005, 2006 and 2011, also funded by NPS)
3. Incorporation of recent USGS ET studies (funded by NPS – DeMeo and others, 2008)
4. Incorporation of geologic, hydrologic and geochemical data from SNWA/LVVWD, Vidler and others
5. Calibration to observed water levels, stream flow and spring discharge and responses to evaporation and pumping rates varying over time

The model and efforts are consistent with what we thought they had been doing to date.

The geology is based on the work of Page (USGS) from 2005-2006, though they now note an update to Page's cross sections published in 2011 (OFR 2006-1040). Here's the summary of changes quoted from Page (2011):

- *Cross section C–C' includes revisions in the east Mormon Mountains in the east part of the section;*
- *D–D' includes revisions in the Mormon Mesa area in the east part of the section;*
- *E–E' includes revisions in the Muddy Mountains in the east part of the section;*
- *F–F' includes revisions from the Muddy Mountains to the south Virgin Mountains in the east part of the section; and*
- *J–J' includes some revisions from the east Mormon Mountains to the Virgin Mountains.*
- *The east end of G–G' was extended about 16 km from the Black Mountains to the southern Virgin Mountains, and*
- *the northern end of I–I' was extended about 45 km from the Muddy Mountains to the Mormon Mountains, and revisions were made in the Muddy Mountains part of the original section.*

I extracted the geologic layer tops and thicknesses from the MODFLOW HUF files, imported and georeferenced them in GIS, and reviewed the units that occur under Tule Desert in a cursory fashion. In general, the units defined beneath Tule Desert are what are shown on the Page cross sections in this area, but that we may want to at some point check the distributions of contact elevations against cross-sections and structural geology interpretations developed to date by Vidler. I would note at this point that the regional carbonate aquifer as input to the HUF package of this model thins along the boundary between Tule Desert and Virgin Valley, but that thinning is modest: from 3,000-3,400 meters down to 2,700-3,000 meters in crossing that boundary from either side. This is a major boundary, as expressed at the surface by the East Mormon Mountains, but the model makes this a short, limited island breaking up only a short distance of the regional carbonate aquifer – only where it is present at the surface. With 9,000 to 10,000 feet of saturated thickness, there is essentially no barrier to flow (or propagating drawdowns) between the Tule Desert and Virgin Valley Hydrographic Areas, even when taking into consideration the strong decline in hydraulic conductivity with depth that they apply in this model. To my way of looking at the structural geology, this representation of this boundary is completely incorrect.

In general, the model is bounded around its edges by large fault alignments. They conclude that flow is low across most of their model boundaries due to a work by Harrill (2007), which I located only in their reference list: "Evaluation of Boundary Fluxes for the Ground-Water Flow Model being prepared as part of the SNPLMA-5 Project, unpublished consultant report, December 2007, 17 pages". That this is J.R. Harrill of the USGS, now retired, is encouraging (though I still may or may not agree with what he has written in this undisclosed report), but an unpublished consulting report is not an acceptable reference unless it is attached.

Recharge was estimated using the famous Maxey-Eakin recharge factors (converted from discrete steps to a continuous cubic equation) and PRISM 800-meter resolution 1971-2007 mean monthly precipitation. They do not explain how they go from monthly values to annual values so that Maxey-Eakin can be applied, though I would hope they just added the monthly values before applying the Maxey-Eakin factors. No recharge is calculated for precipitation values less than 7 inches. No reason is given for extending the lower limit for recharge downward from 8 inches to 7 inches. The exception is that recharge was added at 0.5 in/yr in the Muddy Mountains area above 3,000 feet, despite the precipitation being less than 7 inches there. Recharge was later adjusted overall during calibration to match their assumed discharge rates. In fact, the adjustment was a decrease of 35%.

They used the DRAIN package in all 18 model layers in one horizontal cell location to simulate Rogers and Blue Point Springs. The combined discharge of all 18 nodes is used to track this discharge and to serve as a calibration target. Many other springs were simulated with the DRAIN package. The springs in the Muddy River area were simulated with the stream flow routing (SFR) package.

Evapotranspiration was estimated from DeMeo (2008) and simulated as a constant withdrawal using the WELL package.

Pumping was simulated with the first multi-node well (MNW1) package, which apportions flow over multiple layers based on current water-level and hydraulic conductivity along the well.

The Horizontal Flow Barrier (HFB) package was used to simulate a few selected fault alignments, including the Tule Desert Fault System. A hydraulic characteristic (transmissivity or hydraulic conductivity divided by barrier width –"TDW") of 1×10^{-6} ft/d was used for all but the Tule Desert (1.31×10^{-6} ft/d) and Kane Springs Wash ($4.74. \times 10^{-6}$) Faults

Although a large number and variety of calibration targets were used, they are largely clustered in a fraction of the model area. Tule Desert and Clover Valley are not well represented in the calibration data set. Also, there are no data on the propagation of drawdowns in or out of Tule Desert or Clover Valley.

An important (to the authors) part of the calibration process was simulation of test pumping of Coyote Spring Valley under Order 1169 during the period August 2010 to December 2011. I don't think the simulated drawdowns matched the measured drawdowns well in this exercise of the model. Calibration of the carbonate system hydraulic conductivity using pilot points resulted in isolated unique values in a circle around each pilot point, which is not realistic. This is not a fault of pilot points, but of their application here. One pilot point value was 19,500 ft/d; another was 4,560 ft/d; six more were larger than 1,000 ft/d. The hydraulic conductivity value used in most of the model (which does not contain pilot points) for the carbonate unit ranges from 1,000 to 10,000 ft/day. These are not realistic values for regional simulation of the carbonate unit. I think the regional value should be approximately 3 ft/d as we used in our Tule Desert Model.

They also caused the hydraulic conductivity to decline exponentially with depth using a modification made by these authors to the modification made by the USGS to the HUF package.

The authors' change was to put a limit (floor) on the minimum value that could be reached at depth. The carbonate unit was simulated to decline by an order of magnitude for every 1,333 feet of depth, limited to a minimum of .0003 ft/d. We (i.e., me, Vidler, Wayne Belcher, and Keith Halford) disagree that the hydraulic conductivity of the carbonate unit declines significantly with depth. This feature is reasonable for representing Tertiary sedimentary basin fill, but not for the regional carbonate unit.

The extremely large hydraulic conductivity values obtained from pilot point calibration and the extremely strong decline function with depth lead to flow in and between basins being funneled through the top of the model, which I do not think is representative of this system. I think flow circulates to depths of tens of thousands of feet in the regional carbonate system.

The specific yield of the carbonate system is 0.02, which I agree with. The specific storage is 1×10^{-6} ft^{-1}, which I also agree with.

Overall in this model, prior to large-scale pumping, 50% of discharge is to streams, 40% of discharge is to evapotranspiration, and the remainder is a combination of springs and Lake Mead discharge. They make a point of describing pre-Dam observations (but don't provide a reference) that indicated few and minor discharges of groundwater to what would become the bed of Lake Mead. In this model, they simulate 4,500 ac-ft/yr discharge to Lake Mead. Overall in this model, 38,000 ac-ft/yr comes in through the boundaries and 6,500 ac-ft/yr leaves the boundaries. As I made abundantly clear in discussions of our Tule Desert model, I disagree that flow across this tremendous thickness of carbonates comes essentially to a stop at these boundaries.

This quote from the summary at Page 61 will be of interest to Vidler:

> *"The largest model residuals [mismatch between simulation and measurement] are in high gradient areas, where model errors can result in large differences, in the Clover Mountains where the volcanic stratigraphy is greatly simplified, and in the Tule Desert where some of the structural complexity may not be incorporated in the geologic model and the model grid is relatively coarse."*

Indeed the errors range from 560 feet too low to 149 feet too high in Tule Desert and from 150 feet too low to 730 feet too high in Clover Valley. Also of interest is a quote from Page 62:

> *"Cross sections developed in the Tule Desert by consultants for Vidler Water Company were not used in the construction of the geologic model. There are differences between the interpretations presented in these cross sections and other cross sections developed by Page and others (2011). Given the scale of the modeling and the use of the sections by Page and others in the remainder of the model, some of the information contained in the sections developed by Vidler Water Company was not incorporated. In future work, evaluation and*

incorporation of some of the more detailed information might improve the model in the Tule Desert."

One additional quote related to Vidler's interests, on Page 63:

> *"There are aquifer-testing data available in the Tule Desert, but no long-term pumping has yet occurred, and thus there is no information on long-term productivity or on response to pumping in areas distant from wells. Thus, there is substantial uncertainty on the magnitude and timing of drawdown in the Tule Desert. The most uncertainty is in the Clover and Delaware Mountains. The drawdown that will occur will be very dependent on local conditions and rock properties because of the complex volcanic stratigraphy, which has been generalized."*

Finally, I note that the recently available hydrogeochemistry or geochemistry information described as incorporated in the introduction and summary of this report, was not discussed.

Attachment A-2

U.S. Department of the Interior Fish and Wildlife Service Biological Opinion dated October 29, 2008, File Nos. 84320-2008-F-0007 and 84310-2008-I-0216.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Nevada Fish and Wildlife Office
4701 North Torrey Pines Drive
Las Vegas, Nevada 89130
Ph: (702) 515-5230 ~ Fax: (702) 515-5231

October 29, 2008
File Nos. 84320-2008-F-0007 and
84320-2008-I-0216

Memorandum

To: Field Manager, Ely Field Office, Bureau of Land Management, Ely, Nevada

From: Field Supervisor, Nevada Fish and Wildlife Office, Reno, Nevada

Subject: Request for Formal and Informal Consultation on the Kane Springs Valley Groundwater Development Project in Lincoln County, Nevada

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed Kane Springs Valley Groundwater Development Project and its possible adverse effects on the desert tortoise (*Gopherus agassizii*) (Mojave population), listed as threatened under the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*), and its designated critical habitat, and the Moapa dace (*Moapa coriacea*), listed as endangered under the Act. No critical habitat has been designated for the Moapa dace. Further, the Bureau of Land Management (BLM) requests concurrence that the proposed project *may affect, but is not likely to adversely affect* the southwestern willow flycatcher (*Empidonax traillii extimus*), listed as endangered under the Act. No designated critical habitat for the southwestern willow flycatcher occurs in the project area. The Lincoln County Water District (LCWD) has applied for a BLM right-of-way to construct and operate a system of water facilities on BLM-managed land in southern Lincoln County.

This biological opinion is issued in accordance with section 7 of the Act and based on information provided in BLM's memorandum dated September 27, 2007, to the Service (received on September 28, 2007), and revised biological assessment (BA), dated December 2007 (ARCADIS 2007); Amended Stipulation for Withdrawal of Protests (Stipulated Agreement) dated August 8, 2006; discussions between the Service and BLM; and our files. A complete administrative record of this consultation is on file in the Service's Nevada Fish and Wildlife Office in Las Vegas.

This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to critical habitat.

INFORMAL CONSULTATION

Southwestern willow flycatcher

No habitat is present for the southwestern willow flycatcher within the project area. The closest breeding populations occur at Pahranagat National Wildlife Refuge (NWR) approximately 23 miles northwest and in the Warm Springs Area, approximately 25 miles southeast. Since the springs in the Warms Springs Area are supplied by water from the deep carbonate aquifer, groundwater pumping in the Kane Springs Valley Hydrographic Basin could affect water levels in the Muddy River System. These effects to riparian vegetation will be minimized by actions contained in the Stipulated Agreement among the Service, LCWD and Vidler Water Company, Inc (VWC), which are designed to maintain minimum in-stream flows in the Warm Springs Area of the Muddy River system in order to protect and recover the Moapa dace. (See section below entitled "Proposed Minimization Measures for Moapa Dace"). The project is anticipated to have insignificant effects to the southwestern willow flycatcher since any decreases in groundwater flow to the Muddy River system will be minimized by the Stipulated Agreement.

In consideration of the proposed action, potential effects of the proposed action, and measures proposed by BLM, the Service concurs with BLM's determination that the proposed action *may affect, but is not likely to adversely affect* the southwestern willow flycatcher. This response constitutes informal consultation under regulations promulgated in 50 CFR§402.14, which establishes procedures governing interagency consultation under section 7 of the Act. This informal consultation does not authorize take of any listed species.

CONSULTATION HISTORY

The following chronology documents the consultation process that culminated in the following biological opinion for the desert tortoise and its designated critical habitat and for the Moapa dace:

On May 8, 2006, the Service sent BLM a memorandum containing a species list of endangered, threatened, and candidate species that may occur in or near the proposed Kane Springs Valley Groundwater Development Project (Service File No. 1-5-06-SP-499).

On July 12, 2007, BLM sent the Service a memorandum requesting formal consultation on the Kane Springs Valley Groundwater Development Project for potential adverse effects to the desert tortoise and its designated critical habitat. A BA accompanied the memorandum.

On September 4, 2007, the Service sent BLM a memorandum recommending formal consultation for the Moapa dace and requesting additional information necessary to initiate formal consultation for the desert tortoise (Service File No. 1-5-07-F-558).

On September 27, 2007, BLM sent the Service a memorandum requesting formal consultation on the project for potential adverse effects to the desert tortoise and its designated critical habitat and the Moapa dace. A revised BA accompanied the memorandum.

On October 19, 2007, the Service sent BLM a memorandum that initiated formal consultation on September 28, 2007, since the revised BA contained sufficient information (Service File No. 84320-2008-F-0007).

On December 4, 2007, BLM, the Service, and the project proponent participated in a conference call to discuss several topics including the monitoring wells that are required by the stipulated agreement among LCWD, VWC, and the Service for withdrawal of the Service's protests of water rights applications in Kane Springs Valley. It was decided that the BA would include acreages and potential effects associated with the two new monitoring wells.

On December 6, 2007, ARCADIS, the project consultant, sent the Service a revised BA on behalf of BLM, which included acreages associated with the two new monitoring wells.

On January 28, 2008, the Service sent BLM a memorandum extending the consultation period for this project by 60 days due to a substantial consultation workload.

On June 17, 2008, VWC sent the Service comments on the terms and conditions of the draft biological opinion.

On June 18, 2008, the Service provided BLM a copy of a draft biological opinion via email.

On June 30, 2008, a Memorandum of Understanding (MOU) among LCWD, VWC, and the Service was signed. Pursuant to the MOU, the Service will issue a biological opinion for the project which will include an incidental take statement authorizing such take of Moapa dace as may occur in connection with the pumping and transfer of 1,000 acre-feet of groundwater under Phase I of the Project and implementation of the Monitoring, Management and Mitigation Plan. Upon receiving authorization from the Nevada State Engineer to appropriate more than 1,000 and up to 5,000 acre-feet per year of groundwater from the Kane Springs Valley for use in the Coyote Springs Valley, the Service will reinitiate consultation for the project pursuant to section 7 of the Act.

On July 15, 2008, the Service received a copy of BLM's comments on the draft biological opinion via email.

On July 28, 2008, the Service and BLM met to discuss the draft biological opinion.

On August 18, 2008, BLM sent the Service proposed language for term and condition 4.d. and 5. of the biological opinion via email.

On October 1, 2008, BLM sent the Service updated proposed language for term and condition 4.d. of the biological opinion via email.

On October 1, 2008, the Service and BLM met to discuss deposition of remuneration fees for offsetting desert tortoise habitat loss.

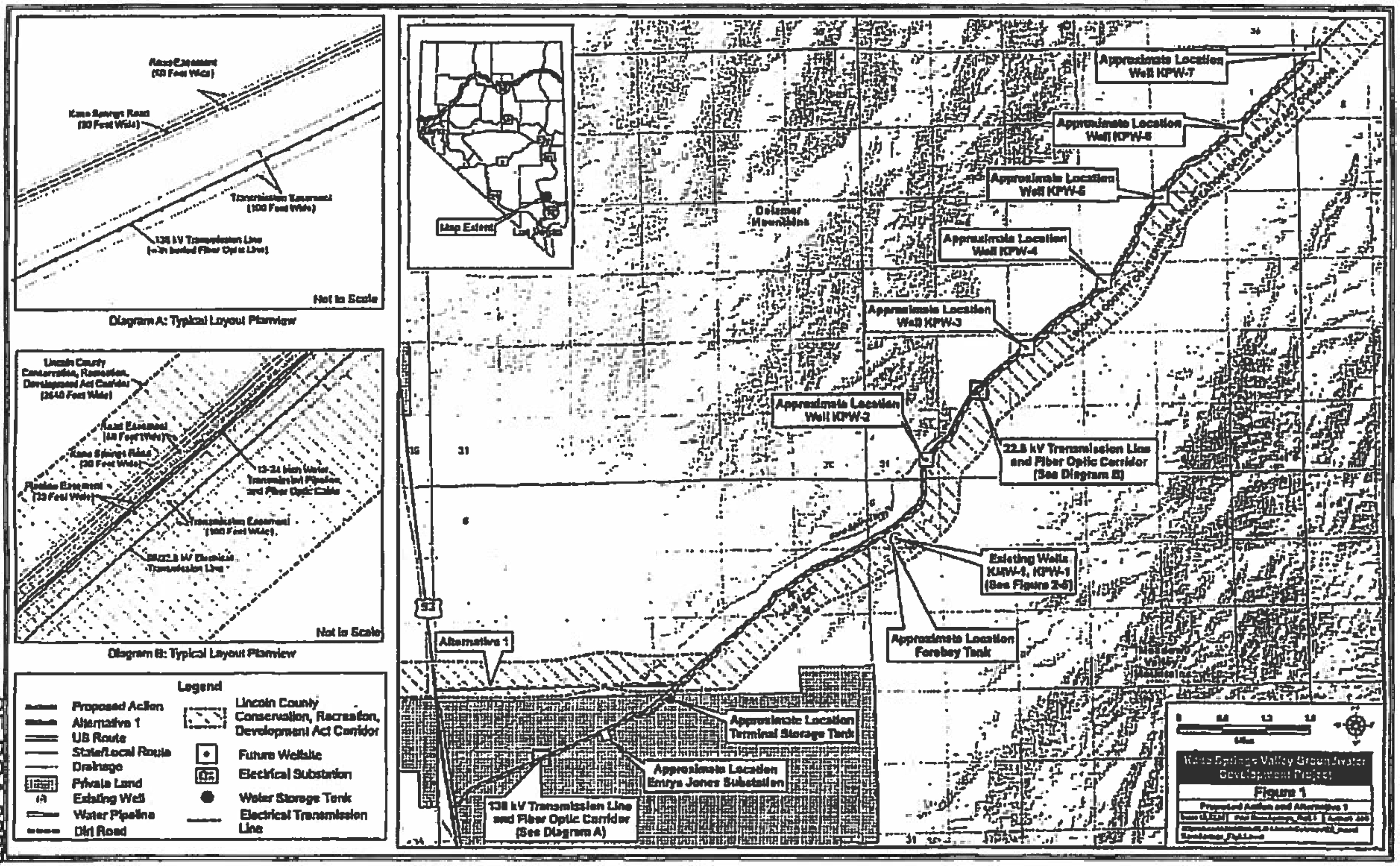
BIOLOGICAL OPINION

A. Description of the Proposed Action

The purpose of the proposed action is to develop a system for tapping groundwater resources in the Kane Springs Valley Hydrographic Basin for municipal water purposes within the Coyote Spring Valley Hydrographic Basin. The project proponents applied to the Nevada State Engineer's Office for 17,375 acre-feet per year (afy), but to date have been granted 1,000 afy under Ruling # 5712. The proposed pipeline would have capacity to transport up to 5,000 afy. Construction and operation of the proposed action would supply a small, but initially substantial portion of the total water requirements for the Coyote Springs Investment (CSI) development projects in southern Lincoln County. The majority of the proposed facilities would be located along or near the Kane Springs Road, within the 2,640-foot wide Lincoln County Conservation, Recreation, and Development Act (LCCRDA) utility corridor on public land, or on private land owned by CSI. The project area extends approximately 16.6 miles along Kane Springs Road from the intersection with US 93 (US 93).

The proposed action consists of several components including, groundwater production wells, monitoring wells, water pipelines, storage tanks, power transmission lines and substations, access roads and a fiber optic line. Figure 1 shows the approximate location of the project components in the lower Kane Springs Valley. LCWD is developing this project in cooperation with Lincoln County Power District (LCPD) Number 1 and Lincoln County Telephone Company. Each utility agency is responsible for the construction, operation, and rehabilitation of disturbed land associated with their utility. Each utility agency may be required to apply for a separate right-of-way with BLM.

Although the BA included the construction of the Emrys Jones Substation and power line west of the Substation, LCPD is constructing these facilities under another project, the Coyote Springs Transmission Line Project. Therefore, these facilities are not considered to be part of the proposed action for this consultation.



Kane Springs Valley Groundwater Development Project
Figure 1
Proposed Action and Alternative 1
Approximate Location Well KPW-7
Approximate Location Well KPW-6
Approximate Location Well KPW-5
Approximate Location Well KPW-4
Approximate Location Well KPW-3
Approximate Location Well KPW-2
22.8 kV Transmission Line and Fiber Optic Corridor (See Diagram B)
Existing Wells KMW-1, KPW-1 (See Figure 2-6)
Approximate Location Forebay Tank
Approximate Location Terminal Storage Tank
Approximate Location Emrys Jones Substation
138 kV Transmission Line and Fiber Optic Corridor (See Diagram A)
Alternative 1
Delamar Mountains
Map Extent
Not to Scale
Diagram A: Typical Layout Planview
Diagram B: Typical Layout Planview
Legend
Proposed Action
Alternative 1
US Route
State/Local Route
Drainage
Private Land
Existing Well
Water Pipeline
Dirt Road
Lincoln County Conservation, Recreation, Development Act Corridor
Future Wellsite
Electrical Substation
Water Storage Tank
Electrical Transmission Line

SE ROA 36385

1. Project Features

a. Wells

Groundwater from the Kane Springs Valley Hydrographic Basin would be supplied to the Coyote Spring Valley area from up to seven groundwater production wells. All production wells would be located within the LCCRDA corridor on public land, spaced approximately 1.3 to 1.8 miles apart. The first well (KPW-1), approved under BLM Serial Number NVN-079630, was drilled in 2005. Each wellhead would be enclosed in a masonry block structure, which would also contain all aboveground piping, shutoff valve, check valve, flow meter, air release valve, and electrical equipment. The size of each fenced well yard would be approximately 150 feet by 150 feet. Production wells would be equipped with an electric pump.

An existing monitoring well, KMW-1, is located adjacent to KPW-1 (Figure 1). The monitoring well was installed in 2005 to assist in assessing the hydrogeology of the Kane Springs Valley Hydrographic Basin. Two new monitoring wells may also be installed per the stipulated agreement for withdrawal of the Service's protests of LCWD and VWC's water rights applications in Kane Springs Valley. The wells would be placed on CSI land and would each have a footprint of less than 1 acre in size. The final location would be coordinated through the Technical Review Team (TRT) established under the stipulated agreement. Should the TRT decide that these monitoring wells are not necessary, funds for the material and construction of the monitoring would be used instead for Moapa dace conservation.

b. Pipelines

There are two types of pipelines associated with the proposed action: the well field pipeline collection system and the main transmission pipeline. Ancillary pipeline components include isolation valves, cathodic protection, control valves, air release/vacuum valves, blow-off valves, access manways, fiber optic splice vaults, and pipe alignment markers.

The well field pipeline collection system would consist of individual branch pipelines from each well to a single main collection pipeline terminating at the forebay storage tank. The total pipeline collection system would extend approximately 9.4 miles. The pipeline, to be constructed of ductile iron, would vary in size (telescope) from 12 inches to 24 inches in diameter, with the largest diameters located closest to the forebay storage tank. The pipeline would be buried to a minimum depth of three feet below grade, or three times scour depth in washes in accordance with engineering requirements. In general, the pipeline would parallel the Kane Springs Road to the south, with a 60-foot wide construction easement and a 30-foot wide permanent easement. If cross-country construction is required, the temporary construction easement would be 75 feet wide, with a permanent easement of 60 feet.

Approximately 3.8 miles of buried 24-inch diameter transmission pipeline would be constructed adjacent to the Kane Springs Road between the forebay storage tank and the terminal storage tank. Appurtenant groundwater facilities (e.g., isolation valves, control valves) would occur, on average, every mile along the alignment. These facilities would be located predominantly below existing grades in traffic-rated, lockable, concrete vaults that would vary in dimension. Typically, these vaults would be located outside of traffic areas and may require small location markers extending several feet above the surface of the ground.

c. Storage Tanks

A 50,000-gallon forebay storage tank would be installed adjacent to the existing production well (KPW-1) and would initially serve as the termination point for the groundwater collection system. This tank would be used to normalize flow pressures in the system and provide storage for secondary lifting to the terminal storage tank, if required. The water level in the forebay storage tank would control the operation of the well field via telemetry. Either wireless telemetry or direct-burial fiber optic telemetry cable located in pipeline trenches would enable communication between the collection system, forebay storage tank, and the terminal storage tank.

A terminal water storage tank would ultimately be located at the southern end of the water transmission pipeline to receive the imported water and to serve as a water distribution source for the northern Coyote Spring Valley area. The storage tank would be constructed with a maximum capacity of 700,000 gallons, subject to final design requirements.

d. Power Distribution

In order to provide reliable electric service to the well fields, LCPD would construct and operate transmission lines and substations. Power facilities built for this project would connect to the Emrys Jones Substation, part of the Coyote Springs Transmission Line Project.

Under the proposed project, LCPD would construct an overhead transmission line with a 69 kV/22.8 kV distribution circuit from the Emrys Jones Substation to the proposed well fields along the Kane Springs Road, parallel to the pipeline. A total of 14 miles of transmission line would be installed. The 69 kV/22.8 kV transmission line would be a single-circuit line supported by wood pole structures. The 69 kV/22.8 kV transmission line would primarily be located on public lands managed by BLM, with a short section near the Emrys Jones Substation located on private property. Each wood pole structure would require a temporary construction easement of 0.07 acre and after construction, each structure would occupy 0.02 acre. The transmission line would have a 100-foot permanent easement.

At each well location, a fenced power substation (approximately 155 feet by 95 feet) would be constructed to serve the well pump motor and ancillary equipment. The substation yards would consist of a 69 kV/22.8 kV to 4.16 kV pad-mounted step-down transformer, primary metering, switch cabinet, capacitor bank, and a station service transformer.

e. Fiber Optic

The Lincoln County Telephone Company is proposing to install fiber optic cables within the proposed project right-of-way. The fiber optic line would be buried in the same trench as the pipeline and adjacent to the 138 kV transmission line on private lands proposed under the Coyote Springs Transmission Line Project. The fiber optic cables would be used for communication to manage the pipeline operation. The fiber optic cables would tie into an existing fiber optic line located on the east side of US 93.

f. Additional Project Components

Approximately 50 acres may be used for temporary extra work spaces. These areas would be spaced approximately 0.5 mile apart and would cover approximately 2 acres. Some larger staging areas may be sited in suitable areas near steeply incised drainages, above and below slopes where construction is expected to be difficult, and at pipe laydown areas. All extra work spaces on Federal lands would be located within the project right-of-way. Staging areas on private lands would be used during construction for storage of materials and equipment, construction office trailers, fuel storage, equipment maintenance, stockpiling and handling of excavated material, and other construction-related activities. Following construction, the staging areas would be restored as described in the Kane Springs Valley Groundwater Development Project Environmental Impact Statement (EIS).

g. Road Access and Transportation

US 93 and the Kane Springs Road would provide primary access into the project area. Spur roads would be constructed from the Kane Springs Road to temporary and permanent facilities sites, such as contractors' yards, well fields, and power pole locations, within the project right-of-way corridor. The number of new spur roads would be held to a minimum, consistent with their intended use (e.g., facility construction, conductor stringing and tensioning). It is estimated that seven new minor access roads would be required to access the proposed well houses. Each of these roads would be approximately 100 feet long and 12 feet wide. Access roads not required after construction would be removed and restored to their approximate original contour and dimensions and made to discourage vehicular traffic. All temporary road surfaces would be ripped or harrowed to establish conditions appropriate for reseeding, drainage, and erosion prevention.

Table 1 lists the estimated temporary and permanent disturbance acreage required for construction and operation of the proposed project. The estimated disturbance acreage is based on preliminary engineering plans and therefore may change slightly.

Table 1 Estimated Surface Disturbance by Land Ownership (at full buildout of the proposed project)		
	Temporary (acres)*	Permanent (acres)*
Federal (BLM)		
Well House and Well Substation	3.2	3.0
KPW-1 Well, Forebay Tank, KMW-1 Well	0.3	1.0
Pipeline Construction right-of-way	148.7	0.0
Terminal Storage Tank	0.0	0.0
Electrical Substation	0.0	0.0
Electrical Transmission Line	14.8	5.0
Electrical Transmission Line Access Roads	0.0	8.0
Fiber Optics Line	0.0	0.0
Subtotal	**167.0**	**17.0**
Private		
Well House and Well Substation	0.0	0.0
KPW-1 Well, Forebay Tank, KMW-1 Well	0.0	0.0
Pipeline Construction right-of-way	0.0	0.0
Terminal Storage Tank	0.7	0.3
Electrical Substation	0.0	0.0
Electrical Transmission Line	2.4	1.1
Electrical Transmission Line Access Roads	0.0	0.7
Fiber Optics Line	14.2	0.0
Two Groundwater Monitoring Wells	4.0	2.0
Subtotal	**21.3**	**4.1**
Total	**188.3**	**21.1**

h. Construction Procedures

Each utility agency would conduct all activities associated with the construction, operation, and rehabilitation of temporarily disturbed areas within the authorized limits of their BLM right-of-way. To supply electrical power to the well fields, it is anticipated that LCPD would be the first utility agency to begin construction after all approvals have been acquired. During construction activities, water would be used to suppress dust in the construction area.

Construction of the electric transmission lines and substation would involve the following general sequence: engineering surveys and staking, clearing and grading, material storage and handling, creation of structure holes or foundations, structure assembly and erection, installation of security fencing around substation, post construction cleanup and reclamation, and construction monitoring. Construction of the overhead lines would be completed in two phases: setting the pole structures and installing the cable. The setting of the pole structures is accomplished with a single multi-purpose truck. The truck has a small crane suitable for lifting and placing poles. A pole trailer is towed behind the crane truck to transport the poles to the installation site. Affixed to the crane is an auger for boring the holes for the pole structures. Soil excavated during construction would be used for backfill and for restoration of disturbed areas. The cable would be installed using two vehicles: a cable truck and a truck with a power lift. The cable would be strung out along the installation route and the man lift would be used to place the cable on the pole structure.

Construction of the groundwater facilities and fiber optic line would involve the following sequence: engineering surveys and staking, topsoil salvage and storage, clearing and grading (including access road construction), trenching and blasting, pipeline stringing/installation, installation of fiber optic line in common pipeline trench, backfilling, hydrostatic testing, re-grading, post-construction cleanup, and reclamation, and construction monitoring. Trenching would consist of excavating the trench using either a trenching machine or track-mounted excavator. In general the bottom of the trench would be five feet wide and up to six feet deep to provide the required cover over the top of the installed pipe. In areas of weathered rock, track-mounted excavators may be preceded by a bulldozer equipped with a single-shank ripper. Limited blasting may be required in areas where shallow or exposed bedrock is present. This project would be constructed utilizing a "Dig and Lay" procedure. In other words, a portion of trench would be dug, the pipe would be laid, welded, and back filled and another segment would begin. There would be minimal (less than 500 feet) open trench at any one time and the backfill would occur almost immediately following pipe installation.

i. Operation and Maintenance

The electrical facilities would be in continuous operation and water facilities would be operated and maintained to ensure safe operation and integrity of the pipeline. Periodic inspection and maintenance of power and water facilities would be required. If a pipeline break were to occur, immediate steps would be taken to isolate the break, the break would be repaired, and the trench backfilled. Areas would be contoured and revegetated after these types of repairs. Emergency maintenance of power lines, such are repairing downed wires and correcting unexpected outages would be performed by LCPD.

j. Project Phases

Construction of the project would occur in three phases, with one to three years between phases. Phases would correspond to demand for water and issuance of permits for additional water rights. Eventually LCWD would like to harvest 5,000 afy from the carbonate aquifer within the Kane Springs Valley Hydrographic Basin but so far has been granted an appropriation of 1,000 afy by the Nevada State Engineer. This appropriation granted four points of diversion, which constitutes the initial production under Phase 1 of the project. If additional appropriations are granted, production from Phase 1 wells could be increased, and Phase 2 and Phase 3 wells could be developed.

- Construction of Phase 1 would occur over a 90- to 180-day period and would begin upon completion of environmental reviews and the acquisition of necessary permits and approvals. Phase 1 water facilities would include the transmission pipeline (main water line) and approximately 9.4 miles of well field collection pipelines for up to four wells (main collection plus laterals to wells), up to four production wells, the storage tanks, and up to two monitoring wells. Power facilities would include 14 miles of 69 kV/22.8 kV overhead power lines and up to four smaller substations to serve each well.

- Construction of Phase 2 would occur over a 30- to 60-day period. Phase 2 water facilities would include one to two production wells and lateral pipelines from these wells to the main collection pipeline (combined length of the two lateral pipelines is expected to be less than 1 mile). Power facilities would include 22.8 kV underground power lines from the main transmission line to the substation(s) and one to two smaller substations to serve the new well(s).
- Phase 3 construction would only occur if production from Phase 1 and Phase 2 were insufficient to meet anticipated demand or if production from previous wells were lower than estimated or designed. Phase 3 facilities and construction times are similar to Phase 2.

2. State Engineer Ruling

On February 2, 2007, the Nevada State Engineer issued Ruling 5712, which granted 1,000 afy of groundwater from the Kane Springs Valley Hydrographic Basin to LCWD and VWC for municipal purposes within the Coyote Spring Valley Hydrographic Basin. Specifically 500 afy was granted under Application 72220 and applications 72218, 72219, and 72221, were granted for a total combined duty of 500 afy.

The State Engineer concluded that to permit the appropriation of water in an amount greater than permitted under this ruling would conflict with existing rights and threaten to prove detrimental to the public interest. After reviewing the existing information, the State Engineer concluded that a small amount of water can be developed in the Kane Springs Valley and not unreasonably impact existing rights in the discharge areas of the White River carbonate-rock aquifer system, which are already fully appropriated. The State Engineer found that no water has been previously appropriated in the Kane Springs Valley Hydrographic Basin and by limiting the quantity of water authorized for appropriation the potential impacts to existing waster rights in down-gradient hydrographic basins would be minimized.

3. Proposed Minimization Measures for Desert Tortoise (Mojave population)

a. The applicant will implement an Environmental Training Program. Prior to beginning work, all contractor personnel assigned to the field for construction-related activity will attend a mandatory one-time Worker Environmental Training Program presented by the project developer's Environmental Compliance Team. The presentation will review topsoil salvage, access restrictions, general site restrictions, and other environmental requirements regarding the project. Participants will sign a statement declaring that they understand and will abide by any guidelines set forth in the material presented.

b. All areas around structures will be backfilled, compacted, and returned as close as possible to the original condition and grade.

c. Signs will be placed along the access roads to discourage off-highway vehicle use of adjacent areas.

d. Clearance surveys will be performed prior to any construction activities within the right-of-ways. Any tortoises located will be handled and relocated by a qualified tortoise biologist in accordance with Service-approved protocol (Desert Tortoise Council 1994, revised 1999). Burrows containing tortoises or nests will be excavated by hand, with hand tools, to allow removal of the tortoise or eggs. Desert tortoises moved during the tortoise inactive season or those in hibernation, regardless of date, must be placed into an adequate burrow; if one is not available, one will be constructed in accordance with Desert Tortoise Council (1994, revised 1999) criteria. During mild temperature periods in the spring and early fall, tortoises removed from the site will not necessarily be placed in a burrow. Tortoises and burrows will only be relocated to federally managed lands. If the responsible Federal agency is not BLM, verbal permission, followed by written concurrence, will be obtained from BLM and the Service before relocating the tortoise or eggs to lands not managed by BLM.

e. Construction monitoring will employ a field contact representative, authorized biologist(s), and qualified biologist(s) during construction activities except in those areas with high disturbance. The Service employs a specific set of guidelines for such monitoring.

f. Tortoises requiring moving will only be handled by the authorized and qualified tortoise biologist or other trained personnel approved by the Service and the Nevada Department of Wildlife (NDOW).

g. A 25 mile per hour (mph) project access road speed limit will be enforced for all project vehicles and personnel.

h. The area limits of project construction and survey activities would be predetermined based on the temporary and permanent disturbance areas noted on the final design engineering drawings to minimize environmental effects arising from the project, with construction activities and traffic restricted to and confined within those limits.

i. Littering is not allowed. Project personnel would not deposit or leave any food or waste in the project area, and no biodegradable or non-biodegradable debris would remain in the right-of-way following completion of construction.

j. No wildlife, including rattlesnakes, may be harmed except to protect life and limb.

k. Project personnel are not allowed to bring pets to any project area in order to minimize harassment or killing of wildlife and to prevent the introduction of destructive animal diseases to native wildlife populations.

l. Wildlife species may not be collected for pets or any other reason.

m. Project supplies or equipment where wildlife could hide will be inspected prior to moving or working on them, to reduce the potential for injury to wildlife. Supplies or equipment that cannot be inspected or from which wildlife cannot escape or be removed, will be covered or otherwise made secure from wildlife intrusion or entrapment at the end of each work day.

n. All steep-walled trenches or excavations used during construction will be inspected twice daily (early morning and evening) to protect against wildlife entrapment.

o. All new access roads constructed as part of the project that are not required as permanent access for future project maintenance and operation would be permanently closed to minimize impacts from increased public access.

p. To minimize perching opportunities for raptors near habitats supporting sensitive prey species, structures incorporating a design to discourage raptor perching will be selected.

q. Only the minimum amount of vegetation necessary for the construction of structures and facilities will be removed. Topsoil will be conserved during excavation and reused as cover on disturbed areas to facilitate re-growth of vegetation.

r. Construction holes left open overnight will be covered. Covers will be secured in place nightly, prior to workers leaving the site, and will be strong enough to prevent livestock or wildlife from falling through and into a hole.

s. Holes and/or trenches will be inspected prior to filling to ensure absence of mammals and reptiles.

t. Where necessary, a biological resource monitor shall be present during the construction to ensure resources are protected in the construction area.

u. Excavations will be sloped on one end to provide an escape route for small mammals and reptiles.

v. A revegetation plan will be developed and implemented for the project which describes procedures the LCWD and its contractors would use to conduct revegetation of the disturbed areas. The Plan describes seedbed preparation; seed mixtures; seeding, salvaging, and transplanting methods; revegetation schedule; post-construction monitoring; evaluation of revegetation success; remediation; and reporting.

w. A noxious weed management plan will be developed and implemented for the project which includes site-specific measures that LCWD and its contractors would implement to control noxious weeds including, but not limited to, the use of cleaned, weed-free equipment, pressure washing of all vehicles and equipment prior to arrival at the work site, and the use of certified weed-free straw/hay bales to control erosion. A key element of the noxious weed management plan is to identify and treat existing weed infestations prior to construction.

x. A fire mitigation plan will be developed and implemented for the project which identifies measures to be taken during construction, operation, and maintenance of the project facilities to prevent and suppress fires. The purpose is to establish standards and practices to minimize the risk of fire or, in the event of fire, to implement immediate suppression procedures.

4. **Proposed Minimization Measures for Moapa Dace**

On August 8, 2006, the Service entered into a stipulated agreement with LCWD and VWC for water rights applications in the Kane Springs Valley Hydrographic Basin, then under review by the Nevada State Engineer's Office. The Service agreed to withdraw its protests for the granting of these water rights in exchange for the parties agreeing to implement the Monitoring, Management, and Mitigation Plan which would help protect senior Federal water rights in the Muddy River Springs/Warm Springs Area from unreasonable adverse impacts from groundwater pumping. The common goal of the parties is to manage the development of the LCWD and VWC water rights in their entirety from the Kane Springs Valley Hydrographic Basin, without resulting in any losses to senior water rights or unreasonable adverse impacts to Federal water resources.

The Monitoring, Management, and Mitigation Plan lists monitoring requirements in relation to the production wells, two new monitoring wells, elevation control and springflow, water quality, data quality, and reporting. The management requirements include action criteria to help to maintain minimum in-stream flows in the Warm Springs Area in order to protect and recover the Moapa dace. The parties agreed to the following, summarized from the Plan:

a. The Average Flow Level shall be determined by flow measurements at Warm Springs West flume. See the Plan for the definition of Average Flow Level.

b. If the Average Flow Level decreases to an amount within the Trigger Range of 3.2 cubic feet per second (cfs) or less, the parties agree to meet as soon as practically possible to discuss and interpret all available data and plan for mitigation measures in the event that flows continue to decline.

c. If the Average Flow Level is within the Trigger Range of 3.15 cfs or less but greater than 3.0 cfs, LWCD and VWC agree to reduce pumping from all wells in Kane Springs Valley by 50 percent or to a pumping level not greater than 2,500 afy, whichever results in the lesser amount of pumping, until the Average Flow Level exceeds 3.15 cfs. The subsequent State Engineer ruling limited pumping to 1,000 afy. Accordingly, under this scenario, LCWD and VWC would be required to reduce pumping by 50 percent.

d. If the Average Flow Level is within the Trigger Range of 3.0 cfs or less, LWCD and VWC agree to cease pumping from all wells in Kane Springs Valley until the Average Flow Level exceeds 3.0 cfs. However, if LWCD and VWC, together with CSI, effectuate a reduction in the quantity of water, CSI would have otherwise been entitled to pump in a given year from wells within the Coyote Spring Valley, then LWCD and VWC shall have the right to pump a like quantity of water from wells within Kane Springs Valley in that year.

The management requirements also include the establishment of a TRT with two representatives each from LCWD/VWC and the Service. The objectives of the TRT include reviewing existing data, making recommendations concerning the monitoring efforts required by this Plan, and determining whether other criteria, such as water levels in the monitoring wells, are a better indicator of potential effects of the pumping wells on the springs in the Muddy River Springs/ Warm Springs Area. As part of their commitment to the recovery of the Moapa Dace, LCWD and VWC will commit annual funds for a period of five years following the granting of the water rights applications, for the restoration of Moapa dace habitat outside the boundaries of the Moapa Valley National Wildlife Refuge (NWR).

B. Definition of the Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action, including interrelated and interdependent actions, and not merely the immediate area involved in the action (50 CFR § 402.02). Subsequent analyses of the environmental baseline, effects of the action, cumulative effects, and levels of incidental take are based upon the action area as determined by the Service.

For the desert tortoise and its designated critical habitat, impacts will be tied to the project area and a zone-of-influence extending 0.5 miles (2,400 feet) beyond the project area to cover potential effects to desert tortoises that could move into construction areas or onto access roads.

For the Moapa dace, which depends on thermal springs in the Warm Springs Area for survival, the action area includes the Kane Springs Valley Hydrographic Basin and the hydrographic basins down gradient of this basin in the White River Groundwater Flow System that are hydrologically connected to the Muddy River ecosystem. These hydrographic basins are the Coyote Spring Valley (Basin 210) and Muddy River Springs Area (Basin 219). The Service acquired the Moapa Valley NWR to secure habitat and assist the recovery efforts for the endangered Moapa dace, a species restricted to the Warm Springs Area and the mainstem of the upper Muddy River. Springs in this area are considered regional discharge points for the carbonate aquifer of the White River Flow System.

C. Status of the Species- Rangewide

1. Desert Tortoise (Mojave population) and Designated Critical Habitat

The current rangewide status of the desert tortoise and its critical habitat consists of information on its listing history, species account, recovery plan, recovery units, distribution, reproduction, and numbers, and critical habitat units and their constituent elements. This information is provided on the Service's website at: http://www.fws.gov/nevada. If unavailable, contact the Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230 and provide File No. 84320-2008-F-0007.

2. Moapa Dace

See the description in the Intra-Service Programmatic Biological Opinion for the Proposed Muddy River Memorandum of Agreement Regarding the Groundwater Withdrawal of 16,100 afy From the Regional Carbonate Aquifer in the Coyote Spring Valley and California Wash Basins and Establishment of Conservation Measures for the Moapa Dace, Clark County, Nevada (Service 2006c) (File No. 1-5-05-FW-536). Updated information on the Moapa dace is provided below.

Warm Springs Natural Area

In September 2007, Southern Nevada Water Authority (SNWA) purchased 1,179 acres of private property that encompasses several springs in the Muddy River headwaters area, including the former Warm Springs Ranch. The property includes 3.8 miles of the mainstream Muddy River. The Warms Springs Natural Area is to be managed as a nature preserve for protection of Moapa dace; and restoration and management of the areas as an ecological reserve.

Current Distribution and Abundance

Moapa dace surveys have been conducted annually throughout the upper Muddy River system. Dace surveys conducted semi regularly between 1994 and 2006 indicate Moapa dace numbers range between 1,296 and 3,825 individuals. The 2007 survey data indicate that there were approximately 1,172 fish in the population that occurred throughout 5.6 miles of habitat in the upper Muddy River system. Approximately 97 percent of the total population occurred within one major tributary that included 1.78 miles of spring complexes that emanate from the Pedersen, Plummer, and Apcar spring complexes on the Moapa Valley NWR and their tributaries (upstream of the gabion barrier). Approximately 48 percent of the population was located on the Moapa Valley NWR and 48 percent occupied the Refuge Stream supplied by the Pederson-Plummer springs. The highest densities of Moapa dace occurred on the Moapa Valley NWR's Plummer and Pedersen units.

In 2008, there was an approximately 60 percent decrease in the number of Moapa dace, from 1,172 fish in 2007 to 460 in 2008. Most of this decline is due to large changes in the numbers of dace in the Pederson, Plummer, and Refuge Stream areas which supported more than 92 percent of the population in 2007. The cause of the population decline is currently unknown, although beavers have recently changed stream characteristics in the Refuge Stream and vegetation management occurred along the Pederson Unit. In addition, habitat restoration projects have been implemented over the past few years in the Pederson and Plummer units of the Moapa Valley NWR, restoring the streams to a more natural state to augment Moapa dace habitat and populations.

D. Environmental Baseline

1. Status of the Listed Species/Critical Habitat in the Action Area

a. *Desert Tortoise (Mojave Population) - Status within the Action Area*

The action area occurs in the Mojave Desert Scrub Biome (Turner 1982), along the Kane Springs Road located in the valley between the Meadow Valley Mountains to the south and the Delamar Mountains to the north. The project area crosses Kane Springs Wash, which flows southwest to its confluence with the Pahranagat Wash in the northern part of the Coyote Spring Valley, in several locations. The vegetation in the action area consists of creosote bush scrub and desert wash scrub along Kane Springs and Pahranagat washes. Elevations in the action area range from approximately 2,600 to 3,300 feet.

Between October 16 and 18, 2006, Greystone-ARCADIS biologists conducted desert tortoise presence-absence surveys in the project area for BLM (ARCADIS 2007). Evenly spaced along the project area were 18, 1.5 mile long by 10 yard wide triangular strip transects. Transects were surveyed for live or dead desert tortoise, and any tortoise sign including burrows, scat, tracks, and water scrapes. The total corrected sign method was used to estimate tortoise densities. Estimated tortoise densities ranged from 10 to 0 tortoises per square mile. No live tortoises were found and most of the tortoise sign was comprised of burrows and water scrapes. The highest tortoise densities were 10 per square mile at 3 transects, and 7 per square mile at 3 transects. The remainder of the transects had densities of 5 per square mile or less. No desert tortoise sign were found in the two transects that overlapped with a wildfire perimeter from 2005 at the northeast end of the project area. Over the project area, tortoise densities average 4 desert tortoises per square mile. Densities in the project area are therefore estimated to be very low.

Recent surveys have been conducted in the Coyote Spring Valley as part of the rangewide population monitoring program. Survey data from 2005 line-distance sampling in the Coyote Spring Valley, which includes transects in the CSI private and lease lands located in the Mormon Mesa Critical Habitat Unit (CHU), estimate the tortoise densities in the valley to be 8.3 tortoises per square mile (Service unpublished data). Over the first five years of line-distance sampling monitoring, tortoises were least abundant in the Northwest Mojave Recovery Unit (2 to 8 tortoises per square mile) as compared to other recovery units (Service 2006b). Tortoise densities in the Coyote Spring Valley are therefore among the highest in the recovery unit. These results are preliminary and additional analysis is needed, incorporating 2006 and 2007 survey results. Desert tortoise clearance surveys were conducted in 2006-2007 in the southern part of the Coyote Spring Valley. One hundred percent clearance surveys were conducted on 5,302 acres of CSI private lands in Clark County as of January 2008. Based on the total number of tortoises cleared during surveys (108 adults and juveniles), we estimate a density of around 13 tortoises per square mile on the CSI private lands in Clark County.

Older desert tortoise survey data exists for the action area including BLM strip triangle surveys and the Coyote Springs Permanent Study Plot (PSP). Prior to 1991, BLM surveyed for tortoises using the strip triangle method, recording all tortoise sign within approximately 5 meters (15 feet) of the transect and estimating species density based on methods described by Karl (1981) for southern Nevada. Densities within one half mile of Kane Springs Road ranged from high to very low. Densities averaged medium (45 - 90 tortoises per square mile) and low (10 - 45 tortoises per square mile) over the project area. Densities on the northeast part of the project area were very low (0 - 10 tortoises per square mile). It appears that densities have declined somewhat since 1991.

The closest 1-square-mile PSP to the project area is the Coyote Spring plot, which is located 1.9 miles east of US 93 and 1.9 miles north of Kane Springs Road. This plot was established in 1986 and resurveyed in 1992 and 1995. EnviroPlus Consulting (1995) characterized this site as having moderately high tortoise numbers, with a size distribution typical of that observed on other PSPs and a significantly skewed sex ratio with female tortoises comprising two-thirds of the observed sub-adult and adult population (however, this effect was not significant for tortoises >208 mm mid-carapace length). Over the three survey periods, total estimated population size on the plot ranged from 96 ± 31 to 116 ± 29 (Esque1986, Converse Environmental Consultants Southwest, Inc. 1992, EnviroPlus Consulting 1995). This is considerably higher than densities in the action area. The annual adult mortality rate for the Coyote Spring plot in 1995 was estimated at 4 percent, which is higher than the 2-3 percent rate that the Service believes necessary to sustain desert tortoise populations (Service 1994). However, the tortoise population at the Coyote Spring PSP was apparently stable over the 10 years that the surveys spanned (EnviroPlus Consulting 1995).

Tortoises with symptoms of cutaneous dyskeratosis and URTD were observed during plot surveys; however, comparisons across survey periods are unreliable due to differences in diagnosis/evaluation criteria used to evaluate health status. In 1995, approximately one-third of tortoises had trauma-related injuries, likely caused by a predator. Overall, mortality by predation was characterized as present, but not at a high rate. Human impacts on tortoise populations in this area were considered low and inconsequential (EnviroPlus Consulting 1995). The PSP is located in the northern part of the Coyote Spring Valley and BLM strip triangle survey data corroborates that this area north of the Kane Springs Road and east of US 93 has higher tortoise densities than the surrounding areas with several very high density (greater than 140 tortoises per square mile) and high density (90 - 140 tortoises per square mile) survey triangles.

b. ***Desert Tortoise Critical Habitat - Status within the Action Area and the Mormon Mesa CHU***

The project area is located mostly within the 427,900 acre Mormon Mesa CHU of the Northeastern Mojave Recovery Unit for the desert tortoise. The primary vegetation community within the Mormon Mesa CHU is creosotebush-white bursage desert scrub, which in Nevada is found in broad valleys, lower bajadas, plains and low hills of the Mojave Desert. Shrub cover is sparse to moderately dense, consisting primarily of creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) with a variety of different shrubs and cacti as co-dominants or understory species. Where poorly-drained soils with high salt and clay content are found on valley bottom floors, pockets of salt desert scrub community may be present, typified by one or more *Atriplex* species.

The CHU boundaries were based on proposed desert wildlife management areas (DWMAs) in the Draft Desert Tortoise Recovery Plan. The land management agencies have subsequently designated areas of critical environmental concern (ACECs) in each DWMA, where they are managing the land as reserves. In general, land management activities that may negatively affect the desert tortoise and its habitat such as domestic livestock grazing, grazing by wild burros and horses, commercial harvest of desert flora, and off-road vehicle use are mostly restricted or not allowed in these areas, as per Recovery Plan recommendations. The Mormon Mesa CHU contains the following ACECs: Kane Springs, Coyote Springs, and Mormon Mesa. The project area is in the Kane Springs ACEC.

CSI owns 29,055 acres of lands in Coyote Spring Valley, in Clark and Lincoln counties, Nevada, all of which is designated critical habitat for the desert tortoise. In addition CSI has a lease for approximately 13,767 acres of BLM-administered land in Coyote Spring Valley for 99 years. In Clark County, CSI is currently constructing a residential and golf community with associated commercial development on 6,881 acres of private land. Construction will occur over 25 years, with an eventual build out of 29,000 residential units, approximately 72,500 residents, and a visitor capacity equal to 14,500 residents (based on full-time equivalency). In Lincoln County, CSI proposes to develop 21,454 acres of private land over a 40 year period. It is estimated that there would be up to 111,000 residential units, resulting in an increase of population of 275,300 residents in Lincoln County. CSI plans to create a natural reserve on 13,767 acres of BLM leased land (approximately 7,548 acres in Lincoln County and 6,219 acres in Clark County).

EnviroPlus Consulting (1995) characterized the Coyote Spring PSP as having low historical and present-day human impact: Old Highway 93 was rarely used and had large shrubs growing through cracks in the pavement; little trash was observed on the plot; no power lines were present; no cattle or burros were observed; and while a few old two-track roads were discernible for short distances, none appeared to be recently made. Furthermore, this area was characterized as having somewhat variable but adequate tortoise habitat, with abundant forage and good soil for burrowing (EnviroPlus Consulting 1995).

The Mormon Mesa CHU is highly fragmented with an extensive network of primarily unimproved and two-track roads. The Desert Tortoise Recovery Plan (companion document for proposed DWMAs, Service 1994), describes this area as having the highest density of roads and trails (1.3 linear miles per square mile) of any desert tortoise *crucial* habitat in southern Nevada based on a 1984 status report [crucial habitat was defined by BLM in the California Desert Plan (1980) as "...Portions of the habitats of sensitive species that if destroyed or adversely modified could result in their being listed as threatened or endangered pursuant to section 4 of the Act or in some category implying endangerment by a State agency or legislature."]. US 93 runs along the western edge and bisects the southwestern tip of the unit, providing a substantial barrier between the unit and protected tortoise habitat in the Desert NWR to the west. State Route (SR) 168 also runs through the western part of the CHU, and I-15 traverses the southeastern edge of the unit. Other well-established roads include the Kane Springs Road and the Carp-Elgin Road which bisects the unit. Powerlines, pipelines, and access roads dissect much of the area.

The 2005 wildfire season in southern Nevada was severe due in large part to the high bio-mass of flammable non-native annual grasses after above-average moisture conditions the previous winter. Approximately eight acres in the northeast part of the project area burned in 2005 in the Meadow Valley Fire, which burned approximately 148,000 acres overall, including a small amount of the Mormon Mesa CHU. In total, over 56 fires of various sizes in southern Nevada, southwestern Utah, and northern Arizona burned roughly 964,806 acres in the Northeastern Mojave Recovery Unit in 2005 including 15,559 acres (4 percent) within the Mormon Mesa CHU. The wildfire hazard in the Mormon Mesa CHU remains significant although fire activity in 2006 and 2007 was lower due to dryer conditions over the winter and spring. Monitoring of the 2005 fires in critical habitat being conducted by the U.S. Geological Survey (USGS) shows that proportionally less tortoise activity occurred in burned areas (treatment plots and control plots) compared to unburned reference plots.

The Mormon Mesa CHU is primarily in Federal ownership, administered by BLM. In addition to CSI's private lands, there are several small privately-held parcels along the Meadow Valley Wash that are within or adjacent to the CHU. Other privately-held lands or Federal land slated for disposal adjacent or near the Mormon Mesa CHU have the potential for future development. Land near the extreme southwestern tip of the Mormon Mesa CHU and northeast of Las Vegas is also in private ownership. Future development of these private lands, as well as possible future disposals of Federal land to allow for expansion of existing cities will create additional challenges for the Service and Federal lands managers in terms of management of the Mormon Mesa DWMA/ACEC, and conservation and recovery of desert tortoises in the Mormon Mesa CHU.

c. *Moapa Dace - Status within the Action Area*

The action area encompasses the entire range of the Moapa dace. Population numbers were discussed in detail in the section entitled "Status of the Species Rangewide, C. Moapa Dace;" thus, no further details are provided here. The relationship of the dace's habitat to groundwater is discussed in more detail below.

2. *Factors Affecting the Listed Species/Critical Habitat in the Action Area*

The action area is located primarily within the Kane Springs Valley, Coyote Spring Valley and Muddy River Springs Area hydrographic basins. These basins are part of the White River Groundwater Flow System, a regional groundwater flow system located in southern Nevada (Eakin 1966, Harrill *et al.* 1988, Prudic *et al.* 1993). The flow system consists of numerous local basin fill aquifers underlain by a large regional carbonate aquifer that transmits groundwater from basin to basin, beneath topographic divides. Groundwater inflow or recharge to the regional carbonate aquifer is primarily through precipitation. The terminal discharge of the White River Groundwater Flow System is most likely the Warm Springs in the Upper Moapa Valley, an area consisting of about twenty regional springs, with numerous seeps and wetlands. Since the Moapa dace is dependent upon these springs for survival it is important to discuss the hydrology of this area in more detail.

The source water supporting spring discharge in the Warm Springs Area is from the regional carbonate groundwater (62 percent) and from local recharge based on precipitation in the surrounding mountain ranges (BLM 2008). The production wells in the Kane Springs Valley that would be pumped under the proposed action are located about 20 miles northwest of the Warm Springs Area. The high permeability and transmissivity of the carbonate aquifer underlying the Kane Springs Valley and down-gradient Coyote Spring Valley could connect the proposed action to springs in the Warm Springs Area. Long-term effects from groundwater extraction could be propagated over great distances. Barriers to flow, such as faults or rock units with low permeability, also affect the extent of drawdown. There may be a break in the regional hydraulic gradient at the location of the Kane Springs Wash fault zone; however until additional long-term pumping data are obtained, the true relationship cannot be fully evaluated (BLM 2008).

a. *Existing Groundwater Rights and State Engineer Rulings in the Action Area:*

Groundwater wells within the Kane Springs Valley and Coyote Spring Valley Hydrographic Basins are associated with municipal, mining, industrial, commercial and irrigation use. Permitted diversion rates for existing wells vary from 145 to 7,242 afy. Within the Kane Springs Valley Hydrographic Basin, permitted water rights are limited to the LCWD/VWC applications recently approved by the State Engineer under Ruling 5712. The LCWD has an additional four groundwater applications pending before the Nevada State Engineer. Currently, in the Kane Springs Valley Hydrographic Basin permitted groundwater rights are 1,000 afy (BLM 2008).

In the Coyote Spring Valley Hydrographic Basin, groundwater rights filed with the Nevada State Engineer include 15 industrial use permits owned by SNWA, 4 municipal use permits owned by CSI, 1 industrial use permit owned by Nevada Power Company, and 4 permits owned by Bedrock Limited, LLC associated with sand and gravel mining operations. Bedrock Limited, LLC also has one vested application for irrigation use. Currently, in the Coyote Spring Valley Hydrographic Basin permitted groundwater rights are 16,304 afy (BLM 2008). There are 34 pending applications by Las Vegas Valley Water District (LVWD); CSI; Dry Lake Water, LLC;

and Bedrock Limited, LLC in the Coyote Spring Valley Hydrographic Basin. A list of surface water and groundwater rights in the Kane Springs Valley and Coyote Spring Valley hydrographic basins is provided in Appendix D of the Kane Springs Valley Groundwater Development EIS (BLM 2008).

There are three Nevada State Engineer rulings that affect the withdrawal of groundwater in the action area. In these rulings the Nevada State Engineer has required "staged development," an incremental approach for phasing in development of the carbonate aquifer with adequate monitoring in cooperation with other parties in order to assist in assessing effects. This approach was adopted by the Nevada State Engineer "...in order to predict, through the use of a calibrated model, the effects of continued or increased development with a higher degree of confidence." Ruling 5712, granting 1,000 afy of groundwater from the Kane Springs Valley to LCWD and VWC was summarized in the section entitled "Description of the Proposed Action." The other two rulings are summarized below.

In Order 1169 issued in 2002, the Nevada State Engineer held in abeyance applications for new groundwater rights in the Coyote Spring Valley, Black Mountains Area, Garnet Valley, Hidden Valley, Upper Moapa Valley, and Lower Moapa Valley groundwater basins until a pump test is completed. All major water right holders in these basins (SNWA, LVVWD, Moapa Valley Water District [MVWD], CSI, and Nevada Power Company) were required to conduct a regional groundwater study, including the pumping of at least 50 percent of the permitted water rights within the Coyote Spring Valley hydrographic basin for a period of at least two consecutive years. Order 1169 is designed to evaluate how groundwater pumping activities in Coyote Spring Valley will impact water rights and the environment within the Warm Springs Area, including the Muddy River ecosystem. Data obtained from the study will be used to evaluate groundwater development activities within the regional carbonate groundwater system.

To date, there has been limited pumping of the permitted groundwater rights in Coyote Spring Valley. In 2005, CSI drilled and pump tested two wells in Coyote Spring Valley under Nevada Division of Water Resources permit numbers 70429 and 70430. Currently, CSI is monitoring and pumping water as needed for their development activities in Clark County.

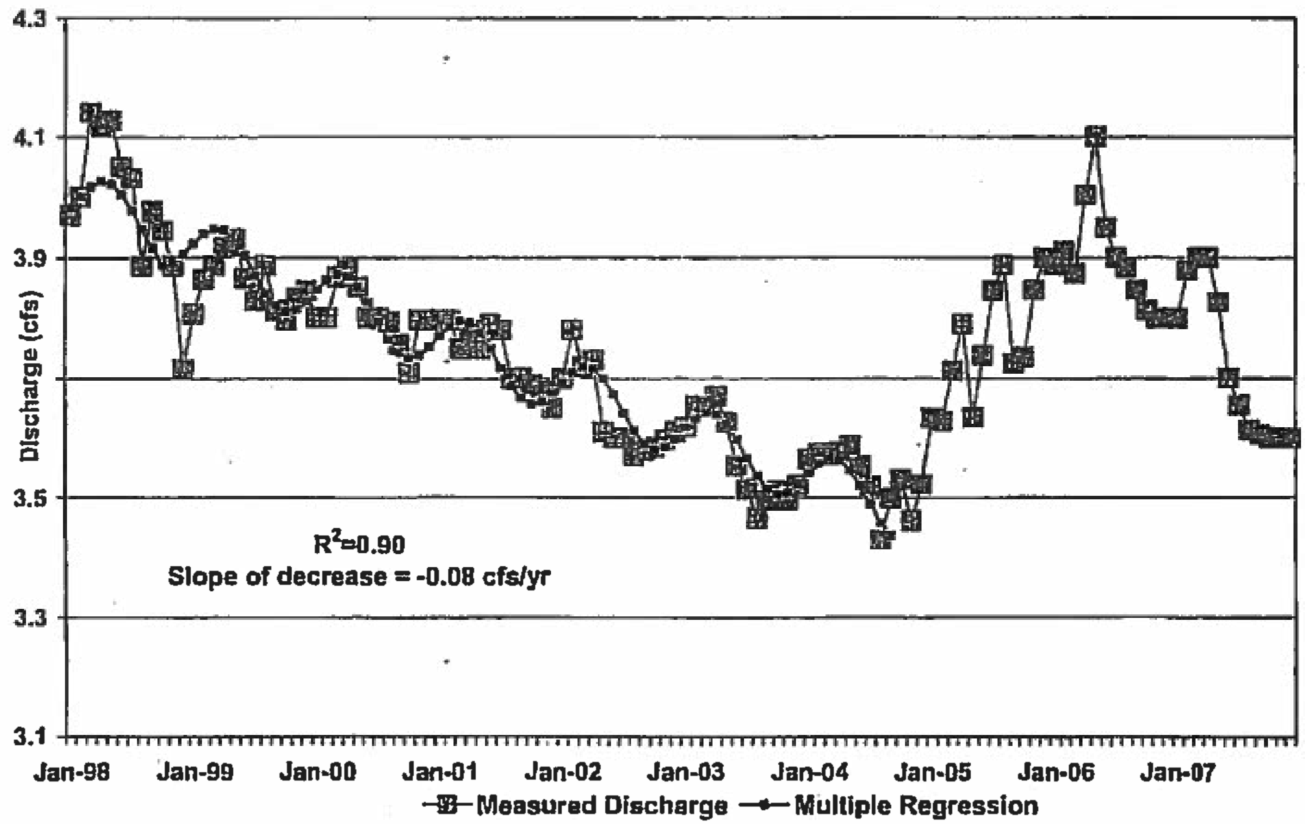
In Ruling 4243 in the Muddy River Springs Area Hydrographic Basin, the Nevada State Engineer granted permits to MVWD for 5,800 afy from Arrow Canyon Well, but with pumping phased in over a 10-year period while monitoring surface water flows and groundwater levels in order to assess potential effects to wells and springs. Annual volume pumped is limited to annual demand, up to the maximum permitted. Annual pumping has consistently been less than the amount allowed in the ruling.

As of 2002, the Nevada State Engineer had granted a total of approximately 14,800 afy of groundwater permits for the alluvial and carbonate aquifer in the Muddy River Springs Area Hydrographic Basin (Service 2006c). Included in these are MVWD permits for the Arrow Canyon Well totaling 7,240 afy (1,440 afy prior to Ruling 4243 plus 5,800 afy from Ruling 4243) from the carbonate aquifer. To date, the actual pumping from the Arrow Canyon Well has been far less than the permitted volume. Approximately 2,400 afy has been pumped on average since 1998.

Concurrent with groundwater pumping between 1998 and 2004, groundwater levels and spring discharge in the Warm Springs Area consistently declined (Service 2006c). Over the same period, the total spring discharge from the Pedersen Unit, as measured at Warm Springs West, decreased from 4.00 cfs to 3.55 cfs (Service 2006c) (Figure 2). The discussion in Mayer (2004) shows that the observed decreases in spring discharge are consistent with expected decreases based on the two-foot decline in groundwater levels observed in the carbonate monitoring wells in the Warm Springs Area. The extremely wet winter of 2005 appears to have recharged the springs with monthly discharge peaking at 4.1 cfs in May of 2006, and decreasing since that time (Mayer 2008). This is expected to be a transient response but the timing and level of a return to equilibrium conditions is not known for certain. Discharge has currently declined to 3.6 cfs (USGS 2008).

The exact timing of the groundwater level decline is important because if the actual decline precedes in time any action or event suspected of causing the decline (such as increased pumping or drought), then this is strong evidence that there are other factors causing the decline. The Service (2006c) analyzed the timing of the decline as it was concerned about the rate and magnitude of the 1998 to 2004 decrease. The start of the decline coincides with MVWD's increased pumping from the carbonate aquifer. In order to address the possibility that drought caused the groundwater level declines, the Service (2006c) compiled precipitation records from a number of stations in the southeastern Nevada area. Their analysis showed that the decline from 1998 to 2004 was not likely to be drought-related. These declines observed between 1998 and 2004 have occurred not only locally in the Warm Springs Area, but have also occurred in monitoring wells 12 miles upgradient in Coyote Spring Valley and 15 miles south in monitoring

Figure 3: Warm Springs West, Moapa Valley NWR - USGS Average Monthly Discharge, Apr 1998 to Dec 2007



wells in the California Wash Basin, based on USGS monitoring well data and monitoring well data shared with the Service in July 2004 (Service 2006c).

On July 14, 2005, a Memorandum of Agreement (MOA) was signed by the SNWA, MVWD, CSI, Moapa Band of Paiutes (Tribe), and the Service, regarding groundwater withdrawal of 16,100 afy from the regional carbonate aquifer in Coyote Spring Valley and California Wash Basins, and establishment of conservation measures for the Moapa dace. The MOA outlined specific conservation actions that each party would complete in order to minimize potential impacts to the Moapa dace should water levels decline in the Muddy River system as a result of the cumulative withdrawal of 16,100 afy of groundwater from two basins within the regional carbonate aquifer system.

To minimize effects to the Moapa dace, conservation actions were identified in the MOA. In order to be considered a benefit to the species, the proposed conservation measures will be initiated or fully implemented prior to the proposed groundwater withdrawal of 16,100 afy. Since development of these water rights requires the construction of facilities, as identified above, there would be a two to five year timeframe in which to implement many of these actions prior to the pumping of the full amount of water. CSI would utilize a small portion of their water right in Coyote Spring Valley prior to full implementation of all of the conservation measures. The action items identified in the MOA include development of a Recovery Implementation Program, restoration, ecological studies, construction of fish barriers, eradication of non-native fish, and dedication of water rights. Minimum in-stream flow levels were established in the MOA that trigger various conservation actions should those predetermined levels be reached. The flow levels will be measured at the Warm Springs West Flume located on the Moapa Valley NWR.

b. Section 7 Consultations Completed for Activities and Projects in the Action Area

1. **File Nos. 1-5-99-F-450 and 84320-2008-F-0078:** On March 3, 2000, the Service issued a programmatic biological opinion (File No. 1-5-99-F-450) to BLM's Ely District Office for implementation of actions in the Caliente Management Framework Plan Amendment (CMFPA). The planning area consisted of public lands in White Pine, Lincoln, and a portion of Nye counties in east-central Nevada. Cumulatively, 25,521 acres of desert tortoise habitat were projected to be affected by the proposed activities within the planning area over a 10-year period.

   On September 9, 2008, the Service issued a programmatic biological opinion (File No. 84320-2008-F-0078) to BLM for the Ely District Resource Management Plan (Ely RMP). This programmatic biological opinion superseded the March 3, 2000, programmatic biological opinion for the CMFPA. Programs in the 2008 programmatic biological opinion included: vegetation management; weed management; wild horse management; lands, realty, and renewable energy projects; travel and off-highway vehicle management;

recreation; livestock grazing management; geological and mineral extraction; and fire management.

Implementation of multiple-use activities (excluding vegetation and weed management) were projected to result in the disturbance of 22,624 acres of desert tortoise critical habitat and 37,311 acres of desert tortoise habitat. During the 10-year term of the programmatic biological opinion, the Service authorized the take of no more than 47 desert tortoises and estimated that 972 tortoises would be taken by non-lethal means (i.e. harassment).

2. **File Nos. 1-5-94-F-334, 335, 336, and 035:** On May 15, 1995, the Service issued a non-jeopardy biological opinion to BLM for the issuance of a right-of-way to install four proposed fiber-optic lines in Clark and Lincoln counties, Nevada. Four applicants comprising the Fiber Toll Joint Venture Project requested a 7.6-m-wide (25-foot-wide) right-of-way for construction of four buried fiber-optic lines. Segments of these lines would parallel SR 168 for approximately 23 miles, and for 43 miles along US 93 (File Nos. 1-5-94-F-334 and 336). Approximately 98 and 65 acres of long- and short-term habitat disturbance, respectively, was attributed to the two segments adjacent to US 93 and SR 168 described above, a majority of which runs through the action area for the CSI project. This included approximately 53 acres of long-term disturbance and 35 acres of short-term disturbance to designated critical habitat (Mormon Mesa CHU) for the desert tortoise. The Service anticipated that up to 34 tortoises would be incidentally taken, 8 through mortality and 26 through injury or harassment.

3. **File No. 1-5-98-F-053, as amended:** On June 18, 1998, the Service issued a programmatic biological opinion to BLM for implementation of the Las Vegas Resource Management Plan (RMP). The project area for this consultation covers all lands managed by BLM's Las Vegas Field Office, including desert tortoise critical habitat, desert tortoise ACECs, and BLM-withdrawn land. The Las Vegas Field Office designated approximately 648 square miles of tortoise habitat as desert tortoise ACEC in the Northeastern Mojave Recovery Unit, and approximately 514 square miles of tortoise habitat as desert tortoise ACEC in the East Mojave Recovery Unit, through the final RMP. As identified in the RMP, BLM manages 743,209 acres of desert tortoise habitat within four tortoise ACECs for desert tortoise recovery. To accomplish desert tortoise recovery in the Northeastern and Eastern Mojave Recovery Units, the Las Vegas Field Office implements appropriate management actions in desert tortoise ACECs.

4. **File No. 1-5-98-FW-177:** On November 2, 1998, the Service issued a non-jeopardy biological opinion to the Nevada Fish and Wildlife Office for the implementation of eradication of non-native fish activities and installation of fish barriers in the Apcar Stream in the Warm Springs Area of the Muddy River. The Service concluded that the project was not likely to jeopardize the continued existence of the Moapa dace.

Incidental take was authorized and Reasonable and Prudent Measures were identified to minimize take to the species.

5. **File No. 1-5-99-F-411:** On December 8, 1999, the Service issued a non-jeopardy biological opinion to BLM for issuance of a right-of-way permit for the Nevada segment of the Las Vegas to Salt Lake City Long-haul Fiber-Optic Project. This consultation evaluated impacts to the desert tortoise and designated critical habitat from the construction, operation, and maintenance of a buried fiber-optic cable and related structures over an 180-mile linear stretch from the Utah-Nevada border to its terminus north of Nellis Air Force Base in Las Vegas. The section of the fiber-optic cable that runs through the Mormon Mesa CHU and CSI lands was located in NDOT's right-of-way east of US 93. The final area of disturbance was calculated at approximately 270 acres, including 158 acres of permanent impacts. The Service estimated that 4 desert tortoises may be incidentally injured or killed and 200 tortoises could potentially be affected by project activities.

6. **File No. 1-5-01-F-463:** On December 26, 2001, the Service issued a non-jeopardy biological opinion to the Bureau of Indian Affairs for approval of a lease for lands on the Reservation for construction and operation of the Moapa Paiute Energy Center. The proposed project would disturb up to 7 percent of the total available spawning habitat for the Moapa dace. As of the date of this biological opinion, the proposed project has not moved forward and the Service is not aware of any plans in the near future to construct the project.

7. **File No. 1-5-02-FW-463:** On March 13, 2002, the Service issued a non-jeopardy biological opinion to the Desert NWR Complex, Las Vegas, Nevada for the implementation of riparian and aquatic habitat restoration activities in the Pedersen Unit of the Moapa Valley NWR. The Service concluded that the incidental take of less than 10 percent of the 180-200 individuals (18-20 individuals) that may be present in the project area, would not likely jeopardize the continued existence of the Moapa dace. Reasonable and Prudent Measures were identified and implemented to minimize take of the species.

8. **File No. 84320-2008-F-0066 and 1-5-94-F-28R:** On December 20, 2007, the Service issued a biological opinion to BLM-Las Vegas for their proposal to amend an existing right-of-way for construction, operation, and maintenance of a single-circuit, overhead 500 kV transmission line (Southwest Intertie Project). The southern portion of the project begins at the Harry Allen Substation in Clark County, Nevada, crossing through the planning area, and ending approximately 34 miles north of Ely in White Pine County, Nevada. The project would disturb 231 acres of non-critical and 365 acres of critical desert tortoise habitat.

9. **File No. 1-5-05-FW-536:** On January 30, 2006, the Service issued a non-jeopardy intra-Service programmatic biological opinion for the Proposed Muddy River MOA, regarding the groundwater withdrawal by multiple parties of 16,100 afy from the regional carbonate aquifer in the Coyote Spring Valley and California Wash Basins. Given that there will be groundwater withdrawn from the same regional carbonate aquifer concurrently by different users and at different locations, it was difficult to assign loss to a specific action. The most accurate way to establish incidental take is at the landscape-level, which was analyzed in the Programmatic Biological Opinion. In that parent document, the cumulative withdrawal of 16,100 afy from all parties associated with the MOA predicted a loss of approximately 22 percent riffle and 16 percent pool habitat (as measured at the Warm Springs West gage downstream from the Pedersen Unit) when the flows reach 2.78 cfs. This amount included habitat losses potentially occurring under both the CSI development and SNWA pipeline. Three tiered biological opinions have been issued under this programmatic opinion:

   a. **File No. 1-5-05-FW-536 Tier 1:** On March 2, 2006, the Service issued a non-jeopardy tiered biological opinion to the Corps for the issuance of a Section 404 permit under the Clean Water Act of 1972, as amended, for the CSI residential development project. The Service concluded the proposed residential development is an interdependent activity with the Corps' action and will result in the permanent loss of 6,881 acres of desert tortoise habitat and take of no more than 645 desert tortoises. The proposed action falls within the scope and coverage of the 10(a)(1)(B) permit issued to Clark County for its multiple species habitat conservation plan (MSHCP), and exemption for the anticipated take of the desert tortoise is provided via the incidental take statement for the MSHCP. The Service estimated that the proposed action will result in the incidental take of Moapa dace associated with the loss of 6 percent of riffle habitat and 5 percent of pool habitat, in the Pedersen Unit. Incidental take was authorized, and reasonable and prudent measures were identified to minimize take of the species.

   b. **File No. 1-5-05-FW-536 Tier 2:** On May 9, 2007, the Service issued a non-jeopardy tiered biological opinion to BLM for a right-of-way to the SNWA to construct a water conveyance pipeline. SNWA's appropriated water right of 9,000 afy from Coyote Spring Valley would be pumped in order to participate in the Nevada State Engineer Study (Order 1169), and to provide water to the Moapa Valley area for residential and commercial purposes. The right-of-way would allow construction of approximately 16 miles of 24-inch diameter pipeline to transport water from three existing groundwater pumping wells in the southern end of the Coyote Spring Valley to an existing storage tank and pipeline. The Service estimated that 12 percent of riffle habitat and 9 percent of pool habitat will be lost due to the withdrawal of 9,000 afy associated with the SNWA action; however there were other factors which complicated the establishment of incidental take at this level for the proposed action.

c. **File No. 1-5-05-FW-536 Tier 3:** On August 6, 2007, the Service issued a non-jeopardy tiered biological opinion to the U.S. Department of Housing and Urban Development for construction of a water pipeline from an existing well on the Moapa River Indian Reservation to the Moapa Valley of Fire Travel Plaza. The use of 7 of the 16,100 afy for the proposed Travel Plaza will independently have no significant impact on the Muddy River Springs area discharge and subsequently the Moapa dace, but was authorized under the Programmatic Biological Opinion.

On October 22, 2008, the Service issued a non-jeopardy intra-service biological opinion for the Coyote Springs Investment Planned Development Project Multiple-Species Habitat Conservation Plan (MSHCP) (File No. 84320-2008-F-0113). The Service subsequently issued a 40-year incidental take permit to CSI under the authority of section 10(a)(1)(B) of the Act. The Permit covers take of desert tortoise on up to 21,454 acres of private lands in Lincoln County, and management of 13,767 acres of lease lands in Clark and Lincoln counties as the Coyote Springs Investment Conservation Lands. Groundwater withdrawal is not a Covered Activity in the CSI MSHCP. Groundwater withdrawals and their effects to the Moapa dace are subject to evaluation under separate biological opinions for several groundwater development projects, and any appropriate incidental take would be authorized through those biological opinions when issued, or under section 10 (a)(1)(B) if these actions did not involve a Federal agency.

E. Effects of the Proposed Action on the Listed Species/Critical Habitat

Effects of the action refer to the direct and indirect effects of the proposed action on the listed species, together with the effects of other activities that are interrelated and interdependent with that action. Direct effects encompass the immediate, often obvious effect of the proposed action on the listed species or its habitat. Indirect effects are caused by or will result from the proposed action and are later in time, but still reasonably certain to occur. In contrast to direct effects, indirect effects can often be more subtle, and may affect listed species populations and habitat quality over an extended period of time, long after project activities have been completed. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

1. Effects to the Desert Tortoise (Mojave Population)

Linear construction projects can negatively affect desert tortoise populations. Studies suggest that differences in the extent of the threat are related to the scale of the project, the ability of crews to avoid disturbing burrows, and timing of construction to avoid peak activity periods of tortoises (Boarman 2002). In addition to the discrete disturbance points formed by towers and lines, maintenance roads and repeated operations can (1) introduce continuous sources of disturbance and (2) provide potential sites for invasion of exotic species. Rights-of-way can cause habitat destruction and alteration where vegetation is minimal, possibly increasing mortality, directly or indirectly (Boarman 2002).

Direct impacts to the desert tortoise would be the permanent and temporary loss of habitat utilized by tortoises for foraging, breeding, and cover. Approximately 21 acres will be permanently lost by the construction of well houses and well power substations, water storage tanks, access roads, ancillary pipeline facilities, and power poles. Approximately 188 acres will be temporarily lost by the construction of the pipelines, power lines, fiber optic line, temporary access roads, and temporary workspaces such as pipe and power line laydown areas, power line pulling sites, staging areas, and construction easements. Many of these activities will involve blading and excavation of the area. These areas will be rehabilitated as described in the Revegetation Plan in the Plan of Development; however, it will likely take a long time (potentially more than 10 years) before these areas can provide foraging and cover sites for the desert tortoise.

Other areas that have heavy machinery moving over them will have crushed vegetation and compacted soil. LCWD and BLM propose to salvage topsoil during excavation and to reuse the topsoil later as cover on disturbed areas to facilitate re-growth of vegetation. LCWD and BLM will also flag the work areas so that unauthorized habitat removal does not occur.

Any tortoise within the construction area during work activities would be highly vulnerable. Desert tortoises may be killed or injured by project vehicles and equipment in the project area. Construction equipment and vehicles could crush tortoises or collapse burrows both occupied and unoccupied if not located during clearance surveys. Project vehicles and equipment that stray away from designated access roads and areas may crush desert tortoises aboveground or in their burrows. Tortoises may take refuge underneath project vehicles and equipment and be killed or injured when the equipment or vehicle is moved. Blasting during construction could collapse burrows and injure tortoises. Tortoises that wander into the project area could also fall into holes or trenches from which they are unable to escape. The following measures proposed by LCWD and BLM should reduce these potential effects to desert tortoises: 1) conduct tortoise clearance surveys within the project area; 2) enforce a 25 mph speed limit on project access roads; 3) cease project activities that may endanger a tortoise until it is moved out of harm's way by an authorized desert tortoise biologist; 4) present a worker education program; 5) cover construction holes left open overnight and check trenches twice daily to check for entrapment of wildlife; and 6) restrict vehicles and equipment to the work area boundaries and designated access roads.

Tortoises moved during clearance surveys and tortoises that are physically moved out of harm's way to prevent mortality or injury could be inadvertently harmed if not handled properly. Urine and large amounts of urates are frequently voided during handling and may represent a severe water loss, particularly to juveniles (Luckenbach 1982). Overheating can occur if tortoises are not placed in the shade when ambient temperatures equal or exceed temperature maximums for the species (Desert Tortoise Council 1994, revised 1999). Tortoise eggs moved during clearance surveys could also be harmed if not handled properly. The following measures proposed by LCWD and BLM should reduce these potential effects to desert tortoises: 1) implementing a worker education program; 2) utilizing Service-approved protocols for handling desert tortoises and tortoise eggs; and 3) ensuring that only authorized individuals handle tortoises.

The resulting indirect impacts to the desert tortoise may include the risk of death, injury, or lower reproductive potential through increased predation and degradation and fragmentation of the habitat surrounding the project area. There is a potential for an increase in the number of predatory and scavenger species due to the presence of humans and improper disposal of trash. Workers associated with the proposed project may provide food in the form of trash and litter; or water, which attracts important tortoise predators such as the common raven, kit fox, and coyote (BLM 1990, Boarman and Berry 1995). Natural predation in undisturbed, healthy ecosystems is generally not an issue of concern. However, predation rates may be altered when natural habitats are disturbed or modified (BLM 1990). Ravens likely would be attracted to human activities and buildings for perch sites and food sources, increasing the potential for predation on juvenile desert tortoise in adjacent habitats. LCWD and BLM will implement a litter-control program and a worker education program to avoid or minimize these potential effects.

The project may degrade habitat in the surrounding landscape by introducing non-native weeds or plants into the project area, which later spread in to the surrounding desert, increasing fuel loads for wildfires and competing with native forbs and shrubs. Land clearing activities in the project area may lead to increased soil erosion especially on steeper slopes. The following measures proposed by LCWD and BLM should help reduce these potential effects to desert tortoise habitat: 1) implementation of a Stormwater and Pollution Prevention Plan;
2) implementation of a Revegetation Plan; and 3) implementation of a Noxious Weed Management Plan.

Following construction, the public may use project access roads which may result in adverse effects to tortoise populations. Humans use the desert for off-road exploration, casual shooting and target practice, personal or commercial collection of animals and plants, searches and digging for minerals and gems, geocaching (GPS guided stash hunts), and even the production of illegal drugs. Desert tortoise shells found in the Mojave Desert with bullet holes were examined forensically with the finding that the tortoises were alive when they were shot (Berry 1986), suggesting that illegal shooting of tortoises could occur. Project personnel could illegally collect tortoises for pets or bring dogs to the project area. Measures proposed by LCWD and BLM to 1) clear project areas of tortoises, 2) prohibit pets from the project area, 3) impose a speed limit, and (4) close unnecessary roads following construction and control public access, should minimize the potential effects to the tortoise described above.

2. Effects to Critical Habitat for the Desert Tortoise (Mojave Population)

Direct impacts to desert tortoise critical habitat would be the permanent and temporary loss of areas that contain the PCEs of desert tortoise critical habitat. Approximately 18 acres will be permanently lost by the construction of well houses and well power substations, water storage tanks, access roads, ancillary pipeline facilities, and power poles. Approximately 155 acres will be temporarily lost by the construction of the pipelines, power lines, fiber optic line, temporary access roads, and temporary workspaces such as pipe and power line laydown areas, power line pulling sites, staging areas, and construction easements. Many of these activities that temporarily impact areas will involve blading and excavation of the area which would remove all of the PCEs of critical habitat. These areas will be recontoured and rehabilitated as described in the Revegetation Plan; however, it will likely take a long time before these areas can provide a sufficient quantity and quality of forage species (PCE 2) and sufficient vegetation to provide shelter from temperature extremes and predators (PCE 5). Other areas that have heavy machinery moving over them, will impact PCE 3 (suitable substrates for burrowing, nesting, and overwintering), PCE 4 (burrow, caliche caves, and other shelter sites), and PCE 5. These areas will also likely take a long time to recover and may also need some revegetation or soil de-compaction treatments. LCWD proposes to salvage topsoil during excavation and to reuse the topsoil later as cover on disturbed areas to facilitate re-growth of vegetation. As per the Revegetation Plan only native species will be used and cacti and yucca will be salvaged when possible.

Indirect impacts to the desert tortoise critical habitat may include fragmentation of the habitat surrounding the project area which will degrade PCE 1 (space to support viable populations and to provide for movement, dispersal, and gene flow). Since the project is linear, it has a greater potential to fragment habitat, although it does follow the existing Kane Springs Road. The project is in the LCCRDA corridor which is 0.5 miles wide. This project is the first to use this designated utility corridor so it may have greater impacts than future projects, although the proposed development on CSI lands in Lincoln County will be a greater barrier to tortoise movement.

Indirect impacts also include the introduction or spread of non-native plants in the project area and into the surrounding landscape which may impact PCE 2 and PCE 5. If red brome increases in the project area or surrounding landscape, this could increase the fuel load which increases the chance of large scale fires. Red brome can often out-compete native species because red brome extracts soil water and nutrients more rapidly than similar native annuals (DeFalco *et al.* 2003) and also reduces the growth of mature native perennials (DeFalco *et al.* 2007b). The project could also introduce new non-native plants into the area which could impact PCE 2 and PCE 5 in the future. LCWD and BLM should help reduce these potential effects to critical habitat by the implementation of a Noxious Weed Management Plan and the implementation of a Fire Management Plan. The Noxious Weed Management Plan includes the following measures: survey of area prior to land clearing, cleaning of vehicles and equipments, treating weed infestations, post-construction monitoring and employee education.

Project activities could also increase soil erosion. Increased soil erosion could negatively impact PCE 2, PCE 4, and PCE 5. LCWD and BLM should help reduce these potential effects to critical habitat by the implementation of a Stormwater and Pollution Prevention Plan.

3. Effects to the Moapa Dace

The Moapa dace will not be directly affected by the physical construction of the proposed groundwater wells, pipelines, and power facilities; however, groundwater pumping will likely indirectly affect the headwater spring discharges of the Muddy River, and therefore, the Moapa dace. The magnitude and timing of impacts from pumping in Kane Springs Valley are uncertain. Differences in boundary conditions relating to the areal extent of the aquifer, location of the pumping, transmissivity, and permeability, all influence the magnitude and timing of pumping impacts. Also, if the proposed pumping lowers carbonate water levels in the Warm Springs Area further, not all springs will be affected equally. The decrease in spring discharge will be proportional to the decrease in head elevation at each spring. Higher elevation springs have a lower head difference initially and are therefore more susceptible to decreases in groundwater levels. Therefore, the higher elevation springs will be affected proportionately more for a given decline in groundwater levels. The highest elevation springs occur on the Pedersen Unit of the Moapa Valley NWR, an area which also comprises some of the most important spawning habitat for Moapa dace in the system.

As discussed in the programmatic biological opinion for the Muddy River MOA (Service 2006c), existing data suggests that current groundwater pumping of the Arrow Canyon Well is causing a decline in the regional carbonate aquifer levels locally and in the Coyote Spring Valley, and a decrease in spring discharge in the Warm Springs Area (Mayer 2004). The average pumping rate at the Arrow Canyon Well since 1998 has been 3.3 cfs or 2,400 afy. Pumping rates will increase with commencement of the pump test, and may further increase pending the outcome of the pump test and associated monitoring. The proposed action includes pumping of an additional 1,000 afy from the same regional carbonate aquifer. The pumping will be located along the same flow path that supplies the Warm Springs Area and is within the low-gradient, high-transmissivity zone that connects Kane Springs Valley, Coyote Spring Valley and the Warm Springs Area.

Under the terms of the stipulated agreement, if the Average Flow Level reaches 3.15 cfs or less but greater than 3.0 cfs at the Warm Springs West gage, LWCD and VWC agree to reduce pumping from all wells in Kane Springs Valley by 50 percent. This would mean pumping at these flow levels would be reduced to 500 afy. If the Average Flow Level reaches 3.0 cfs or less, LWCD and VWC agree to cease pumping from all wells in Kane Springs Valley until the Average Flow Level exceeds 3.0 cfs. The exact magnitude and timing of the impacts from pumping groundwater from the carbonate aquifer in Kane Springs Valley are unknown at this time, as are the effects of reduced or cessation of groundwater pumping or whether there will be some equilibration of the aquifer to the proposed pumping.

In the programmatic biological opinion for the MOA, the Service (2006c) used the potential effects on spring discharge at the Warm Springs West gage to predict potential effects to Moapa dace habitat. The results indicated that both spring discharge and dace habitat are reduced with declines in groundwater levels. Flows and habitat loss were projected as a function of incremental declines in groundwater levels (Service 2006c). If flows were reduced to 3.02 cfs at the Warm Springs West gage this would be a 25 percent reduction of flows from the 1998 conditions which would reduce riffle habitat by 17 percent and pool habitat by 13 percent in the Petersen Unit. Because pumping for the Kane Springs project will occur concurrently with the potential pumping of 16,100 afy in the carbonate aquifer of White River Flow System, only a very small amount of this possible reduction would be attributable to pumping in Kane Springs Valley. Given the amount of 1,000 afy authorized by the State Engineer, effects from this project will be difficult to tease apart from effects of pumping 16,100 afy as described in the programmatic biological opinion for the MOA. However, monitoring of the Kane Springs wells concurrent with other monitoring under the MOA will lend greater understanding to the overall effects.

The primary effect to the Moapa dace of diminished flows within the spring channels will be a decrease in the hydraulic conditions that create the diversity of habitat. A decrease in velocity and depth within riffles would result in a decrease of invertebrate and phytoplankton (food) production. Drift stations in pools are maintained by the scouring effect of turbulent flow. Scour will decrease in pools as water velocity and depth at the upstream end of the pool decreases. Perhaps the most prominent impact that would occur, as a result of decreased discharge and subsequent depth, is the reduction of overall volume of water that will be available to the species within the channel. Scoppettone *et al.* (1992) demonstrated that Moapa dace size is scaled to water volume. Thus, larger water volumes provide the habitat necessary for increased food production and subsequently larger fish, therefore greater fecundity. Hence, more numerous, larger eggs provide a better opportunity for the long-term survival of the species.

Additional factors that would influence channel and hydraulic characteristics within the stream channels following a decline in spring discharge include, but are not limited to, changes in sediment transportation rates, and the alteration of riffle and pool maintenance that is accomplished at the present rate of discharge in each spring channel. Additionally, vegetative encroachment and subsequent channel obstruction may also occur as the wetted cross sectional area of the channel decreases, and new surfaces become exposed for vegetation growth. Decreases in these parameters will likely have an adverse impact on the overall diversity and quantity of hydraulic habitat.

The Pedersen Unit of the Moapa Valley NWR is one of the six spring complexes that the Moapa dace depends on for successful reproduction. It includes the highest elevation spring, presumed most susceptible to groundwater level declines. The analysis presented in the programmatic biological opinion for the MOA (Service 2006c) estimated that at 3.02 cfs, there is a 25 percent loss in flow on the Pedersen Unit from 1998 conditions. This loss is estimated to reduce available riffle habitat by 17 percent and pool habitat by 13 percent within the Pedersen Unit. In addition to the loss of habitat, decreased flows would also result in a loss of temperature that would extend downstream, thereby reducing the thermal load in the system and thus the amount of available habitat at the appropriate spawning temperature. The additional 1,000 afy of groundwater pumping under the Kane Springs Groundwater Development Project would potentially increase overall habitat loss and temperature declines, however, trigger levels identified in the Monitoring, Management and Mitigation Plan (starting at 3.2 cfs or less) are a higher threshold than those established under the MOA. Accordingly, adverse effects on Moapa dace habitat should be prevented.

Conservation Measures Identified to Minimize Effects of the Proposed Action

Guaranteed Groundwater Pumping Reductions (Trigger ranges): LCWD and VWC have agreed to reduce groundwater pumping by half in the Kane Springs Valley should stream flows reach 3.15 cfs or less but greater than 3.0 cfs at the Warm Springs West gage. The groundwater pumping will be stopped in the Kane Springs Valley should stream flows reach 3.0 cfs or less at the Warm Springs West gage. This conservation measure will result in a reduction in the rate of decline of water levels and spring discharge. Further reduction in the rate of decline will depend on the effect of remaining groundwater pumping by other parties in the Coyote Spring Valley, California Wash, and the Warm Springs Area.

Restore Moapa Dace Habitat Outside of the Moapa Valley NWR Boundary: LCWD and VWC agreed to provide funds annually for five years to be used for habitat restoration outside of the Moapa Valley NWR boundary to promote recovery of the Moapa dace. This funding will be applied towards various on-going or proposed activities that would improve and secure habitat that is currently not being utilized due to degraded conditions (i.e. illegal diversions or non-native species presence). The funding will provide a mechanism to restore habitat to a level that would provide a higher quality of habitat for the species. These habitat improvements would contribute to the long-term survival of the species by increasing the food production potential, providing additional habitat types that would be available for the various life stages and providing an environment that is devoid of predatory non-native fishes.

F. Cumulative Effects

Cumulative effects are those effects of future non-Federal (State, local government, or private) activities that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

1. Desert Tortoise (Mojave Population)

The action area is on both Federal and private lands. The Service determined that future actions in the action area would likely require section 7 consultation or fall under purview of an HCP (section 10 of the Act). Thus, no future non-Federal activities are reasonably certain to occur in the action area; thus, there are no cumulative effects to the desert tortoise as a result of the proposed action. Private lands in the action area include CSI property. These activities are proposed to be covered under the Coyote Springs Investment MSHCP and associated incidental take permit, which are currently under development.

2. Critical Habitat for the Desert Tortoise (Mojave Population)

The Mormon Mesa Critical Habitat unit occurs mostly on Federal lands with CSI private land along US 93 and private property along Meadow Valley Wash. The Service determined that future actions in the action area would likely require section 7 consultation or fall under purview of an HCP (section 10 of the Act). No future non-Federal activities are reasonably certain to occur in the action area; thus, there are no cumulative effects to designated critical habitat as a result of the proposed action. Activities on CSI lands in Clark County are covered under the approved Clark County MSHCP and associated incidental take permit, and the activities in Lincoln County are proposed to be covered under the CSI MSHCP and associated incidental take permit, which are currently under development. The Southeastern Lincoln County Habitat Conservation Plan and associated incidental take permit, which are currently under development, will cover activities on private land along Meadow Valley Wash.

3. Moapa Dace

Future demand for groundwater will continue to threaten spring flows and surface water important for aquatic species such as the Moapa dace. In the Warm Springs Area, MVWD's existing permit would allow more groundwater to be pumped from the Arrow Canyon Well in the future. The maximum permitted pumping rate at the Arrow Canyon Well is 7,200 afy, as compared with the annual average of 2,400 afy pumped currently. Depending on the outcome of the pump study mandated in the State Engineer Order 1169 and subsequent ruling by the State Engineer, additional groundwater could potentially be pumped in Coyote Spring Valley. The maximum volume that could be removed from the Coyote Spring Valley and Muddy River Springs Area basins under existing permits is 31,100 afy. This represents more than a tenfold increase from current withdrawals in the system. In addition to the existing permitted water rights, there are pending applications for a far greater volume of groundwater above and beyond the permitted amount in the Coyote Spring Valley, Muddy River Springs Area, and Kane Springs Valley hydrographic basins.

G. Conclusion

1. Desert Tortoise (Mojave Population)

After reviewing the current status of the desert tortoise, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the project, as proposed and analyzed, is not likely to jeopardize the continued existence of the threatened desert tortoise (Mojave population). This conclusion for the desert tortoise is based on the following:

a. The proposed project will not result in a level of take of desert tortoise that would significantly affect the rangewide number, distribution, or reproduction of the species; tortoises that are taken as a result of the project are anticipated to remain in the wild with no long-term effects except for two desert tortoise estimated to be killed or injured by project activities.

b. The desert tortoise densities in the project area are considered low and measures have been proposed by LCWD and BLM to minimize the effects of the proposed action on the desert tortoise.

2. **Critical Habitat for Desert Tortoise (Mojave Population)**

The Service has reviewed the current rangewide status of designated critical habitat for the desert tortoise (Mojave population), the environmental baseline, the effects of the project, and the cumulative effects. Based on this review, it is the Service's biological opinion that these actions are not likely to destroy or adversely modify designated critical habitat for the desert tortoise (Mojave population). The project actions will not diminish the capability of the area to serve its role for recovery by continuing to provide the PCEs of critical habitat. The basis for this conclusion is summarized as follows:

a. The amount of critical habitat permanently and temporarily disturbed by the project is 173 acres, approximately 0.05 percent of the Mormon Mesa CHU.

b. Measures have been proposed by LCWD and BLM to minimize the effects of the proposed action on critical habitat for the desert tortoise.

3. **Moapa Dace**

After reviewing the current status of and environmental baseline for the Moapa dace, the effects of the project, and the cumulative effects, it is the Service's biological opinion that the action, as proposed and analyzed, is not likely to jeopardize the continued existence of the endangered Moapa dace. The project could contribute to groundwater level declines and spring flow reductions; however, implementation of the project's conservation actions will minimize these impacts.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act, as amended, prohibits take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering (50 CFR § 17.3). "Harass" is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR § 17.3). Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the

Federal agency or applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The terms and conditions may include: (1) restating measures proposed by BLM; (2) modifying the measures proposed by BLM; or (3) specifying additional measures considered necessary by the Service. Where these terms and conditions vary from or contradict the minimization measures proposed under the Description of the Proposed Action, specifications in these terms and conditions shall apply. The measures described below are nondiscretionary and must be implemented by BLM so that they become binding conditions of any project, contract, grant, or permit issued by BLM or other jurisdictional Federal agencies as appropriate, in order for the exemption in section 7(o)(2) to apply. The Service's evaluation of the effects of the proposed actions includes consideration of the measures developed by BLM, and repeated in the section entitled "Description of the Proposed Action" of this biological opinion, to minimize the adverse effects of the proposed action on the desert tortoise. Any subsequent changes in the minimization measures proposed by BLM may constitute a modification of the proposed action and may warrant reinitiation of formal consultation, as specified at 50 CFR § 402.16. These reasonable and prudent measures are intended to clarify or supplement the protective measures that were proposed by BLM as part of the proposed action.

BLM, or other jurisdictional Federal agencies as appropriate, have a continuing duty to regulate the activity that is covered by this incidental take statement. If BLM, or other jurisdictional Federal agencies as appropriate, fail to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to permits or grant documents, and/or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

A. Amount of Take

Desert Tortoise (Mojave Population)

Based on the analysis of effects provided above, measures proposed by BLM, and anticipated project duration the Service anticipates that the following take could occur as a result of the proposed action:

1. No more than two adults and an unknown number of hatchling and juvenile desert tortoises would be incidentally killed or injured as a result of the proposed project. Should any desert tortoise be killed or injured in association with the proposed action, all activity in the vicinity of the incident shall cease and the project proponent shall contact the Service within 24 hours to assess the circumstances and discuss if additional protective measures are necessary.

2. All desert tortoises located during clearance surveys or located in harm's way in work areas may be harassed by capture and removal from the project area. Based on survey data, timing of the proposed project, and description of the project area, the Service estimates that no more than 33 desert tortoises may be taken (other than killed or injured) by non-lethal means as a result of project activities.

3. An unknown number of desert tortoise nests with eggs may be excavated and relocated. The Service determined that no desert tortoise nests with eggs are anticipated to be destroyed as a result of project activities.

4. An unknown number of desert tortoises may be preyed upon by ravens or other subsidized desert tortoise predators drawn to trash in the project area; however, the Service estimates that the potential increase in ravens will be minimized by litter-control measures proposed by BLM.

Moapa Dace

The Service anticipates that incidental take of Moapa dace through harm (i.e., habitat modification or degradation that results in death or injury) will occur, but the actual death or injury of fish will be difficult to detect for the following reasons: the species has a small body size and finding a dead or impaired specimen is unlikely in a flowing stream environment. On the other hand, significant habitat modification or degradation that could result in take of Moapa dace will be detectable and measurable. Therefore, we are expressing take of Moapa dace in terms of habitat loss resulting from changes in habitat characteristics, such as water temperature or chemistry and water flows. Although the extent of effects to the species as a result of the proposed action is not yet known, future and on-going biological and hydrological studies will assist us in determining how flow reductions and thermal load losses will affect Moapa dace habitat, food availability, reproduction, and fecundity.

Perhaps the most significant impact to Moapa dace habitat that could result from implementation of the proposed action, as a result of decreased discharge and subsequent wetted area, is the reduction of overall volume of water that would be available to the species within the channel. The amount of groundwater pumping permitted under the Kane Springs Groundwater Development Project (1,000 afy) is substantially smaller than the amount of pumping that could potentially co-occur under Order 1169 (16,100 afy). A small but unquantifiable amount of take in the form of habitat loss would occur in the Pedersen Unit if flows reached 3.0 cfs at the Warm Spring West gage. Should flows at the Warm Springs West gage decline below 3.0 cfs, the amount of incidental take for this project would be exceeded for the Moapa dace.

B. Effect of Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the desert tortoise or Moapa dace. These determinations are based in part on the implementation of conservation easures detailed in the BA for this project.

C. Reasonable and Prudent Measures with Terms and Conditions

The Service believes that the following reasonable and prudent measures (RMPs) are necessary and appropriate to minimize take of desert tortoise or Moapa dace.

RPM 1: *BLM, LCWD, VWC, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of measures to minimize injury or mortality of desert tortoises due to surface-disturbing activities and operation of project vehicles or equipment:*

Terms and Conditions:

1.a. An authorized desert tortoise biologist shall be onsite at all locations where ground-disturbing activities are occurring within desert tortoise habitat. The authorized biologist will be responsible for approving, evaluating, and supervising monitors to assist in implementing the desert tortoise measures of this biological opinion. Potential biologists shall complete the Qualifications Form (Attachment A) and submit it to the Service for review and approval as appropriate. Allow 30 days for Service review and response.

1.b. Prior to initiation of construction, an authorized biologist or approved monitor shall present a desert tortoise awareness program to all personnel who will be onsite, including but not limited to contractors, contractors' employees, supervisors, inspectors, and subcontractors. This program will contain information concerning the biology and distribution of the desert tortoise and other sensitive species, their legal status and occurrence in the project area; the definition of "take" and associated penalties; the terms and conditions of this biological opinion; the means by which employees can help facilitate this process; responsibilities of workers, approved monitors, and biologists; and reporting procedures to be implemented in case of desert tortoise encounters or non-compliance with this biological opinion. The name of every individual trained will be recorded on a sign-in sheet. Each trained individual will be given evidence indicating they have received this training and will keep that evidence with them at all times when they are in the project area.

1.c. Immediately prior to surface-disturbing activities or traveling off of main access roads on the right-of-way, the authorized biologist shall survey for desert tortoises and their burrows using techniques providing 100-percent coverage of the right-of-way and an additional area approximately 90 feet from both sides of the right-of-way. Transects will be no greater than 30 feet apart. All potential desert tortoise burrows will be examined to determine occupancy of each burrow by desert tortoises and handled in accordance with Term and Condition 1.d. – 1.f and 2.a – 2.c. below.

1.d. All potential desert tortoise burrows located within the project area that are at risk for damage shall be excavated by hand by an authorized biologist, tortoises removed, and burrows collapsed or blocked to prevent occupation by desert tortoises.

1.e. Desert tortoises located in the project area, but outside of an area to be disturbed by ground disturbing activities, sheltering in a burrow during a period of reduced activity (*e.g.*, winter), may be temporarily penned. Tortoises shall not be penned in areas of moderate or heavy public use. Penning shall be accomplished by installing a circular fence, approximately 20 feet in diameter to enclose the tortoise/burrow. The pen should be constructed with durable materials (*i.e.*, 16 gauge or heavier) suitable to resist desert environments. Fence material should consist of ½-inch hardware cloth or 1-inch horizontal by 2-inch vertical, galvanized welded wire. Pen material should be 24 inches in width. Steel T-posts or rebar (3 to 4 feet) should be placed every 5 to 6 feet to support the pen material. The pen material should extend 18 to 24 inches aboveground. The bottom of the enclosure will be buried several inches; soil mounded along the base; and other measures should be taken to ensure zero ground clearance. Care shall be taken to minimize visibility of the pen by the public. An authorized biologist, approved monitor, or designated worker shall check the pen daily.

1.f. Desert tortoises and eggs found within construction sites shall be removed by an authorized biologist in accordance with the most current protocols identified by BLM and the Service. Desert tortoises will be moved solely for the purpose of moving them out of harm's way. Desert tortoises shall be relocated up to 1,500 feet into adjacent undisturbed habitat on protected public land in accordance with Service-approved handling protocol (Desert Tortoise Council 1994, revised 1999). The disposition of all tortoises handled shall be documented in accordance with 6.b. below.

1.g. All fuel, transmission or brake fluid leaks, or other hazardous materials shall not be drained onto the ground or into streams or drainage areas. All petroleum products and other potentially hazardous materials shall be removed to a disposal facility authorized to accept such materials. Waste leaks, spills or releases shall be reported immediately to BLM. BLM or the project proponent shall be responsible for spill material removal and disposal to an approved off-site landfill.

Servicing of construction equipment will take place only at a designated area. All fuel or hazardous waste leaks, spills, or releases will be stopped or repaired immediately and cleaned up at the time of occurrence. Service and maintenance vehicles will carry a bucket and pads to absorb leaks or spills.

1.h. Vehicles shall not exceed 25 mph on access roads. Authorized desert tortoise biologists and/or approved monitors will ensure compliance with speed limits during construction.

1.i. Project personnel shall exercise caution when commuting to the project area and obey speed limits to minimize any chance for the inadvertent injury or mortality of species encountered on roads leading to and from the project site. All desert tortoise observations, including mortalities, shall be reported directly to an authorized biologist and the Service.

1.j. Any vehicle or equipment on the right-of-way within desert tortoise habitat shall be checked underneath for tortoises before moving. This includes all construction equipment and the area under vehicles should be checked any time a vehicle is left unattended, as well as in the morning before any construction activity begins. If a desert tortoise is observed, an authorized biologist will be contacted.

1.k. Project activity areas shall be clearly marked or flagged at the outer boundaries before the onset of construction. All activities shall be confined to designated areas. The authorized biologist and approved monitors shall ensure that no habitat is disturbed outside designated areas as a result of the project, including ensuring that all vehicles and equipment remain on the right-of-way or areas devoid of native vegetation.

1.l. To prevent mortality, injury, and harassment of desert tortoises and damage to their burrows and coversites, no pets shall be permitted in any project construction area.

1.m. All desert tortoises observed within the project area or access road shall be reported immediately to the authorized biologist. The authorized biologist shall halt activities as necessary to avoid harm to a desert tortoise. Project activities that may endanger a desert tortoise shall cease until the desert tortoise moves out of harm's way or is moved out of harm's way by an authorized biologist.

1.n. Only water or an alternative substance approved by BLM shall be used as a dust suppressant. Water application shall avoid pooling of water on roadways. Pools of water may act as an attractant to desert tortoises.

1.o. In the event that blasting is required, a 200-foot-radius area around the blasting site shall be surveyed by an authorized biologist for desert tortoises prior to blasting, using 100-percent-coverage survey techniques. All tortoises located above ground or in pallets within this 200-foot radius of the blasting site shall be moved 500 feet from the blasting site. Additionally, tortoises in burrows within 75 feet of the blasting will be placed into an artificial or unoccupied burrow 500 feet from the blasting site. This will prevent tortoises that leave their burrow upon translocation from returning to the blasting site. Tortoises in burrows at a distance of 75 to 200 feet from the blasting site will be left in their burrows. Burrow locations will be flagged and recorded using a GPS unit and burrows would be stuffed with newspapers. Immediately after blasting, newspaper and flagging will be removed. Blasting would only occur in the brief time period after an area has been cleared by an authorized biologist, but before any relocated tortoises could return to the site.

1.p. If possible, overnight parking and storage of equipment and materials shall be located in previously-disturbed areas or areas to be disturbed that have been cleared by an authorized tortoise biologist. If not possible, areas for overnight parking and storage of equipment shall be designated by the authorized biologist.

1.q. Within desert tortoise habitat, any construction pipe, culvert, or similar structure with a diameter greater than 3 inches stored less than 8 inches above ground on the construction site for one or more nights shall be inspected for tortoises before the material is moved, buried, or capped. As an alternative, all such structures may be capped before being stored on the construction site.

1.r. Flagging and wire shall be removed from the project area at the end of project to ensure debris is not consumed by desert tortoises.

1.s. All project activities in desert tortoise habitat shall be conducted from dawn until dusk.

1.t. Any excavated holes left open overnight shall be covered, and/or tortoise-proof fencing (Attachment B) shall be installed to prevent the possibility of tortoises falling into the open holes.

1.u. Open pipeline trenches shall be fenced with temporary tortoise-proof fencing or inspected by an authorized biologist or approved monitor periodically throughout and at the end of the day, and immediately prior to backfilling, and tortoise escape ramps (of at least 3:1 slope) shall be installed at least every quarter mile. Any tortoise that is found in a trench or excavation shall be promptly removed by an authorized biologist in accordance with Service-approved protocol or alternative method approved by the Service if the biologist is not allowed to enter the trench for safety reasons.

1.v. In areas to be encircled by a security fence, such as well yards and well substations, the fence shall be installed at least one foot below the surface of the ground or install permanent desert tortoise fencing around the area, to ensure that tortoises do not get trapped inside. See Attachment B for the Service's recommendations on tortoise exclusion fencing, dated September 2005. Fences should be checked during regular maintenance of the facilities to ensure zero ground clearance.

1.w. Any tortoise injured as a result of the proposed project shall immediately be transported to a qualified veterinarian and reported to the Service's Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230.

RPM 2: *BLM, LCWD, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of the following measures to ensure that tortoises are not injured as a result of capture and handling:*

Terms and Conditions:

2.a. All appropriate NDOW permits or letters of authorization shall be acquired prior to handling desert tortoises and their parts, and prior to initiation of any activity that may require handling tortoises.

2.b. Tortoises and nests shall be handled and relocated by an authorized tortoise biologist in accordance with the Service-approved protocol (Desert Tortoise Council 1994, revised 1999). If the Service or Desert Tortoise Council releases a revised protocol for handling of desert tortoises before initiation of project activities, the revised protocol shall be implemented for the project area. A pair of new, disposable latex gloves shall be used for each tortoise that must be handled. After use, the gloves will be properly disposed. Burrows containing tortoises or nests shall be excavated by hand, with hand tools, to allow removal of the tortoise or eggs. Desert tortoises moved during the tortoises less active season or those in hibernation, regardless of date, must be placed into an adequate burrow; if one is not available, one shall be constructed in accordance with Desert Tortoise Council (1994, revised 1999) criteria. Desert tortoises that are located aboveground and need to be moved from the project area shall be placed in the shade of a shrub. All desert tortoises removed from burrows shall be placed in an unoccupied burrow of approximately the same size and orientation as the one from which it was removed.

2.c. Special precautions shall be taken to ensure that desert tortoises are not harmed as a result of their capture and movement during extreme temperatures (i.e., air temperatures below 55° F or above 95° F). Under such adverse conditions, tortoises captured will be monitored continually by an authorized biologist or approved monitor until the tortoise exhibits normal behavior. If a desert tortoise shows signs of heat stress, procedures will be implemented as identified in the Service-approved protocol (Desert Tortoise Council 1994, revised 1999). The disposition of all tortoises handled shall be documented in accordance with 6.b. below.

RPM 3: *BLM, LCWD, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of the following measures to minimize predation on desert tortoises by predators drawn to the project area:*

<u>Terms and Conditions</u>:

Trash and food items shall be disposed properly in predator-proof containers with resealing lids. During construction activities, trash containers will be emptied and waste will be removed from the project area daily. Trash removal reduces the attractiveness of the area to opportunistic predators such as desert kit fox, coyotes, and common ravens.

RPM 4: *BLM, LCWD, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of the following measures to minimize loss and long-term degradation and fragmentation of desert tortoise habitat, such as soil compaction, erosion, crushed vegetation, and introduction of weeds or contaminants as a result of construction activities:*

<u>Terms and Conditions</u>:

4.a Off-road travel outside construction zones shall be prohibited.

4.b. The designated utilities shall follow the Noxious Weed Management Plan which includes the following: washing vehicles and equipment prior to mobilizing to the project area, providing onsite personnel with BLM weed identification information, reseeding the project area with a BLM-approved certified weed-free seed mix, and controlling noxious weeds should they be introduced as a result of the proposed action.

4.c. After completion of the project, the designated utilities shall follow the Revegetation Plan to restore all temporarily-disturbed areas to functioning desert tortoise habitat, using native seeds or plants.

4.d. BLM shall ensure payment of remuneration fees by the project proponents, the designated utilities, for compensation of the loss of desert tortoise habitat as a result of the proposed project. BLM shall require a receipt of payment from each designated utility prior to issuing the Notice to Proceed.

The right-of-way applicant is required to submit a Final Plan of Development to the BLM, which must be approved by BLM prior to issuance of the Notice to Proceed. It is likely that the amount of disturbance will change with the final engineering design; therefore, BLM will reevaluate the project disturbance and adjust the total compensation fee accordingly. A copy of the Final Plan of Development and a breakdown of the final compensation fee will be provided to the Service. The applicant will be made aware that, depending on final engineering designs, the final compensation fee may be lower than the estimated value provided in this document.

Currently, the basic compensation rate for disturbance to desert tortoise habitat is $753 per acre. For disturbance to desert tortoise critical habitat a multiplier is used to increase the cost per acre as described in Hastey *et al.* (1991). For each project, this multiplier for critical habitat is based on assignment of ratings to the following five factors:

- Category of Habitat (value of the land to tortoise populations)
- Term of Effect (short term vs. long term)
- Existing Disturbance on Site
- Growth Inducement (growth inducing effects of the proposed action)
- Effect of Adjacent Lands (whether adjacent lands will be affected)

The proposed project will disturb 209 acres of desert tortoise habitat on lands in Lincoln County. The total compensation fee for this project is $808,722. Attachment C shows a breakdown of these calculations. Fees for disturbances on Federal land will be deposited into the Lincoln County Section 7 Account, while fees for disturbance on private land will be deposited into the CSI MSHCP Section 10 Trust Fund. The payee will fill out the attached fee payment forms (Attachment D) and include these with the payments.

Each year these fees will be indexed for inflation based on the Bureau of Labor Statistics Consumer Price Index for All Urban Consumers (CPI-U). Information on the CPI-U can be found on the internet at: http://stats.bls.gov/news.release/cpi.nr0.htm. The next rate adjustment will occur on March 1, 2009.

Fees deposited in the Lincoln County Section 7 account will be managed consist with an MOA to be developed between BLM and the Service. The development of a MOA will be initiated within 30 days of the ROD.

Section 7 fees collected under this biological opinion may be used in coordination with the mitigation program of the CSI MSHCP, to implement conservation and recovery measures within the Mormon Mesa critical habitat unit.

RPM 5: *BLM, LCWD, VWC, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of the following measures to minimize impacts to Moapa dace that may result from groundwater pumping associated with the project in the Kane Springs Valley:*

Terms and Conditions:

BLM shall assure that all provisions of the proposed actions including the Monitoring, Management and Mitigation Plan of the Stipulated Agreement are fully implemented.

RPM 6: *BLM, LCWD, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of the following measures to comply with the reasonable and prudent measures, terms and conditions, reporting requirements, and reinitiation requirements contained in this biological opinion:*

Terms and Conditions:

6.a. LCWD shall designate a field contact representative. The field representative will be responsible for overseeing compliance with protective stipulations for the desert tortoise and coordinating directly with BLM and the Service. The field contact representative shall have the authority to halt activities or construction equipment that may be in violation of the stipulations. A copy of the terms and conditions of this biological opinion shall be provided to the field contact representative, biologists, and monitors for the project.

6.b. The authorized biologist shall record each observation of desert tortoise handled. Information will include the following: location, date and time of observation; whether tortoise was handled, general health and whether it voided its bladder; location tortoise was moved from and location moved to; and unique physical characteristics of each tortoise. A final report will be submitted to the Service's Nevada Fish and Wildlife Office in Las Vegas within 90 days of completion of the project.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take or loss of habitat identified is exceeded, such incidental take and habitat loss represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The designated utilities must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

D. Reporting Requirements

Upon locating a dead or injured endangered or threatened species within the action area, notification must be made to the Service's Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230. Care should be taken in handling sick or injured endangered or threatened species to ensure effective treatment and be taken for handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by the Service to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed. All deaths, injuries, and illnesses of endangered or threatened species, whether associated with project activities or not, will be summarized in an annual report.

Desert Tortoise (Mojave Population)

The following actions should be taken for injured or dead tortoises if directed by the Service:

1. Injured desert tortoises shall be delivered to any qualified veterinarian for appropriate treatment or disposal.

2. Dead desert tortoises suitable for preparation as museum specimens shall be frozen immediately and provided to an institution holding appropriate Federal and State permits per their instructions.

3. Should no institutions want the desert tortoise specimens, or if it is determined that they are too damaged (crushed, spoiled, etc.) for preparation as a museum specimen, then they may be buried away from the project area or cremated, upon authorization by the Service.

4. The designated utilities shall bear the cost of any required treatment of injured desert tortoises, euthanasia of sick desert tortoises, or cremation of dead desert tortoises.

5. Should sick or injured desert tortoises be treated by a veterinarian and survive, they may be transferred as directed by the Service.

Moapa Dace

The following action should be taken for injured or dead Moapa dace if directed by the Service: Dead Moapa dace suitable for preparation as museum specimens shall be frozen immediately and provided to the Service's Nevada Fish and Wildlife Office in Las Vegas.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service provides no conservation recommendations at this time.

REINITIATION

This concludes formal consultation on the actions outlined in your requested dated September 27, 2007. As required by 50 CFR § 402.16, reinitiation of formal consultation is required where the discretionary Federal agency involvement or control over an action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. In particular, if the State Engineer grants additional water rights beyond the currently permitted 1,000 afy for the Kane Springs Groundwater Development Project, then formal consultation should be reinitiated.

The incidental take statement provided with this Biological Opinion authorizes take of the Moapa dace as may occur in connection with the pumping and transfer of 1,000 afy of groundwater under Phase I of the Project, and implementation of the Monitoring, Management, and Mitigation Plan established under the amended stipulated agreement for the Kane Springs Valley Hydrographic Basin. In June 2008, the LCWD, VWC, and the Service executed a Memorandum of Understanding to ensure additional consultation on this project should additional water rights be appropriated to LCWD and VWC in the Kane Springs Valley Hydrographic Basin (Attachment E). Specifically, the Memorandum requires that the Service reinitiate Section 7 consultation, and, if required, LCWD and VWC will apply for an incidental take permit under Section 10(a)(1)(B) of the Act to cover any take that may occur due to the pumping and transfer of such additional groundwater.

If we can be of further assistance regarding this consultation, please contact me at (775) 861-6300, or Janet Bair in the Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230.

Sincerely,

Robert D. Williams
Field Supervisor

Attachments

cc:
Lincoln County Treasurer, Pioche, Nevada
Supervisory Biologist - Habitat, Nevada Department of Wildlife, Las Vegas, Nevada
Field Manager, Caliente Field Office, Bureau of Land Management, Caliente, Nevada
Nevada Groundwater Projects Office, Nevada State Office, Bureau of Land Management, Reno, Nevada
T&E Species Coordinator, Nevada State Office, Bureau of Land Management, Reno, Nevada

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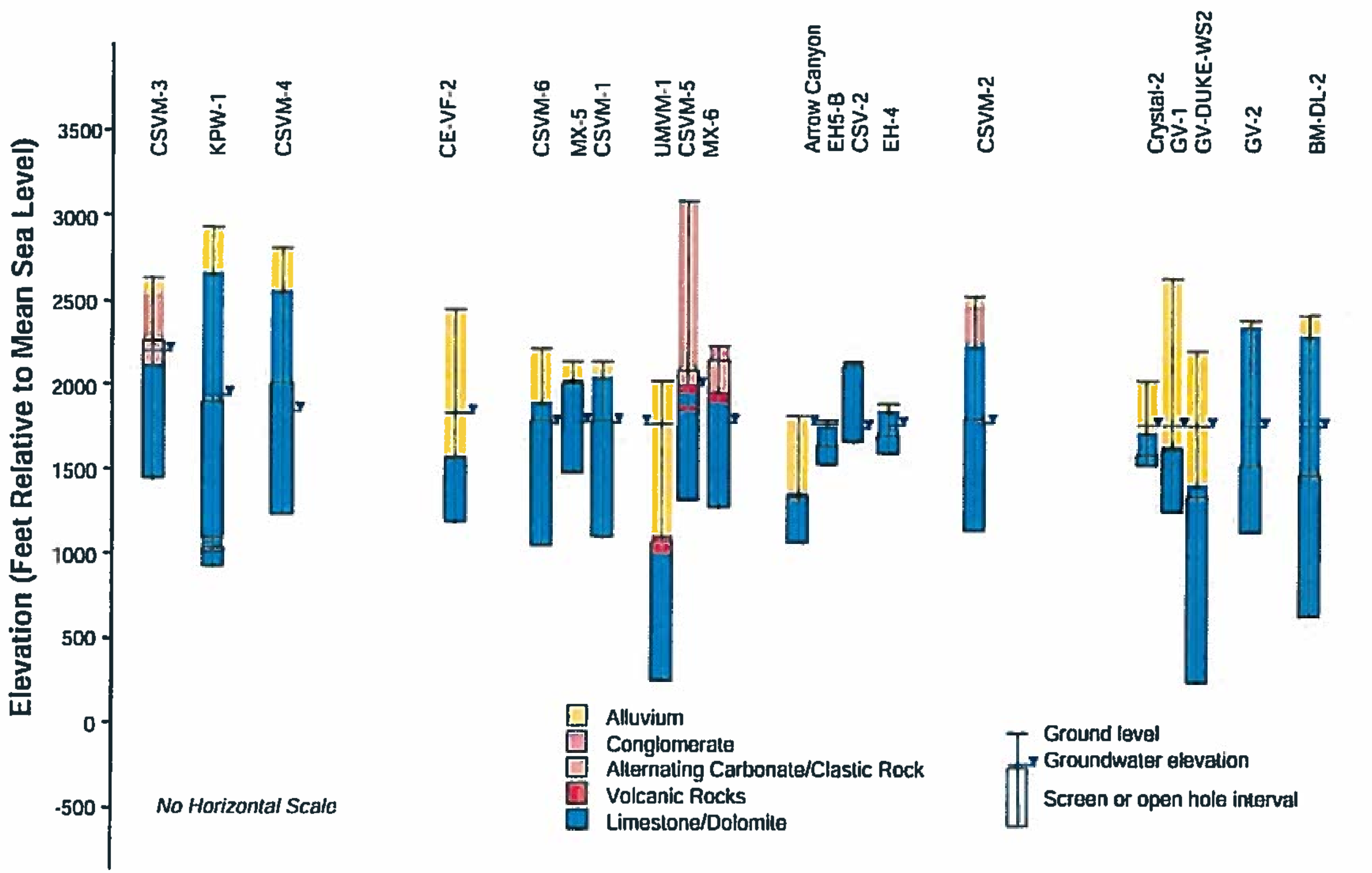
Attachment A-3

Vertical Profile through selected carbonate wells in study area, reproduced from CH2M Hill 2006a.

FIGURE 3-4. VERTICAL PROFILE THROUGH SELECTED CARBONATE WELLS IN STUDY AREA



Source : CH2MHill (2006)

SE ROA 36436

Attachment A-4

Localized Cross Section through KMW-1, Kane Springs Valley

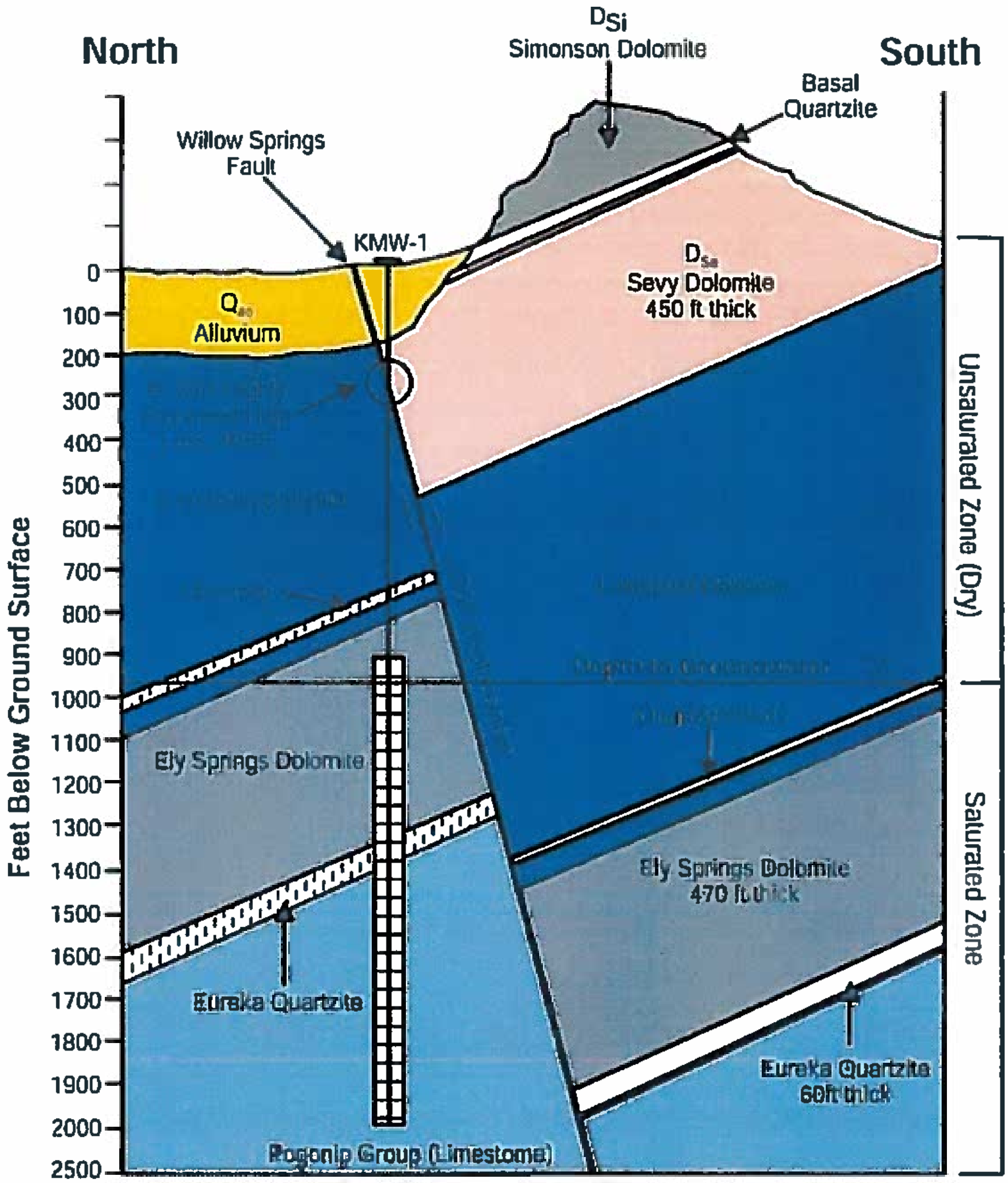


FIGURE 3-3 LOCALIZED CROSS SECTION THROUGH KMW-1, KANE SPRINGS VALLEY

Source: URS: Unpublished field notes taken during Drilling KMW-1 by Feast Geosciences

Attachment B

Lower White River Flow System Interim Order #1303 Rebuttal Report to the Nevada State Engineer

Prepared by

Peter Mock, Ph.D., R.G.

Peter Mock Groundwater Consulting, Inc.

Lower White River Flow System
Interim Order #1303
Rebuttal Report to the
Nevada State Engineer

Prepared by
Peter Mock, Ph.D., R.G.
Peter Mock Groundwater Consulting, Inc.

Prepared for:
Lincoln County Water District and Vidler Water Company

August 16, 2019

REGISTERED GEOLOGIST
CERTIFICATE
21614
PETER A.
MOCK
DATE SIGNED 8/16/19
ARIZONA U.S.A.
Expires 9/30/2021

Executive Summary

Peter Mock Groundwater Consulting, Inc. respectfully submits to the Nevada State Engineer (NSE) rebuttal to selected portions of selected reports submitted July 3, 2019 to the NSE regarding Order 1303. The selection of reports and portions of reports for rebuttal here was typically based on noting new proposals to include the Kane Springs Valley (KSV) Hydrographic Area (HA) No. 206 in the proposed Lower White River Flow System (LWRFS) administrative unit. KSV HA was not included by the NSE in the LWRFS and accumulating evidence has consistently supported the NSE's findings in this regard. I conclude that the NSE should continue to maintain that the KSV HA is outside the LWRFS administrative unit due to distance and geologic structures in light of the goal of practically and efficiently protecting the springs and associated surface flows of the Muddy River Springs Area (MRSA) from depletion. My rebuttals will expand on my reasoning for this conclusion.

With respect to the Mifflin & Associates, Inc. Report of July 3, 2019 for the Moapa Band of Paiutes to the NSE, I primarily rebut the use of the results from a new groundwater flow simulation that does not explicitly incorporate the structural geology of the region to assert that pumping in KSV will have impacts in the MRSA in 10 years. I am also rebutting: 1) the use of the asserted correlations to distant river flows of previous decades to extend or filter real water well hydrographs, 2) the confusion of [particle] capture for hydraulic system capture (Theis 1940), 3) that drawdown impacts are transported solely within groundwater flow paths as if they were attached to water molecules, 4) that variable anisotropy in a slab of uniform thickness and transmissivity can be a valid substitute for explicitly incorporating the contacts between the Paleozoic carbonates and much less permeable structural blocks in this region, and 5) that the effective porosity of the Paleozoic carbonates is two orders of magnitude less than 0.1.

With respect to the two Interflow Hydrology, Inc. reports of July 2, 2019 for the City of North Las Vegas to the NSE, I rebut the use of a new groundwater model of the southern portion of the LWRFS for supporting the conclusion that groundwater enters the LWRFS from the Las Vegas Valley, as opposed to my opinion that groundwater flows out to the Las Vegas Valley. I am further rebutting the assertion that the total flow rate out to the Las Vegas Valley is of the magnitude of hundreds of acre-feet per year, as opposed to my opinion that it is thousands to tens of thousands of acre-feet per year.

With respect to the Tetra Tech Report of July 3, 2019 for the U.S. National Park Service to the NSE, I rebut the use of the Tetra Tech Model that includes the LWRFS, first reported on in 2012, for projecting regional impacts from pumping. The use of the HUF MODFLOW package averages away and thereby diminishes the structural controls of the regional geology. I infer from my understanding of this model that the projected drawdowns are too shallow and broad in extent because of the use of a hydraulic conductivity that decreases exponentially with depth for the Paleozoic carbonates and because of the use of Pilot Points in calibration of the model in such a way that localized areas of exceedingly high hydraulic conductivities are selected in the uppermost layer of the model.

With respect to the Report of Dr. Tom Myers, Hydrologic Consultant, of July 3, 2019 for the Center for Biodiversity to the NSE, I rebut the assertion that the variation in gradients at the boundary between KSV and CSV is a basis for the NSE to include KSV HA for the purpose of effectively protecting the springs and associated surface flows of the MRSA.

With respect to the Report by the U.S. Fish & Wildlife Service, no author given, on July 3, 2019 to the NSE, I rebut statements that parameters of the Theis Equation in the SeriesSEE model are meaningless followed by discussion of the results in terms of meaningful transmissivity and its variability, which itself is not allowed to vary in SeriesSEE. I further rebut assertions that the Tertiary Calderas of the region (higher elevations of which form the Delamar and Clover Mountains) are barriers to groundwater flow. Finally, I rebut a series of narrative (not calculated) projections of water level and groundwater flow responses to a variety of conditions given by the authors or authors of this report.

With respect to the Report by Andrew Burns, Warda Drici, Casey Collins, and James Watrus, Sr. for the Southern Nevada Water Authority and Las Vegas Valley Water District on June 27, 2019 to the NSE, I rebut the assertion that groundwater flows are negligible through the Tertiary Calderas of the region, specifically those in KSV.

Introduction

On July 3, 2019, several entities submitted reports to the Nevada State Engineer (NSE) regarding Interim Order #1303. Interim Order #1303 discusses management of multiple administrative hydrologic areas/basins as a single administrative unit for the express purpose of preserving the flows of springs and associated surface water flows in the Muddy River Springs Area (MRSA) Hydrographic Area (HA) No. 219, also known as Upper Moapa, and asked for the technical commentary that was later received on July 3, 2019.

This review comments on sections of a few reports that assert new perspectives on the regional flow of groundwater and the propagation of drawdowns in the regional aquifer in the Paleozoic carbonates of this region and/or that suggest or propose the addition of Kane Springs Valley (KSV) HA to what the NSE proposed for the administrative units of the Lower White River Flow System. Thus, not all reports or sections of the selected reports submitted in this matter on July 3, 2019 are reviewed here. I would also note that I have attempted to avoid rebutting repetitions of these statements in the selected reports as that would lead to a more voluminous rebuttal than I present here. My not rebutting a specific report or section of a selected report submitted to the NSE on or around July 3, 2019 should not be interpreted to mean that I agree with that specific report or report section that I have not rebutted here.

I earned Bachelor's and Doctoral degrees in Hydrology from the University of Arizona. My Ph.D. minor was in Applied Mathematics, focused on numerical analysis (i.e., the algorithms and programming instructions of simulation codes). I am recognized as a Geologist by the states of Arizona and California. I have visited and interpreted the geology and hydrology of this region and submitted reports to the NSE regarding Tule Desert and KSV and the potential impacts of groundwater development proposed by Lincoln County Water District and Vidler Water Company there. The groundwater flow model I developed for the Tule Desert work was reviewed by multiple local experts at the U.S. Geological Survey and was and remains unique in that the model layering explicitly incorporated the geology as published by the U.S. Geological Survey (Page and Others, 2005). I have also visited and interpreted the geology and hydrology of the Clover Valley and surrounding region for Lincoln County Water District and Vidler Water. I have been familiar with and have run the model developed by Tetra Tech (2012) for the U.S. National Park Service (USNPS) that includes this region and the model developed by Frank D'Agnese for the Southern Nevada Water Authority (SNWA) that includes a larger region.

The remainder of this report is organized by sections for each of five selected reports:

- Cady Johnson and Martin Mifflin of Mifflin & Associates for the Moapa Band of Paiutes,
- Dwight Smith and Alexa Terrell of Interflow Hydrology, Inc., for the City of North Las Vegas;
- Richard Waddell of Tetra Tech, Inc. for the USNPS,
- Tom Myers for the Center for Biodiversity, and
- Andrew Burns, Warda Drici, Casey Collins, and James Watrus, Sr. for the Southern Nevada Water Authority and Las Vegas Valley Water District

Following the considerations of these report sections, I provide my brief conclusions.

Selected Comments on: "Water-Level Decline in the LWRFS: Managing for Sustainable Groundwater Development, Initial Report of Moapa Band of Paiutes in Response to Order #1303", prepared by Cady Johnson and Martin Mifflin (Mifflin & Associates, Inc.), dated July 3, 2019

This report was downloaded from the NSE website as an 84-page Acrobat-PDF file. I found many items to rebut in this report, so this rebuttal is organized into sub-sections to assist the reader.

Rebuttal Summary

I primarily rebut the use of the results from a new groundwater flow simulation that does not explicitly incorporate the structural geology of the region to assert that pumping in KSV will have impacts in the MRSA in 10 years. I am also rebutting: 1) the use of the asserted correlations to distant river flows of previous decades to extend or filter real water well hydrographs, 2) the confusion of [particle] capture for hydraulic system capture (Theis 1940), 3) that drawdown impacts are transported solely within groundwater flow paths as if they were attached to water molecules, 4) that variable anisotropy in a slab of uniform thickness and transmissivity can be a valid substitute for explicitly incorporating the contacts between the Paleozoic carbonates and much less permeable structural blocks in this region, and 5) that the effective porosity of the Paleozoic carbonates is two orders of magnitude less than 0.1.

Two Primary Points from the Executive Summary

The two key points of this report (MAI2019), as summarized from the Executive Summary are:

1. There are two primary [particle] capture zones in this region – one for the MRSA and one for the Las Vegas Valley – and they say that the NSE's rationale for selecting the LWRFS ignores this.

2. The regional declines in water levels are due to climatic factors and they say that there are two consequences of this: the response to the Order 1169 pumping was vastly over represented and there may be no point in conserving water resources as the surface flows and the life that depends on them are going to dry up anyway as the groundwater levels continue to respond to drought.

My responses to these two primary points are:

1. I agree that there are currently substantial flows of groundwater in this region that exit at the MRSA as well as out to the Las Vegas Valley. However, I disagree about what the current configuration of groundwater flow paths means for management of the LWRFS.

    a. Figure 1 of MAI2019 shows the "divide" they have defined between these two flow paths. I disagree that all of the flow from Meadow Valley Wash and all of the flow of north and central CSV or much of the flow of the uppermost part of Lower Moapa Valley has to exit at the MRSA springs and surface flows. These divides they say were derived from a new, FEFLOW-based model, which I will call MAI-FEFLOW-2019 here and which should not be relied upon for delineation of flow paths as it does not explicitly incorporate the structural geology of the region.

b. The current flow paths of groundwater through this system can be viewed as "capture zones" as the authors of MAI2019 state, but that is meaningless with respect to preserving the flows of springs and associated surface flows in the MRSA. Hydrologists distinguish between **"particle capture"**, i.e. identifying the particles of water in a groundwater system that actually emerge from a well (or spring) and **hydraulic system capture**, i.e., the specific hydraulic changes in adjustable boundary conditions propagated across a porous medium in response to an imposed stress, e.g., pumping wells. This apparently non-intuitive, but primary distinction with a tremendous difference has been taught persistently by the USGS and leaders in the hydrologic community trained in the USGS for 60 years (starting with Theis in 1940 and more recently by Leake (2011), Barlow and Leake (2012) and Konikow and Leake (2014) among many. In this case, one can pump from a well in a hydrographic basin that has groundwater currently headed to a subsurface basin outflow line and cause water levels and flows to decline at springs in another hydrographic basin where the groundwater is currently headed distinctly towards a group of springs. **One can reduce surface flows by pumping while not completely rearranging the groundwater flow paths.** [Particle] capture zones became popular in the 1980s for designing remediation systems and rightly so: there the goal is explicitly to "capture" the actual "particles" of water with a contaminant dissolved in them and avoid collecting and treating the clean water outside of a plume of contaminated groundwater. Much to the profession's detriment, the term "capture" was thereby itself captured from the hydrogeologic lexicon where it had been used explicitly for system hydraulic capture. See Fetter (2001, [4th edition], page 436) for a classic exposition of the current and widely-applied concept of [particle] capture. Perhaps it helps to recognize that [particle] capture zone boundaries do not impose walls to advancing pressure or hydraulic head changes. The authors imply the opposite on Page 14: "... a rational and observable zero-flux boundary enclosing all ground-water flow paths to a regional discharge area". Also, contrary to the author's assertions of Page 14, unique chemistries do not uniquely define [particle] capture zones except in the most unusual and isolated of circumstances. That is, two different samples of groundwater can have the same chemistry and be from different flow paths, basins or even continents. A new pumping well will produce drawdowns that will quickly invade and pass through pre-existing [particle] capture zones that the authors imply are inviolable. Likewise, drawdowns will quickly pass through regions of unique water chemistry as long as the pore volumes are accessible to pressure or total hydraulic head changes. In fact, in porous media, propagating pressure or total hydraulic head changes (well impacts) do not run into and impede one another: they progress independently (except for the effects of changing aquifer thickness and hence the area for flow) and accumulate or superimpose, but they do not impede one another. This is primary, basic aquifer hydraulics, not of my development. On a more intuitive level, drawdowns proceed outward in all directions (radial flow) from a well irrespective of the groundwater flow direction until they encounter and cause changes in an adjustable boundary (e.g., lake, stream, transpiration through a patch of phreatophytes – see Theis (1940) for the primary presentation on this). Drawdowns, no matter where they travel from or what [particle] capture zones they enter, cross or leave, cause reductions to spring and stream flow in proportion to their magnitude.

c. Particle capture zones are not the appropriate tool for assessing hydraulic impacts to springs or other surface flows. Therefore, the authors have made a reasonable observation that the regional groundwater flow system has two primary exits (though I disagree with the authors' delineation), but this recognition is not a basis for protecting the springs and associated surface flows of the MRSA. The NSE has been wise to ignore the current split in groundwater flowing to different exit locations from the LWRFS when deciding which HAs to include in the LWRFS. Distance and geologic barriers are the most germane to the NSE's selection of HAs to administer protection of the springs and other surface flows of the MRSA.

2. I agree that the region has been experiencing a decline in water levels since at least the winter of 2005 when precipitation in this area was approximately three times the historical average. I don't think we know unambiguously what was happening before or after in terms of decadal-long or longer trends in groundwater levels.

   a. The response of water levels in the wells available for measurement to the wet winter of 2005 is convincing: after that winter, the water levels rose and fell slowly and smoothly. Thus, the Order 1169 Test was run during the time of regional water level recession from this 2005 winter precipitation event, making the inference of the farthest extents of drawdowns due to the Order 1169 pumping questionable at best.

   b. On Page 29, the authors assert that the MODFLOW and SerieSEE (Theis Superposition) analysis by the DOI Bureaus of the Order 1169 Test data is erroneous because they did not recognize that the regionally-experienced water-level declines during the Test were not due to the Order 1169 Pumping. Trying to match a model of drawdowns propagating from a limited area outward to a larger area with essentially uniform declines will indeed be without physical basis, so I agree.

   c. The dedicated monitoring wells available for measurement largely came on line just before the winter 2005 event, so we have limited knowledge about the nature of the regional long-term trend for, say, decades before that.

   d. We also do not know if such an antecedent (to the 2005 event recession) decline, if it existed, will continue into the future.

e. Given this lack of local foundation for unambiguously declaring a persistent (multiple decades) regional decline in groundwater level, it is reasonable for the NSE to continue to work to preserve springs and associated surface water flows in the MRSA.

The MAI FEFLOW-2019 Model

Proceeding to the MAI2019 report as a whole, the authors pursue a novel and unique for this region technical analysis that was not in the end tied to the protection of the MRSA. Of particular novelty here is the application of the FEFLOW code to simulate coupled groundwater flow and heat flow in much of southeastern Nevada. This model is called by the authors different names in different places, e.g., "transmissivity" model or "scoping" model, both in lower case. The use of FEFLOW is novel in the arena of groundwater flow simulations developed to present to the NSE regarding water resources development. FEFLOW should simulate groundwater flow as well as, but practically no better than, any other widely-applied groundwater flow simulation code so the selection of FEFLOW itself is not of concern. It should not be considered superior for practical groundwater flow simulation to, say, MODFLOW.

The extension of groundwater flow models to include heat transport is well-founded and applied in the geothermal development and nuclear materials isolation communities and has seen a few, rare applications in more common hydrogeologic investigations. The additional information provided by consideration of heat transport with groundwater flow simulation has not yet been found by the hydrologic community at large to be valuable for projects despite several valid calls in the literature for its consideration (e.g., Anderson, 2005). I think there are rare circumstances where it may have value, but they are indeed very rare.

What is critical for understanding the MAI-FEFLOW-2019 is to recognize is that the heat transport extension in FEFLOW is strongly dependent on the accuracy of the groundwater flow simulation. As with mass transport, the flow simulation must be extremely accurate or the mass is carried to places it doesn't go and at rates it doesn't maintain. Considering heat transport cannot cure an inaccurate groundwater flow representation.

The application of FEFLOW here suffers a fatal flaw (not a fault of the FEFLOW code) that overshadows all further comments: its simulation of groundwater flow is without foundation (i.e., there is no clear and substantial support provided here for interpreting uniformity of thickness and hydraulic conductivity) and rigid uniformity actually conflicts with what is known about the basic structural geology of the region. I opened the FEFLOW simulation file downloaded from the NSE website and inspected it in FEFLOW (I currently have version 7.2), for which I have had a license for two decades. The MAI-FEFLOW-2019 model is two dimensional, has a uniform thickness of 1000 meters, and has uniform transmissivity. I need only point to the cross-sections of either Page and others (2005, revised in 2011) or Rowley and others (2017) and in particular point out the complex and dominant juxtapositions of Proterozoic basement units/early Cambrian quartzites with the Paleozoic carbonates of interest. The exposures of Proterozoic rock at the surface in the Mormon and East Mormon Mountains are just two of the most obvious clues that the Paleozoic carbonates have been spectacularly broken up. In short, in view of the currently accepted structural geology of this area, the saturated Paleozoic carbonates cannot reasonably be viewed as a continuous, uniform, slab aquifer or aquifer system. They are instead broken up and separated into corridors such as underlie Meadow Valley Wash, which is the largest of these corridors in this region. A labyrinth or maze of huge, elongated structural blocks is a better analogy than a simple block or slab for the flow of groundwater in the Paleozoic carbonate aquifer system.

The remarkably novel use of spatially variable anisotropy with a uniform transmissivity field by the authors to produce the sinuous particle tracks they infer from aquifer testing (Appendix V) is not supported by theory for this setting or by local demonstration of its applicability and is in any case insufficient to represent the huge separations imposed by shallow occurrences of Proterozoic granite or early Cambrian quartzite. The reason is that these blocks each have very different hydraulic conductivities, as a whole, than the Paleozoic carbonates. On Page 59 (Appendix III), the authors state that this anisotropy field is "experimental and based entirely on professional judgement..." So, once built from those assertions, it cannot be expected by itself to prove or suggest that it provides a foundation for inferences about this specific aquifer system.

Appendix V discusses analysis of aquifer tests in the CSV. The authors propose a sinuous anisotropy field to explain non-uniform responses to pumping at individual observation wells, which apparently perhaps lead to the MAI-FEFLOW-2019 model structure. As I understand it, the authors think of drawdown propagation as analogous to the procession of a plume of dissolved contaminant in flowing groundwater, which certainly can have a serpentine or sinuous appearance. However, I completely disagree that this is how drawdowns propagate in even highly heterogeneous porous media. In keeping with my education in the literature on total hydraulic head fluctuations in porous media, I instead recommend adoption of straight-forward consideration of heterogeneity, that is, variations in actual magnitudes of hydraulic conductivity and storage parameters by volumes (not just direction). I would point to the voluminous petroleum engineering literature on well tests and reservoir simulation in carbonate reservoirs, none of which follow the approach followed by these authors. That profession uses heterogenous permeability and storage property arrays to simulate flow and transport in fractured rock reservoirs. This literature has been extensively peer reviewed over several decades.

In further conflict with their uniform transmissivity model, the authors state from their presentation to a conference in 2003 (see top of Page 24) that the springs and associated surface flows of the MRSA are due solely to a southward transmissivity decrease. If they thought a non-uniform transmissivity in the Paleozoic carbonate system important enough to present to a national meeting of geologists, then it would seem to be important enough to build it into their MAI-FEFLOW-2019 model so that the MRSA springs and associated surface flows appear at the surface in the correct locations as they say. They do not put such a feature, or any other structural feature, in the MAI-FEFLOW-2019 model.

To put the problematic lack of structure of the MAI-FEFLOW-2019 into perspective, these same two authors published an extensive analytic element model (AEM) of this region in the journal of Ground Water (Johnson and Mifflin, 2006). Neither this AEM nor the intricate hydraulic conductivity zones and no-flow barriers (Las Vegas Shear Zone, Kane Springs Wash Fault, Weiser Syncline) they developed from calibrating it to available water-level measurements are mentioned in this MAI2019 report. Clearly, they thought highly of their groundwater flow modeling work by publishing it in 2006, but not only didn't they carry their findings forward in 2019, they didn't even mention this extensive previous work in what the NSE has defined as the LWRFS. Further, the article mentions a MODFLOW analysis they had subsequently developed based on the AEM, which was also not mentioned in the current report. The AEM was prescribed a uniform, infinitely extensive, 1,524-meter-thick slab, the selection of which, they said was supported for this system, by "available evidence". They then referenced the USGS Moapa West Quad preliminary geologic map as the support for relative continuity in the carbonate system in this area. How that map indicated this is not developed, but the cross sections of Page and others (2005, 2011) and Rowley (2017) clearly indicate to me that a single slab representation is not a reasonable approximation for the current disposition of the Paleozoic carbonates. In this globally-distributed article, they say that the Kane Springs Wash Fault, (a linear no-flow (impervious) boundary in their AEM model) had to be extended southwestward as it was "... required to fit *[the difference between]* VF-2 and CSV-3 water levels." Finally, in the abstract they say: "Using new monitoring well data collected in the south, and analyses confirming that seasonal pumping effects in the north are not propagated to the south, a later AEM model that included a barrier calibrated with relative ease." At even a broad conceptual level, it appears that the explicit incorporation of structure divisions and the results are somehow discarded in the current MAI-FEFLOW-2019 model and go against their unexpected statement at the end of the last Appendix to MAI2019 that pumping in KSV will impact the MRSA within 10 years.

Regional Models of Groundwater Flow in the Deep Carbonate Aquifers of Nevada

The authors repeatedly challenge simulation of groundwater flow in the Paleozoic carbonate system, for example, on Page 22: "In fractured-rock aquifers, pumping impacts do not decrease predictably with distance as they do in idealized porous media." If this is true, the authors should have avoided analyzing aquifer tests in fractured rock with continuous radial equations for groundwater flow and should have avoided creating or applying and making conclusions from their own AEM, MODFLOW or FEFLOW Models of the regional Paleozoic carbonate aquifer system.

A further challenge to regional models, despite the authors persistent construction and use of them, is found on Page 33: "Regional groundwater models are intrinsically general, and not reliable at the level of detail needed to evaluate groundwater-development proposals (water-rights applications) at the local (sub-hydrographic basin) level." I obviously disagree as I have used regional groundwater models for this purpose.

At the end of MAI2019, the authors indicate a concern for structural features, but don't recognize that this was ignored in their MAI-FEFLOW-2019 model or that it is actually a weakness of finite element models: "Because the structural grain is highly variable, MODFLOW grids (and for that matter finite difference codes in general) are inadequate for tracking regional groundwater flow and heat redistribution in the central and southern Great Basin. Instead, finite-element analysis of coupled water and heat transport is the appropriate study framework." If now resolution of highly-variable "structural grain" is a key determining factor, then a uniform slab "transmissivity model" as presented in this report would be inadequate, as they say. Actually, MODFLOW has always been a finite volume code and for two years (officially) now has had all the flexibility of any finite element code in terms of discretization. A little-known fact is that finite element codes do not locally mass balance when using heterogenous material properties in adjacent elements. This is because the finite element approach balances mass in a weak or integral sense, not element by element. Therefore, highly-variable "structural grain" would create inaccuracies and local mass balances in a finite element model. FEFLOW has recently changed their formulation so that it now employs a control volume solution (like the current MODFLOW) and this problem has in theory been resolved. Finite volume codes preserve mass both globally and locally.

Simulation of Heat Transport – the Eureka Low or High

The authors propose to address the "Eureka Low" and bring the resolution of that anomaly's explanation into the discussion of how to manage the LWRFS. I am not aware of nor could I find a call in the NSE's Order 1303 for resolving any question about the explanation of the Eureka Low. There has long been a simple and reasonable explanation for the Eureka Low and no one has publicly challenged the USGS' original explanation of the Eureka Low in the nearly 50 years since the explanation was proffered. Alongside their repeated assertions of success, the authors do not explain for practicing scientists and engineers participating in these proceedings how their approach to simulating the effects of the Eureka Low is relevant to the matter before the NSE in the LWRFS.

My research (largely USGS publications) turns up that the Eureka Low is an enclosed area of relatively lower heat flow from the earth compared to the surrounding western U.S. The USGS found this entity while compiling information on heat flow for the purpose of estimating the long-term natural (vertical) infiltration rate through the very large vadose zone of the Nevada Test site. Sass and Others (1971) provided the first plot of relevant regional heat flow measurements, identified the "Eureka Low" for the first time, and based on the abruptness of its boundaries, proposed high lateral groundwater circulation down to 3 km as the most likely cause. Sass and Others (1976) updated the publication of 1971 in terms of Heat Flow Units (1 HFU = 41.8 mW/m^2) for the coterminous US, and confirmed the delineation of the Eureka Low (< 1.5 HFU or 62.7 mw/m^2).

So, it appears that the phenomenon being pursued by the authors is that the Eureka Low is an area of remarkably deep and substantial groundwater flow that carries away heat coming up out of the earth much more so than surrounding areas. This is certainly consistent with understanding that fractures of the regional Paleozoic carbonate groundwater flow system of this region do not seal up significantly with depth as the effective porosity of Tertiary basin fill certainly does, but instead conduct groundwater to depths of tens of thousands of feet where blocks of the Paleozoic carbonate units are intact to those depths. The U.S. Geological Survey work in compiling hydraulic property estimates for the Death Valley Regional Flow Model (Belcher and Others, 2001) included tests from across southern Nevada, including CSV and MRSA and failed to quantitatively determine a relationship between hydraulic conductivity and depth for any unit in their estimation, including the Paleozoic carbonates. Figure 1 (attached) is a plot of only the Upper and Lower Carbonate Unit data from Belcher and Others (2001). Karstified (cavernous) or vuggy (oil field term for very large dissolution openings) values are enclosed on Figure 1 with an ellipse; the remaining values appear to be a relatively random band that is largely independent of depth, confirming the findings of Belcher and others (2001) from regression calculations on these same data.

This concept of the Paleozoic carbonates maintaining their hydraulic conductivity to great depths is also consistent with the widely expressed interpretation that there are exceedingly thick flows of groundwater in the connected, intact corridors of Paleozoic carbonates that remain from the tectonic events affecting this region. Such a gigantic system, even if broken into a maze or labyrinth, carrying groundwater across great thicknesses would clearly be expected to disturb the heat flow field compared to adjacent areas of much smaller lateral groundwater flow.

The distinguishing feature of the inputs to the heat flow portion of MAI-FEFLOW-2019 was a block of cells in the area of the Eureka Low that were assigned much higher heat flow than the surrounding area. The distribution is different from that of either Sass and others (1971) or Sass and others (1976) and is attributed to a map by researchers at Southern Methodist University (Blackwell and Others, 2011) that was obtained from the internet. The SMU map shows, as do the two Sass and Others (1971 and 1976) compilations, a closed area with heat flow 10 – 30 mW/m² less than the surrounding area. Thus, it appears that the MAI-FEFLOW-2019 simulation is the result of assumptions that are the converse of those typically ascribed to the Eureka Low. The opportunity for history matching/calibration and developing and communicating clearly additional understanding about the actual system, where the Eureka Low is cooler, is lost by not simulating the actual arrangement of heat flow in this system.

It appears from Page 51 that the authors understand that they have the simulation in reverse and it is not a mistake: *"The question studied is if rapid signal propagation indicated by modern climate response of springs in the MRSA is corroborated by plausible groundwater velocities needed to deliver the "missing" heat lost from the Eureka Low to the regional springs in a steady-state process"*. Doing this with a steady-state model puts further logical distance between the simulation and the intended advance in understanding what the authors say elsewhere is the important transience of the system. Even if simulating the reverse of the actual distribution of heat flow is intended, the authors never show how simulating the Eureka Low as a heat source warming water otherwise at zero degrees proves their point, which apparently was to: "establish if regional flow from northern recharge areas in the highest mountains to discharge at the southern warm springs is physically possible and more importantly, plausible within the decadal scales suggested by climate response in the MRSA." I can't conceive of any trained geologist questioning at all that transport of heat at a regional scale by groundwater is possible or plausible at all conceivable time scales of practical interest. Heat transport in saturated porous media is an established and widely-accepted physical process and one need only read the literature of nuclear waste isolation simulation to see the great reliance physicists around the world place on this being true. The question is what this means for the NSE in considering the boundaries of the LWRFS and how to protect the springs and associated surface flows of the MRSA, and I conclude that as presented here it doesn't have meaning. That is, the MAI-FEFLOW-2019 heat transport simulations do not address: how, from where, and how fast do drawdowns from pumping in the LWRFs or surrounding areas reduce flow at the MRSA springs and associated surface flows.

In the MAI-FEFLOW-2019 model presented by the authors, the groundwater temperature is largely zero degrees Centigrade in much of the model domain and groundwater becomes much hotter to the southeast of and hydraulically down-gradient (as calculated by this groundwater flow model) of the Eureka Low. The authors claim to have calibrated their heat flow model to two points in their domain and from what they infer as success in calibration, they claim that the model's heat flow component was demonstrated to be valid and reliable and constraining on groundwater flow. This wasn't demonstrated in my opinion. For example, the results of the model and the field data for the two selected calibration points are not compared or discussed. The Steptoe MX point was off gradient from the Eureka Low and simulated with a temperature of zero degrees centigrade and it appears from Figure 5 that the Tule Springs point was downgradient and simulated with a temperature of 25 degrees centigrade. The dozens of other groundwater temperature values available in this region, especially the very warm 43+ degrees Centigrade value at the KPW-1 well in KSV were ignored and it is doubtful that this model could match them because the Eureka Low is simulated as an anomalously high heat flow area. Finally, being concerned for much of the simulated field being zero degrees centigrade (frozen), I confirmed from the FEFLOW simulation input that hydraulic conductivity was not linked to temperature. Thus, the water flows in this simulation based on hydraulic conductivity and porosity that stay the same no matter what its temperature and is not in fact frozen where simulated at zero degrees.

"Recharge Boundaries" – A New Source of Water for Development?

The authors further assert a unique interpretation of unique occurrences in the area, saying that aquifer tests of the Paleozoic carbonates find "recharge boundaries" (see Page 16, Figure 19 [Page 19], Page 23, Page 26 or 33, for example), but they do not explain these in terms of widely-recognized hydrologic features that match their selected aquifer test model. The authors go further to say that groundwater development should focus on finding and pumping from more of these "recharge boundaries" (Page 33) as if they were unique sources of groundwater. I studied well hydraulics specifically as part of my graduate studies and have taught aquifer test analysis courses for decades. The recharge boundaries that the authors simulate so as to compare with drawdown data are based on an expanding radially symmetric drawdown cone calculated with the Theis Equation encountering a linear, fully-penetrating source of infinite water. This was done with an image, injection well to provide as much water as the real well pulls from it, without limit. I submit that, other than at the edges of Lake Mead or Lake Powell, such fully-penetrating, laterally continuous walls of water are largely absent in southern Nevada. An "extensive (at least several kilometers) highly transmissive and highly anisotropic broken and karstified zone" asserted by the authors, if such indeed exists, is not reasonably represented by the Theis equation and an image well-based recharge boundary and in any case, would have very low storage capacity, i.e., without immediate connection to an actual, hydrologic feature such as a deep lake or large river, such a source would be exhausted rapidly by continued pumping.

Instead, the flattening of the drawdown curve during carbonate well tests is in my opinion often due to the transition in storage processes from a few, large fractures to a larger system of finer and denser fractures. This can be approximated with a dual-porosity solution, but the Theis solution should be avoided along with non-hydrologic recharge or no-flow boundaries applied with image wells. I would refer the reader to either early basic texts (Streltsova, 1988; Da Prat, 1990) or more recent discussions of well test analysis for fissured reservoirs (Bourdet, 2002; Stewart, 2011). The approach for modeling flow to wells in fractured reservoirs has not changed over decades of oil and gas field well testing – dual (or sometimes triple) porosity well-test models (not Theis) are the preferred approach.

Another potential is that the expanding drawdown cone reaches into volumes with larger transmissivity/hydraulic conductivity, which will cause a decrease in the rate of drawdown. This situation is not simulated by petroleum well test analysts with a constant head source, but instead they have used models with a circular change in transmissivity at a distance (see Streltsova [1988, page 246] for a discussion of a now dated approach to simulating radial discontinuity), or more appropriately in recent years with a full reservoir flow model that handles realistic heterogeneities in permeability (as could also be simulated with MODFLOW or FEFLOW).

Finally, if there is a very large fracture at the well, then the petroleum engineers have many well-test solutions for large vertical or horizontal fractures, but they are completely different from the Theis equation with recharge boundaries. What has been found by well test analysts in the petroleum industry is that the impact of large continuous fractures directly intercepting a pumping well is not to provide an additional source of (freely drawn in) water, but to conduct (oil or) water from the surrounding rock mass and, in effect, make a larger well. Again, recharge boundaries simulated via the Theis Equation are not the preferred approach for well test analysis in fractured rock across a variety of situations.

Even more novel, the authors choose to analyze the KPW-1 well test conducted by Lincoln County/Vidler in KSV using the steady-state Thiem (not Theis, but Thiem) equation with a fully-balancing steady-state image well. The graph offered by the authors of the monitoring well response (Figure 29) clearly shows that the drawdown was continuing to increase throughout the pumping period, so it cannot be construed as steady state. Use of the Thiem equation with an image well for this setting is even less reasonable than using the Theis equation, i.e., for a fractured aquifer that demonstrates dual-porosity behavior. The mathematical outer boundary condition of the Thiem Equation is a deep lake or perhaps ocean completely surrounding the pumping well, which itself is in a circular "island" of aquifer. There is no such deep lake or even deep perennial river in KSV to provide the full pumping rate of this well in a fully penetrating or any other fashion within a day or few days (during the test) and achieve steady-state.

In summary, I disagree with advising the NSE that well tests indicate that there are "recharge boundaries" – independent sources of groundwater - within the Paleozoic carbonate aquifers of the LWRFS. Therefore, I also disagree with the authors' proposition that such "recharge boundaries" should be pursued as yet-untapped sources for future development of groundwater supplies.

Statistical Correlations Rather than Physically-Based Simulations

The authors depend on many correlations to produce corrections to hydrographs, primarily to remove pumping effects and discern trends absent of pumping. See Figure 4 of MAI2019 for the first example. The EH-4 hydrograph in what the authors call "a more pristine form" is simulated using Virgin River, North Fork flows (far away) and sixteen years before (long ago). On page 15, the authors found and used a correlation between flow at Big Muddy Spring in the MRSA and a 12-22-year prior base flow of the Humboldt River. Again, the two things being correlated are far apart and far removed in time, which the authors ascribe elsewhere to movement through the system, yet water doesn't not move between the correlated entities in each case. Appendix II expands on these ideas to develop their "Two-Climate: Model" and mix both. I would note that they do not present and analyze the residuals of their reconstructions, a basic requirement of analyzing and deciding on the validity of a time series model. I disagree with this use of correlations as a replacement for physical models such as MODFLOW or FEFLOW. MODFLOW and FEFLOW use Darcy's Law and local and global mass balance to physically represent changes in total hydraulic head and associated groundwater flows. Location in space and time is critical in a physical model as it is in physical space, but these are ignored in the many correlations presented by the authors. Finally, correlation and common or related causation are easily mistaken for one another and I submit the many correlations presented here are not useful for adjusting or extending water-level or surface flow hydrographs in this setting despite their coefficients of fitting.

Appendix IV discusses regression modeling (Empirical Mode Decomposition Filtering) between pumping and the water levels at EH-4. While extensive, this approach also abandons physics in favor of empirical (non-physical) statistical fitting, which has been largely dismissed in hydrology. This dismissal of statistical fitting of non-physical models in hydrology has been due to the excellent and dependable process descriptions we have in hydrology and the highly erratic projections created by statistical regression fits outside of the exact data used to create them (the famous "over-fitting" problem). I would not depend on these correlations for simulating water levels from pumping rates in this setting.

Effective or Interconnected Porosity

On Page 20, the authors say that their regional modeling of the Eureka Low "suggests" that the "regionally-interconnected porosity" is 0.00015 and that the "active flow-zone porosity" is larger at 0.00064. These values are far less than those used or even considered by hydrologists to date for the carbonates. How the MAI-FEFLOW-2019 model itself suggests such unusual and here-to-fore unreported values is not stated. The value of 0.1 is widely accepted for the interconnected porosity (fractures overwhelming the matrix in defining this total) for regional groundwater flow in carbonate systems. The authors therefore have based their calculations on a porosity that is 150 to 650 times (or two to nearly three orders of magnitude) too small. The results of using such a value for transport calculations is to simulate water particle arrival times 1/150 to 1/650 of their actual values. Finally, the potential for matrix diffusion (pursued on Page 57) would be severely overstated if the fracture porosity is 150 to 650 times too small. In any case, I would submit that transport is not relevant to the deliberations of the NSE about Order 1303.

Unexpected and Unsupported Conclusions Concerning Pumping in Kane Springs Valley

On Page 59, the authors approach conclusion with a positive assessment of the MAI-FEFLOW-2019 model: *"The transmissivity analysis using FEFLOW (Diersch, 2014) was instructive in that time-of-travel capture zones for the MRSA were delineated in a simple (low-dimensional) conceptual framework (Figure 11) where behaviors of the process variables hydraulic head and temperature under different scenarios are easily visualized because there are no inhomogeneities. The anisotropy field used for this base case is experimental and based entirely on professional judgment, as is the operational recharge cutoff surface, OSDc-only recharge-area lithology selection, and admittedly low-confidence characterization of the Eureka Low heat source (see Critique below)."* Looking at these statements, it appears to me that the basis of the authors' confidence is that the model is low (two) dimensional and free of inhomogeneities. After spending some time with the surficial mapping and cross-sections of Page and Others (2005 and 2011) and Rowley and others (2017), I would say that these two simplifications not only do not support its use, but literally toss out the most important features controlling flow in this region, making these results of little use.

An unexpected conclusion surprises the reader at the end of Appendix III (Page 59). Using travel times along flow paths calculated by the steady-state MAI-FEFLOW-2019 model, the authors say: "...that carbonate-rock aquifer pumping in KSV would likely impact the MRSA within 10 years, and development impacts in Delamar Valley would likely be sensed at the MRSA in 20 years." This is a surprise as there is no mention of either of these two impact/sensing evaluations in the report, that is, neither was ever listed as an objective. Seeing from the MAI2019 report that the authors did not calculate transient drawdowns or depletions of the MRSA springs and associated surface flows anywhere in the model, this statement is without basis in MAI2019. The authors' confusion of [particle] capture with hydraulic system capture (see earlier in this rebuttal) appears to be the source of their thinking that lead to the conclusion that impacts would reach and be sensed at the MRSA due to pumping in KSV or Delamar. Steady-state [particle] capture zones only outline flow paths through an undisturbed groundwater flow system of water molecules and associated dissolved substances, such as sodium or bicarbonate ions. The assumption that flow with moving groundwater is the mechanism for distributing impacts from well pumping is all the more curious when one considers that pumping could only remove water molecules and associated dissolved substances from the groundwater system, so they would not be available to move along the groundwater flow paths downstream in any way and cause "impacts" or be "sensed". Movement of groundwater along flow paths does not deplete springs or streams; drawdowns do, and drawdowns are not transported like salts or other dissolved substances along groundwater flow paths with the flowing water. Drawdowns (declines in pressure or total hydraulic head) propagate in directions radiating out from a pumping well irrespective of local or regional flow directions. There is a Technical Commentary published in the journal Ground Water by Stan Leake of the USGS entitled "Capture – Rates and Directions of Groundwater Flow Don't Matter!" (Leake, 2011) that gives a current, peer-reviewed reminder of this common confusion. Finally, if the authors are instead thinking in terms of dissolved transport of some sort, the travel times for dissolved substances calculated using either porosities of 0.00015 or 0.00064 would be 150 to 650 times too fast. Despite how it may sound from the statements on Page 59, drawdown impacts on the MRSA's springs or associated surface flows from pumping in either Delamar or KSV were not calculated the MAI-FEFLOW-2019 Model.

Selected Comments on: "Garnet Valley Groundwater Pumping Review for APEX Industrial Complex, City of North Las Vegas", prepared by Dwight L. Smith and Alexa Terrell (Interflow Hydrology, Inc.), dated July 2, 2019

I am rebutting the use of a new groundwater model focused on the APEX area of Garnet Valley for supporting the conclusion that groundwater enters the LWRFS from the Las Vegas Valley, as opposed to my opinion that the opposite is more likely. I further rebut that the total flow rate prior to pumping through the area covered by this new model is low (hundreds of acre-feet per year). I think that one source of their mistake is that they only consider a small fraction (1/25 to 1/20) of the Paleozoic carbonate flow system in the model. The flow of regional groundwater leaving the LWRFS is related to the flow throughout the LWRFS, so changing that concept from tens of thousands of acre feet per year to hundreds of acre feet per year has important implications for what the NSE accepts as reasonable in regional groundwater flow modeling.

This report was downloaded from the NSE website as a 53-page Acrobat-PDF file. The authors focus on the area west and south of the MRSA for the City of North Las Vegas. Of interest is the MODFLOW model built to evaluate the area and a conclusion that the results indicate that groundwater flows north and out of the Las Vegas Valley basin across the Las Vegas Shear Zone.

Pages 7 and 8 present a summary of hydrogeology, which describes a very large Paleozoic carbonate groundwater flow system (20,000 to 25,000 feet) which carries flow from CSV to MRSA, but also to Hidden Valley. Though data are very sparse in Hidden Valley, this interpretation is reasonable, consistent with the interpretations of others, and the authors certainly support it while asking for additional monitoring wells to be completed in the carbonate system. Figure 7 presents the water-level elevations for the overall system and indeed water levels are higher in CSV and Hidden Valley than in Garnet Valley, supporting a southern flow path through these basins distinctive from the flow to the MRSA. I would submit that such a large aquifer with very large transmissivity and a southward gradient would be moving a not insignificant quantity of groundwater and that without another discharge location in Garnet Valley, that groundwater continues on to the Las Vegas Valley. On Page 16, the authors note the difference between the estimated recharge in the LWRFS (50,000 AF/yr.) and the discharge at MRSA (36,000 AF/yr.) and pumping in the LWRFS (9,000 AF/yr.). The recharge estimates are in particular uncertain, but together these estimates by themselves leave room for a significant flow of water (much more than hundreds of acre-feet per year) to exit through Garnet Valley to the Las Vegas Basin.

On Page 33, the authors pursue a comparison of water levels between southern Garnet Valley and northern Las Vegas Valley, but found only a scattering of drillers' estimates over many decades and concluded: "Based on the existing data in northeastern Las Vegas Valley, it is not possible to accurately determine the direction of groundwater flow." Therefore, the authors leave room from their own work for the flow to be out to the Las Vegas Valley.

The MODFLOW model developed and presented by the authors was a slab with a uniform thickness of 1,000 feet and had a uniform K of 5.5 ft/day (Page 37). Therefore, because of its thickness, the model does not represent the Paleozoic carbonate system as a whole and because of its uniformity in thickness and parameters, does not incorporate the structural geology of the area. Therefore, the testing of the largely general-head-boundary conditions lacks foundation for being definitive. In modeling terms, the PEST-based calibration of the general head boundaries suffered from structural error. That is, the lack of geologic structure and the lack of much of the carbonate flow thickness was compensated for by adjusting the boundary conditions to obtain a close fit. Sensitivity (page 38) is not an independent measure of this problem as structural errors rule the sensitivity as well. Therefore, I don't find the inference of inflow from Las Vegas Valley credible based on this model. Based on sheer size and data for the overall flow system (LWRFS scale), I would instead infer outflow to the Las Vegas Valley. If the full thickness and actual geologic structure of the Paleozoic carbonate system were simulated and with inflows reasonable from basins to the north, such as CSV, the much smaller pumping in Garnet Valley would not cause a flow reversal, i.e., draw water into Garnet Valley that normally flows out to the Las Vegas Valley.

Selected Comments on: "<u>Concept Review of Artificial Recharge in Garnet Valley for the APEX Industrial Complex, City of North Las Vegas, Clark County, Nevada</u>", prepared by Dwight L. Smith and Alexa Terrell (Interflow Hydrology, Inc.), dated July 2, 2019

This report was downloaded from the NSE website as a 23-page Acrobat-PDF file. The authors focus on the area west and south of the MRSA for the City of North Las Vegas. Of interest is the MODFLOW model built to evaluate the area and a conclusion that the results indicate that groundwater flows north and out of the Las Vegas Valley basin across the Lax Vegas Shear Zone.

The authors report on a steady-state (representing the year 2015) MODFLOW model of this local area with an inflow from Las Vegas to Garnet Valley of 698 AF/yr. (Table 1). Inflow from CSV and northern Hidden Valley is the next largest boundary condition at 456 AF/YR. In the analysis conducted prior to building the model, the authors found that the median/geometric mean transmissivity calculated from specific capacity of existing wells is 1,300 ft^2/d (Page 11). This represents just 1,000 feet of saturated thickness of a much larger Paleozoic carbonate aquifer, which they say is 20,000 to 25,000 feet thick (Page 5). The details of the model are referenced to the other report submitted to the NSE.

Two sentences from Page 14 indicate that the authors could entertain an alternative hypothesis:

- "The flow of groundwater from Las Vegas Valley to Garnet Valley is uncertain and needs to be verified by accurate groundwater elevation measurements (Interflow, 2019)."
- "However, if the gradients between Las Vegas Valley and Garnet Valley are different than assumed, then the analysis changes. If the groundwater gradient is from Garnet Valley to Las Vegas Valley..."

I submit that two reasons for the low flow rates through the model is the use of a very small fraction of the thickness of the aquifer and the extensive use of general-head boundaries. Based on the accumulation of flow from northern basins, such as CSV, and considering the more likely full thickness and geologic structure of the Paleozoic carbonate system, I instead infer that groundwater in Garnet Valley flows largely south to and enters the Las Vegas Valley at a rate of the magnitudes of thousands to tens of thousands of acre feet per year. Because the clear goal of the authors was not to characterize regional flow, but to size a well-based recharge project, I understand their focus on the uppermost 1,000 feet of the tremendously thick aquifer. However, this model accidently led to inferring, even if tentatively by these authors, that flow is <u>in</u> from the Las Vegas Valley.

Selected Comments on: "Prediction of the Effects of Changing the Spatial Distribution of Pumping in the Lower White River Flow System", prepared by Richard K. Waddell of Tetra Tech, dated July 3, 2019

I rebut the use of the Tetra Tech Model of Selected Basins within the Colorado Regional Groundwater Flow System, Southeastern Nevada, first reported on in 2012, for projecting regional impacts from pumping. The use of the HUF package to average out and diminish the structural controls of the regional geology, the use of hydraulic conductivity that decreases exponentially with depth for Paleozoic carbonates, and the use of Pilot Points in calibration of the model in such a way that localized areas of exceedingly high hydraulic conductivities are selected in the uppermost layer of the model by the parameter-estimation algorithm make the projected drawdowns too broad in extent.

This report was downloaded from the NSE website as a 29-page Acrobat-PDF file. The model used for the simulations described in this report is the same one presented to the NSE back in 2012. This 2012 Model is called in the text the "updated model", which does not mean it has been updated since 2012, but that the 2012 Model was updated from an earlier (2001 – see text on Page 3, 2nd paragraph of Section 1.2), preliminary model. That being the case, we would reiterate the comments we made on the 2012 model at that time and which have not been heeded in the interim.

In essence, the model starts from the cross sections of Page and others (2005, 2011), but, rather than using the unit contacts to become MODFLOW layers with dramatically different hydraulic conductivities, e.g., Proterozoic basement rocks, early Cambrian quartzites, Mesozoic sediments, or Neogene Basin Fill versus Paleozoic carbonates, they select several flat layers and allow the HUF package of an earlier version of MODFLOW to average the hydraulic conductivity of whatever portion of the units is in the layer and use that. This in effect strongly "blurs" the strong breaks between the blocks of units depicted in Page and others (2005, 2011). On Page 6, the text clearly shows that the author is aware of this approximation: "The complex stratigraphy is not incorporated in the model." Finally, they apply with that HUF package an exponential decrease in K with depth, which causes the flow in the model to be artificially pushed up to its shallowest layers. I disagree that the Paleozoic carbonates have an exponential decrease in hydraulic conductivity with depth. See the attached Figure 1 for a plot of the Belcher and others (2001) data for the Paleozoic carbonates (a primary unit for groundwater flow here). I interpret a regional value of the magnitude of 1 foot/day (shown also on Figure 1) for much of the Paleozoic carbonates in this region, even to thousands of feet of depth. Tetra Tech did prescribe a smallest value (a floor) on their exponential decline with depth of hydraulic conductivity: 3×10^{-4} foot/day and this is also shown on the attached Figure 1. This floor does not affect the exponential decline with depth from above this value and leads to this very low value dominating the deepest layers of the model. The artificial forcing of much higher values to the top of the model combined with a calibration via pilot points that created bulls-eyes of exceptionally high hydraulic conductivities in the shallowest layers leads to a model much different than what I would interpret from the cross sections of Page and others (2005 and 2011). To move the specified quantities of regional Paleozoic carbonate groundwater through the shallowest layers, the PEST algorithm, when saddled with this situation, is not to be faulted in assigning very large hydraulic conductivities individual pilot points in the top most layers. I don't think it represents the regional Paleozoic carbonate system accurately because it excessively limits what should be deep circulation (as much as tens of thousands of feet in some areas). The effect of selecting the HUF package plus exponentially declining hydraulic conductivity in the Tetra Tech 2012 model is for pumping impacts to spread very widely and rapidly across the top of the model, no matter what the actual materials are in place.

On Page 22, the author states his opinions about pumping in KSV: "Thus, the model predicts that the carbonate aquifers in KSV and Coyote Spring Valley are connected. Observations of water levels in wells CSVM-4 and KMW-1 show drawdown caused by the pumping in MX-5 during the Order 1169 test, showing that pumping effects are transmitted into this area in a few months. Based on this evidence, we would recommend including all of Kane Springs Valley within the final boundary of the LWRFS." I don't agree that this model predicts that these areas are connected; clearly, connections are built in from the very beginning of the conceptual model and carry through to the selection of inactive cells and the variations in hydraulic conductivity. That is, an assumption shouldn't be given as proof. The excessive and excessively shallow connections in the Tetra Tech 2012 Model are pervasive, as discussed above, and the problem would also be present in the Northern Coyote Springs and Kane Springs Valleys. KSV and northern CSV are connected, but they together are isolated to a significant degree from southern CSV by geologic structure, as most recently confirmed by the data presented in Lincoln/Vidler's report of July 3, 2019 to the NSE. Following up on this, KSV is quite distant from the MRSA and it should be remembered that the springs and associated surface flows of the MRSA, not northern CSV's deep aquifer, are what are intended for protection by the NSE's administrative unit under Order 1303. The author says nothing about what their model shows about effects of pumping in KSV on the springs of the MRSA; they only say that the drawdown cones from KSV coalesced with those of (from inspecting the figures with drawdowns, northern) CSV. Finally, the declines in water levels in both CSVM-4 and KMW-1 during the Order 1169 test were virtually identical and are due to regional recession from the winter precipitation event of 2005, not pumping at MX-5, as has been stated not only by Lincoln County/Vidler, but in other reports to the NSE as well.

The flow path outline, shown on page 22 of Appendix A, was developed with the Tetra Tech 2012 model. Because that model assumed that all flow in the southern part of the model can only exit at Blue Point and Rogers, Springs, indeed, that is what the flow path shows. This conceptual model and the boundary conditions applied to the model ignore a discharge south through Garnet Valley to the Las Vegas Valley. On Page 22, this assumption by Tetra Tech in building the 2012 Model is confirmed: "The Las Vegas Valley Shear Zone is considered to be the down-gradient end of the LWRFS. While there is a gradient across the shear zone indicating that there may be groundwater flowing from the LWRFS into the rest of Las Vegas Valley, the amount of flow is believed to be very low. The model simulates that boundary flow to be 0 afy, using a no-flow boundary condition, based on estimates developed by USGS hydrologists Jim Harrill and Doug Bedinger." I typically agree with USGS hydrologists, but with regard to the Las Vegas Valley Shear Zone, I disagree with this specific boundary flow interpretation, which is that the water flowing southward out of the LWRFS is forced to take an abrupt/right angled, left turn to discharge only at Blue Point and Rogers Springs, and not cross the Las Vegas Valley Shear Zone. I would note in closing my discussion of this topic that the Pahranagat Shear Zone is not generally considered to be a no-flow boundary (completely sealed), but to allow very large flows of groundwater across it.

Selected Comments on: "Technical Memorandum, Groundwater Management and the Muddy River Springs, Report in Response to Nevada State Engineer order 1303", prepared by Dr. Tom Myers, Hydrologic Consultant, dated June 1, 2019

I rebut the recommendation of Dr. Tom Myers that KSV should be included in the LWRFS administrative unit because he bases this on his inference that drawdowns from pumping from KSV could reduce or reverse the flow of groundwater into (northern) CSV. He makes no calculations using groundwater models to estimate either these drawdowns or the flows at the edge of KSV due to KSV pumping or, more to the relevance to what the NSE is considering, the potential for KSV pumping to measurably reduce flows in the springs and associated surface features of the MRSA.

This report was downloaded from the NSE website as a 27-page Acrobat-PDF file. On Page 1, the author states four points, the second of which is: "2. The [Dr. Myers'] report considers the reasons to consider Kane Springs Valley (KSV) as part of the LWRFS (the water level is just five feet higher in Coyote Springs Valley (CSV), and pumping in KSV could reverse the gradient pulling water from CSV.[sic]" The text associated with this point, on Page 19, expands only slightly on this conclusion by saying the gradients are low and that responses to MX-5 were fast, but then says: "Because of the very low perennial yield in Kane Springs Valley and lack of inflow to the valley from upgradient valleys, pumpage in Kane Springs Valley could reverse the gradient and draw water from CSV."

I rebut the statements of the previous paragraph as a basis for changing the composition of the LWRFS selected by the NSE primarily because it is based on consideration of drawdowns that may be experienced in (northern) CSV when wells are pumped in KSV. The goal of the NSE's designation of multiple HAs as the LWRFS administrative unit was to protect the springs and associated surface flows in the MRSA, not the current water levels in (northern) CSV. Due to distance and the intervening geologic structure, drawdowns that do make it out of KSV into northern CSV are also limited in their propagation to the MRSA. Further, I rebut that a water level difference of a few feet is a basis for calculating changes in or even complete reversals of flows or the timing guessed at here of a few years. If the "rapid response" being referred to is associated with CSVM-4 and KMNW-01 during the MX-5 test, I would say it was not a very fast response to pumping at MX-5, but was instead was a roughly simultaneous recession across a region from the winter precipitation of 2005. Also, the author assumes a continuous high transmissivity aquifer from (southern) CSV, near MX-5, into KSV. This is not what has been found, as most recently confirmed by the report of Lincoln County/Vidler to the NSE on July 3, 2019. Finally, I rebut that the perennial yield of or the inflow to the KSV HA at any level (and I do not think either is low or lacking) determine that pumping could reverse the gradient and draw water from CSV. Even if this happened at the boundary of KSV and (northern) CSV, it does not address the potential depletion of springs and associated surface flows in the MRSA.

Selected Comments on: "Issues Related to Conjunctive Management of the Lower White River Flow System, Presentation to the Office of the Nevada State Engineer in Response to Order 1303", prepared by the U.S. Fish and Wildlife Service, dated June 3, 2019

I downloaded the 82-page Acrobat-pdf report from the NSE website. The author or authors are not given; the cover letter says it is the "Services'". The report discusses what was requested by the NSE with a focus towards the potential for impacts to the Moapa Dace (a small, officially-Endangered, fish).

I rebut the proposed addition of KSV to the LWRFS administrative unit, but agree with the addition of Lower Meadow Valley Wash, both proposed on Page 2. KSV is relatively far away and has geologic structures impinging between KSV and the MRSA; the MRSA HA is, from a structural geology perspective, "cut-out" of the LMVW HA. That is, the MRSA is drawn from surface topography but is in the same block of Paleozoic carbonates as the rest of LMVW. Even respecting the HA boundaries as drawn, LMVW is immediately adjacent to the MRSA.

I rebut the discussion of SeriesSEE application to pumping during the Order 1169 Test Page 15 to 16) in which it is defended forcefully in the introduction by dismissing the core Theis solution and its "parameters" as merely fitting coefficients and that "successfully reproducing" the "measured changes in water levels across the study area" means that application was useful. If fitting is the measure, and the coefficients aren't important as long as the match is close, then they should have instead used a much more powerful tool: artificial neural networks. The general finding has been that artificial neural networks match the available data extremely precisely, but fail immediately upon application to a slightly different set of inputs. In this case, I would return to viewing the Theis solution as an actual physical model of groundwater flow (as Theis clearly intended it) intentionally selected by the authors of SeriesSEE as such. SeriesSEE is most reasonably applied where groundwater flow is radially uniform and there are places where this is very useful. In the case of the LWRFS, the structural geology presented in Page and others (2005, 2011) indicates to me that the Theis Equation (either through SeriesSEE or in other code) should not in general be applied to analysis of the drawdown responses to the MX-5 test. A numerical model which allows explicit incorporating of the local structural geology is more reasonable. Finally, in the case of the Order 1169 test, the problem of matching the measured water level changes through any model was that the simultaneous regional decline from the recharge of the winter of 2005 was mis-identified as drawdown due to pumping. In my opinion, matching uniform water-level declines during the Order 1169 Test throughout the LWRFS and adjacent areas, in light of the 2005 winter event, via any model using pumping as the lone cause for water-level decline is cause for concern about that model application, not attribution of success. The text says specifically on Page 16: "... and long-term trends in area groundwater levels were not accounted for during the analysis. Additionally, no-flow boundaries cannot be "simulated" (accounted for) during SeriesSEE curve fitting; SeriesSEE not [sic] a distributed groundwater flow model. Consequently, although a number of no-flow boundaries are known or likely to exist in the vicinity of the portion of the regional carbonate-rock aquifer stressed during the test, they were not accounted for during the estimation of MX-5 induced drawdowns." Therefore, the authors know that they are intentionally ignoring the structural geology of the region; it is not a mistake. I disagree with leaving the structural geology of this region out of groundwater flow and drawdown calculations. Finally, given the initial extended cautions by the author or authors to not view the physical Theis Equation as the selected mathematical transform and the parameters found by Series SSES as anything but meaningless regression coefficients, I find the extended discussions of Pages 17 and 18 of advancing cones of depression, controlled by local variations in transmissivity (a meaningful coefficient in the Theis Equation) contrary to these clear warnings.

I rebut the challenge across Pages 19 to 23 by the author or authors of the NSE's earlier finding in excluding KSV from the 1169 Order Test. In summary, I find that their arguments about similarity of declines in central-northern CSV and KSV being proof of drawdowns are flawed in that they are instead widespread essentially simultaneous decline from recharge due to the heavy winter rains of 2005. For example, see the first full paragraph of Page 21. Secondly, I find their arguments for hydraulic continuity from KSV into CSV are counter to the water-level differences and the geophysical data provided by Lincoln County/Vidler in the July 3, 2019 Report. See for example the first full paragraph on Page 22. From this proposition of continuity, the author or authors then expect water level impacts at Muddy River Springs and Muddy River, but they do not provide a groundwater flow simulation with the known structural geology to support their projection of impacts.

I rebut the assertion that the Kane Springs Wash caldera complex makes flow from Pahranagat Valley the primary source of groundwater flowing through KSV (bottom of Page 28). Elsewhere, I have pointed out that the distinctly larger recharge rates on the Delamar Mountains would surely create perennial or at least intermittent streams on them if the Tertiary Caldera units were such barriers to groundwater flow as asserted here. This rebuttal also applies to a parallel discussion on Page 29 with regard to groundwater flowing south from northernmost LMVW, i.e., groundwater flows through (not just between and around) the Caliente Caldera Complex (Clover Mountains) or there would be perennial or at least intermittent streams across the crest of the Clover Mountains. Given my objections to the Tertiary Calderas being impermeable, I rebut the first three bullets of Page 30.

I rebut the second bullet from bottom of Page 30 that asserts that flow across the Las Vegas Valley Shear Zone is negligible due according to the author or authors to discontinuous carbonates across the shear zone. I would infer instead that the shearing may not have created a no-flow boundary, but may have provided for a large portion of the flow in the LWRFS to enter the Las Vegas Valley.

I rebut the generalized projections of pumping impacts into northern CSV and thence into KSV, or the reverse given on the top of Page 33. Given that the topic being addressed by the NSE is protecting springs and associated surface water features of the MRSA, the narrative projections given here must assume that the drawdowns they envision will measurably reduce those surface water features in the MRSA. No groundwater model of any kind is offered to support the consequences of these projections on the MRSA. In particular, I disagree with saying in this forum that the drawdown experienced at the edge of a central, high transmissivity area would be transmitted "at least some magnitude over a large area; i.e., at 650 square miles...". Although "at least some magnitude" as written would strictly include ridiculously miniscule numbers, such as 1×10^{-10} foot, I assume the author or authors intend significant, i.e., measurable and causing measurable impact to springs or surface flows. I would recommend that the NSE dismiss narrative projections implying unacceptable impacts to the MRSA from pumping in distant HAs. The author or authors' narrative projections ignore the complex structural geology of the region and are free from the restrictions of combining Darcy's Law with strict mass balance as are found in groundwater models such as the Theis Equation, MODFLOW or FEFLOW. The narrative groundwater flow and water-level response projections continue across pages 33 to 35, but here they assert the specific responses to assumed constancy or variation in inflow through the Pahranagat Shear Zone and Panaca Valley's boundary with LMVW, transmission of climate signals, and groundwater development and pumping impacts and recovery. All of these narrative projections are presented for the NSE in determining how to protect the springs and associated surface water features of the MRSA without an actual calculation involving a groundwater flow model code.

Selected Comments on: "Assessment of Lower White River Flow System Water Resource Conditions and Aquifer Response, Presentation to the Office of the Nevada State Engineer", prepared by Andrew Burns, Warda Drici, Casey Collins, and James Watrus, Sr. for the Southern Nevada Water Authority and Las Vegas Valley Water District, dated June 27, 2019

This report was downloaded from the NSE website as a 143-page Acrobat-PDF file. I rebut the statement on Page 3-4 that the "Tertiary caldera complexes forming the northern boundary of Kane Springs are effective barriers to groundwater flow. The calderas are barriers primarily because of their underlying intracaldera intrusions and both hydrothermal clays and contact-metamorphic rocks formed by emplacement of the intrusions into intracaldera tuffs (Rowley et al., 2011)." While I understand the inferences about Caldera Complexes repeated from past studies, I would note that they in fact have not been drilled and tested. What we can note is that the much higher recharge volumes falling on the Delamar (or Clover) Mountains (compared to the valley plains) would create persistent perennial or intermittent streams if the Caldera Complexes that form them were barriers to groundwater flow. Instead, I infer that the much higher recharge volumes falling on the Delmar or Clover Mountains instead sink in and flow through the caldera systems out through their lateral boundaries.

Conclusion

My conclusion after reading the selected report sections is that I support the NSE's previous finding that the KSV HA should not be included in the LWRFS. My basis for saying this is that, due to its distance and the intervening structural geology, it is reasonable to conclude that pumping from the KSV HA would have negligible, if any, effect on the springs and associated surface flows in the MRSA HA and therefore is not an effective area for management efforts focused on protecting those features.

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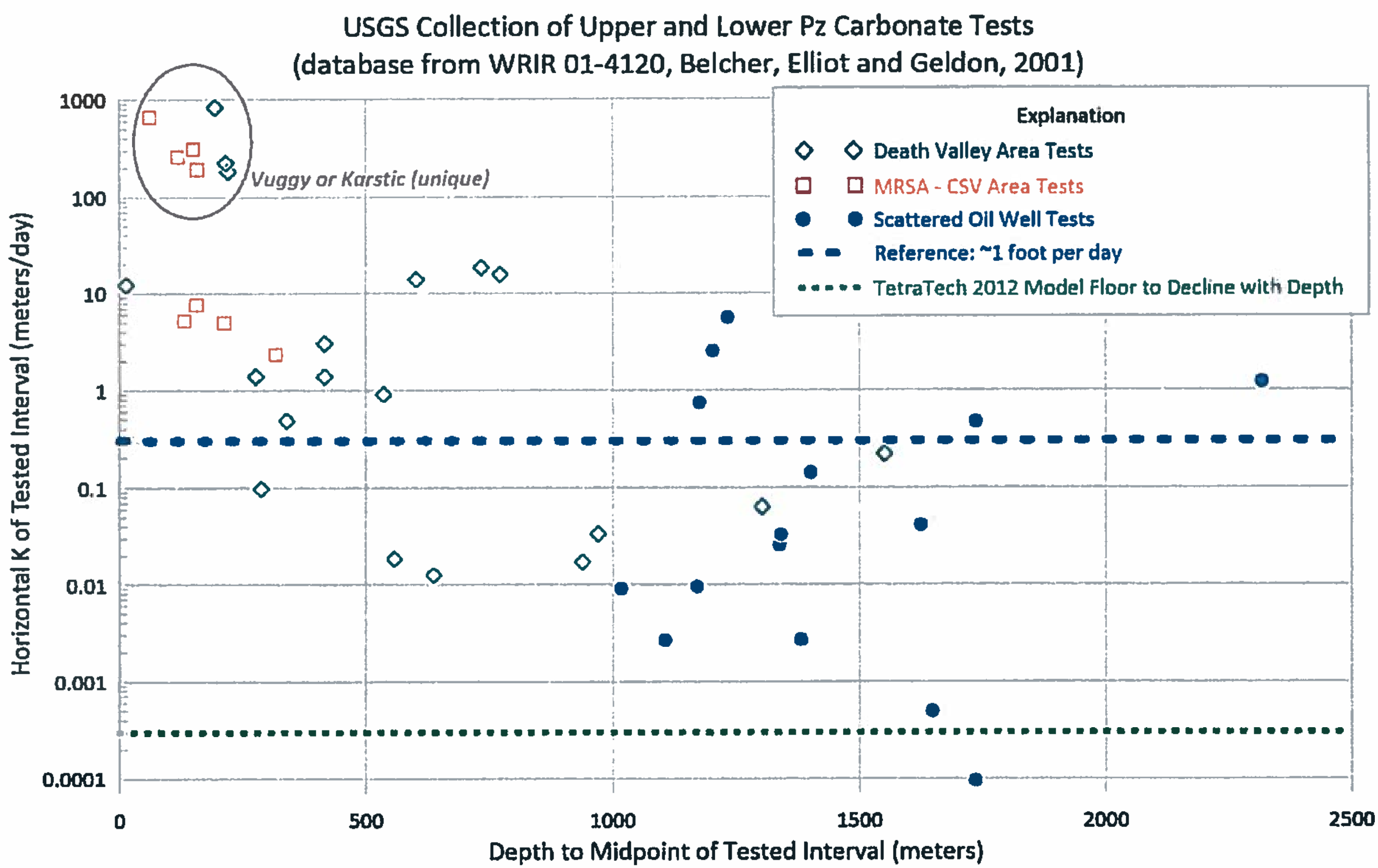

Figure 1 - Distribution of Horizontal Hydraulic Conductivity with Depth in Paleozoic Carbonates of Nevada

SE ROA 36468

Attachment C

Technical Memorandums:

Review of Water Level Decline in the LWRFS: Managing for Sustainable Groundwater Development, dated July 3, 2019

And

Review of Preliminary Geochemical Evaluation of Sources of Water discharge at Rogers and Blue Point Springs, Southeastern Nevada

Prepared by

Thomas Butler, P.G., C.H.G., C.E.G.

Stantec Inc.

Stantec

Memo

To:	Mr. Greg Bushner, R.G. Vice President of Water Resource Development Vidler Water Company	From:	Thomas Butler, PG, CHG, CEG Senior Hydrogeologist/Geochemist
		Date:	August 16, 2019

Reference: Review of Preliminary Geochemical Evaluation of Sources of Water discharge at Rodgers and Blue Point Springs, Southeastern Nevada.

This memo has been prepared to provide comments to the report titled *Preliminary Geochemical Evaluation of Sources of Water discharge at Rodgers and Blue Point Springs, Southeastern Nevada*, dated September 2012 and prepared by Geochemical Technologies Corporation and Tetra Tech (Report). In the following sections, italicized text is provided as direct quotes from the Report, while plain text is provided as comments.

Comment 1, Page 17, Paragraph 1 and 2 states: *Blue Point Spring δD of -93 ‰ and $\delta^{18}O$ of -12.4 ‰ contrast with the carbonate wells that have an average δD of -97 ‰ and $\delta^{18}O$ of -13 ‰. This difference is significant and results in a separation of the plotted values (Figure 2). If the water emerging from Rogers and Blue Point Springs is principally water that originates in the carbonate aquifer, and is modified only by reaction with reactions with rocks or other water along the flow path, then there are only two explanations for the difference in the isotopic values. The shift to more enriched values would occur if the spring water has been evaporated or has mixed with a water with a more enriched signature.*

It is clear that relying on evaporation as a cause is not plausible since both springs have values that plot on the MWL.

The difference in water isotope values (δ^2H and $\delta^{18}O$) from Rogers and Blue Point Springs from that of the average computed value for the carbonate aquifer are not significant, as inferred in the Tetra Tech Report (September 2012). The process of evaporation can reasonably occur as groundwater moves from a deeper aquifer (such as the carbonate aquifer) to much shallower zones that are in contact with the atmosphere or as it pools at/near the surface. To test this hypothesis a simple evaporation model was constructed using published enrichment factors. Based on that model, the δ^2H and $\delta^{18}O$ values at Rogers and Blue Point Springs can be approximated by evaporating only 5% of the water that has original isotope values similar to that of the average computed values for the carbonate aquifer wells, suggesting this process could indeed explain the values found at Rogers and Blue Point Springs. Therefore, in contrast to the findings of the Tetra Tech Report, evaporation is a process that can account for the slightly more enriched values of δ^2H and $\delta^{18}O$ present at Rogers and Blue Point Springs. Note that we agree with the finding that mixing could also account for the isotopic values at Rogers and Blue Point Springs.

Comment 2, Page 20, Point 2, Preliminary Modeling Results states: *The δD and $\delta^{18}O$ compositions of Blue Point Spring can only be matched by addition of recharge water with a heavier isotopic composition than the water from the three postulated source areas. This implies mixing of local recharge. The Muddy Mountains are the most feasible source of recharge. ^{14}C data from the Simplot and Valley of Fire wells support this conclusion. The ^{14}C value from Blue Point Spring is best matched by using a source of water in the southern part of the study area.*

Similar to comment 1, the isotopic composition of water at Rogers and Blue Point Springs are not that different and can be modeled by evaporating only 5% of water from the average computed values of the carbonate wells.

Reference: **Review of Preliminary Geochemical Evaluation of Sources of Water discharge at Rodgers and Blue Point Springs, Southeastern Nevada.**

Stantec Consulting Services, Inc.

Thomas Butler, PG, CHG, CEG
Senior Hydrogeologist/Geochemist

Phone: 925-296-2126
thomas.butler@stantec.com

References:

CH2M Hill, 2006. Hydrologic Assessment of Kane Springs Hydrographic Area (206): Geochemical Framework, Presentation to the office Nevada State Engineer, April 2006. 42 pages.

Stantec

Memo

To:	Mr. Greg Bushner, R.G. Vice President of Water Resource Development Vidler Water Company	From:	Thomas Butler, PG, CHG, CEG Senior Hydrogeologist/Geochemist
		Date:	August 16, 2019

Reference: Review of Water Level Decline in the LWRFS: Managing for Sustainable Groundwater Development, dated July 3, 2019.

This memo has been prepared to provide comments to the report titled *Water-Level Decline in the LWRFS: Managing for Sustainable Groundwater Development*, dated July 3, 2019 and prepared by Cady Johnson and Martin Mifflin of Mifflin & Associates, Inc (Report). Specifically, comments provided herein address portions of the report focusing on the interpretation of geochemical data as it relates to the potential movement of groundwater within and between Kane Springs Valley (KSV), Coyote Spring Valley (CSV), and the Muddy River Springs Area (MRSA). In the following sections, italicized text is provided as direct quotes from the Report, while plain text is provided as comments. As the Report did not present extensive tabular summaries of water chemistry data, Appendix C from the report titled *Hydrologic Assessment of Kane Springs, Hydrogeographic Areas (206): Geochemical Framework by CH2M Hill*, dated April 2006 *(CH2M Hill Report)* was utilized extensively for discussion purposes. The major finding of the discussion provided below is that, based on the analysis of available geochemical and isotope data, KSV is not likely part of the MRSA capture zone, as suggested, and is instead likely locally mixing with northeastern portions of the CSV represented by CSVM-4. Recently collected geophysical data obtained in this region support this conclusion and suggest that the northeastern CSV and KSV are structurally isolated from the greater groundwater flow system to the south and southeast.

Comment 1, Page 14, Paragraph 1 states: *The groundwater captures zones for Las Vegas Valley and Pahranagat Valley bound the MRSA capture zone to the west, forming an important hydrodynamic divide that should be recognizable from diagnostic chemical (F, As) and isotopic (D, ^{18}O, $^{87}Sr/^{86}Sr$, $^{243}U/^{238}U$) differences.*

When evaluating groundwater chemistry data for markers of groundwater sources, movement, or to identify groundwater capture zones it is important to identify those constituents that are conservatively transported in groundwater, that is they do not readily participate in geochemical reactions that may affect concentration significantly and be spatially transient, regardless of groundwater flow. Arsenic, in particular, is the exact opposite of the definition of a "conservative" constituent and thus should not be used to identify groundwater movement, groundwater sources, or potential captures zones. Specifically, arsenic concentrations are significantly affected by many processes including geothermal activity, REDOX potential, pH, and the presence of iron oxyhydroxides. Accordingly, processes that release arsenic to groundwater include hydrothermal activity, low pH, and reducing conditions (low REDOX). Conversely, arsenic is removed from solution as water oxidizes or as arsenic is adsorbed by iron oxyhydroxides that may be present in the aquifer matrix, causing the measured concentrations to vary significantly spatially. The elevated concentration within southern KSV at KPW-1 was 46 ug/l and illustrates this point perfectly. This high concentration is not observed to this magnitude elsewhere in the Lower White River Flow System (LWRFS) and is likely due to a combination of reducing conditions and local hydrothermal activity. At best, due to the lack of similarly high arsenic concentrations at other locations within the LWRFS, one could conclude that the transport of high arsenic groundwater out of southern KSV is not occurring. A similar discussion of how fluoride is an ineffective geoforensic marker is provided in the Comment 2 discussion below.

Reference: **Review of Water Level Decline in the LWRFS: Managing for Sustainable Groundwater Development, dated July 3, 2019.**

Comment 2, Page 14, Paragraph 1 states: *The MRSA capture zone is characterized by dissolved fluoride concentrations that can exceed 4 mg/liter, whereas groundwater in the Las Vegas Valley and upstream Pahranagat Valley capture zones have dissolved fluoride generally well below 1 mg/liter.*

(1) Fluoride should not be used as a geochemical marker to define the MRSA capture zone principally due to the fact that the concentration range in virtually each basin is too similar to make it a diagnostic marker. Conversely, (2) the temperature dependent solubility of the mineral fluorite does provide evidence that groundwater is not likely flowing from the southern portion of Kane Springs Valley (the most hydraulically down gradient portion of the KSV) or northeastern CSV into the MRSA. A discussion of these two points is provided as follows:

The Report is stating that fluoride concentrations are diagnostic in determining the source of water to the MRSA (e.g., the capture zone) and that elevated fluoride concentrations in the southern KSV (KPW-1, F = 6.1 mg/l) and the northeastern portion of CSV (CSVM-4, F = 4.6 mg/l) indicate that groundwater from these areas is flowing into the MRSA as they have concentrations greater than 4 mg/l. I do not agree with this interpretation. In fact, the highest concentrations of fluoride in the KSV is at well KPW-1, located in the southern most portion of the KSV and upgradient of CSV and MRSA. However, none of the fluoride concentrations measured in the MRSA approach the concentration measured at KPW-1 (or CSVM-4). Instead, MRSA fluoride concentrations range from 1.2 to 2.3 mg/l, similar to that measured in most of the other basins in the LWRFS, making it non-unique and thus not a useful marker in defining the MRSA capture zone. In fact, if fluoride were to be used as a geochemical marker of groundwater flow, it would have been more plausible to use the elevated concentrations in southern KSV to illustrate how groundwater is not flowing from KSV to the MRSA as the concentrations in southern KSV and northeastern CSV are not found anywhere else in the studied groundwater system.

It is important to note that a potential process responsible for the elevated fluoride concentrations at KPW-1 and CSVM-4 is the temperature dependence of the solubility of the mineral fluorite. Fluorite is a mineral associated with hydrothermal activity and common in carbonate and volcanic rocks. To test this hypothesis (temperature dependent solubility control on fluoride concentrations), a simple geochemical equilibrium model was constructed using the USGS modeling software PHREEQC, modeling the concentration of fluoride in equilibrium with the minerals fluorite and calcite, at KPW-1, and as a function of temperature (Figure 1). The blue line in Figure 1 indicates the modeled equilibrium concentration of fluoride as a function of temperature. The modeled equilibrium fluoride concentration at KPW-1 was found to be 6.2 mg/l at the actual measured sample temperature of 57 °C, compared to the actual measured concentration of 6.1 mg/l, demonstrating the local geothermal control on fluoride concentrations at this location. Similarly, the measured temperature at CSVM-4 was 41.6 °C with a modeled fluoride concentration of 4.9 mg/l, again comparing well to the measured concentration of 4.6 mg/l. As can be seen from Figure 1, of all the samples, where both fluoride concentration and temperature were available from the CH2M Hill Report (April 2006), only KPW-1, CSVM-4, and Little Ash Spring are near equilibrium with the mineral fluorite, suggesting these sample locations are unique compared to other samples in the LWRFS.

Similarly, the green line in Figure 1 illustrates the concept of completive ion effect to mineral solubility. Adding the mineral gypsum (another common mineral) to the equilibrium system, has the effect of reducing the solubility of the mineral fluorite. Therefore, in contrast to KPW-1, CSVM-4, and Little Ash Spring, the green line indicates that the rest of the samples within the LWRFS also may be influenced by gypsum solubility or are in disequilibrium, likely due to reaction kinetics (lack of sufficient residence time to reach equilibrium). These data again demonstrate that over most of the LWRFS, fluoride is a poor indicator of water source due to similar concentration ranges and apparent equilibrium with fluorite-calcite-gypsum or disequilibrium.

Reference: **Review of Water Level Decline in the LWRFS: Managing for Sustainable Groundwater Development, dated July 3, 2019.**

Conversely, KPW-1, CSVM-4, and Little Ash Spring are unique and appear to be near equilibrium with the minerals fluorite and calcite, providing evidence that water from these areas is not a significant source of water to other portions of the LWRFS, including the MRSA. It is important to note that although other geochemical evidence, including major cations and anions, water and carbon isotopes, fluoride, and temperature all suggest that KPW-1 and CSVM-4 may be related, this is not the case for Little Ash Spring, which is geochemically different (see Piper and Durov Diagrams below) to water from these two wells. The only similarity between Little Ash Spring and KPW-1 and CSVM-4 appears to be equilibrium with the mineral fluorite.

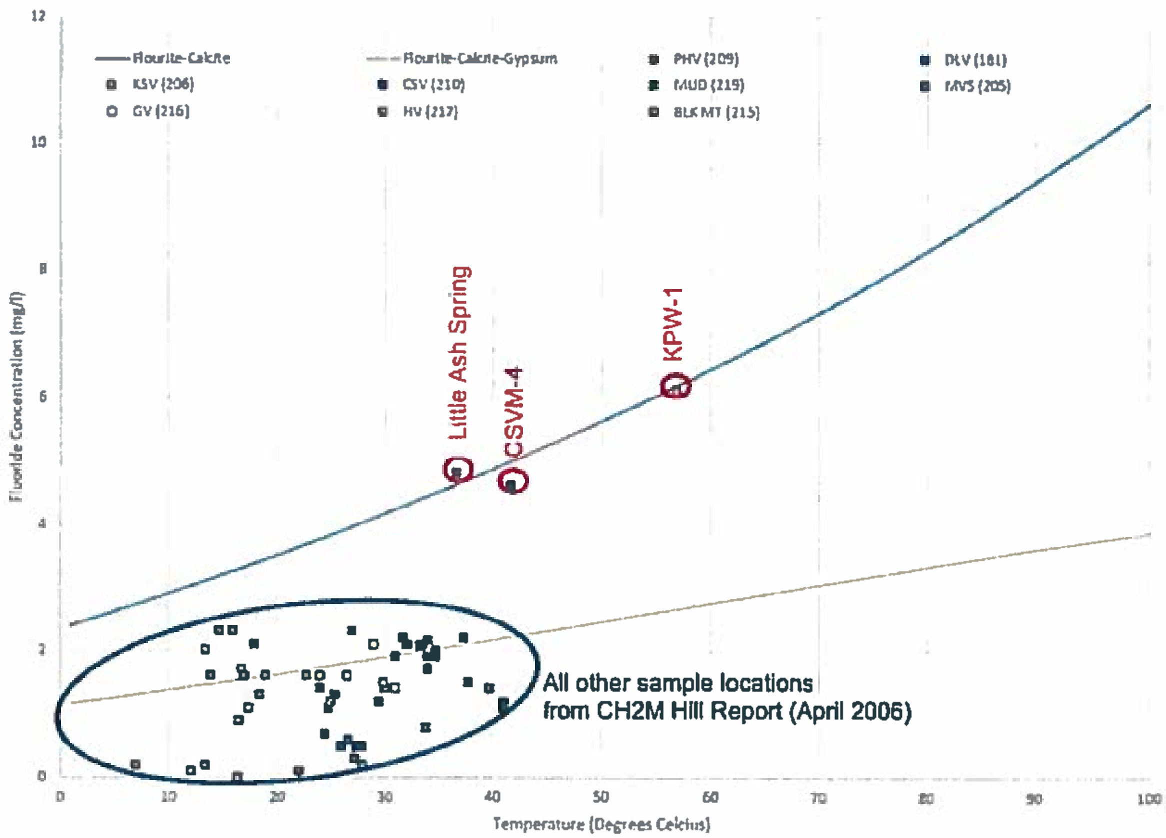

Figure 1: Fluoride concentrations from equilibrium of fluorite and changes in temperature.

Comment 3, Page 14, Paragraph 1 states: *Much depleted deuterium and ^{18}O are (values) are to be expected in groundwater west of the divide (blue dots on Figure 1) that is tributary to Pahranagat or Las Vegas Valley, while elevated fluoride and arsenic are expected to the east in water bypassing Panaca Spring and tributary to the MRSA (Johnson and Mifflin 2019).*

The water isotopes δ^2H and $\delta^{18}O$ data presented in Appendix C of the CH2M Hill Report (April 2006) illustrate the opposite may be occurring, with δ^2H and ^{18}O values from samples collected southwest of the groundwater divided (Figure 1, Johnson and Mifflin, July 2019) in CSV being more enriched (less negative/heavier) than samples collected within northeastern CSV, southern KSV, or the MRSA. In fact, the δ^2H and $\delta^{18}O$ values in southern KSV and northeastern CSV are generally more depleted (more negative/lighter) compared to most sample sites presented in the CH2M Hill Report (April 2006). The isotopically light values of δ^2H and $\delta^{18}O$ in southern KSV and northeastern CSV likely reflect the source of recharge being at higher elevations or during a cooler period in earth's history. Other samples within KSV are not as light suggesting a different recharge source to the north and/or potential deep circulation of groundwater in the vicinity of KPW-1 and CSVM-4 from distance, supported by the elevated water temperatures at these locations and presence of numerous faults.

Comment 4, Appendix I, Page 41, Figure 1: Conceptual model for groundwater system in terminal "LWRFS" flow corridor, with bounding faults from Felger and Beard (2010).

Figure 1 from Appendix I of the Report depicts the MRSA capture zone with regional and local groundwater flow vectors, with KPW-1 from the KSV within the MRSA capture zone. Available geochemical and isotope data do not support the conclusion that KPW-1 is in the MRSA capture zone. In addition to the discussion in the previous comments, Figure 2 represents a Piper Diagram constructed using data from the CH2M Hill Report (April 2006). As can be seen from this figure, the chemistry data from southern KSV and northeastern CSV, represented by KPW-1 (solid blue circle) and Willow Spring (solid black circle) and CSVM-4 (solid purple circle), are chemically dissimilar to wells in central CSV (solid diamonds) or the MRSA (open stars), providing chemical evidence that water from KVS is not flowing to the MRSA capture zone, as suggested by the CSV-MRSA mixing arrow (black arrow in Figure 2). Furthermore, groundwater/springs from northern portions of KSV (open circles) are chemically dissimilar from CSV, MRSA, and southern KSV groundwater despite groundwater flow vectors suggesting a southerly/southwestern flow in this area. Mixing between water sources present in the MRSA and central CSV cannot however be ruled out. Figure 3 is a Durov Diagram (similar to a Piper Diagram but also incorporates salinity and pH) and also illustrates potential mixing between central CSV and MRSA area wells (black arrow), with KPW-1, Willow Spring, and CSVM-4 again being chemically dissimilar and not plotting on the mixing trend line.

Reference: **Review of Water Level Decline in the LWRFS: Managing for Sustainable Groundwater Development, dated July 3, 2019.**

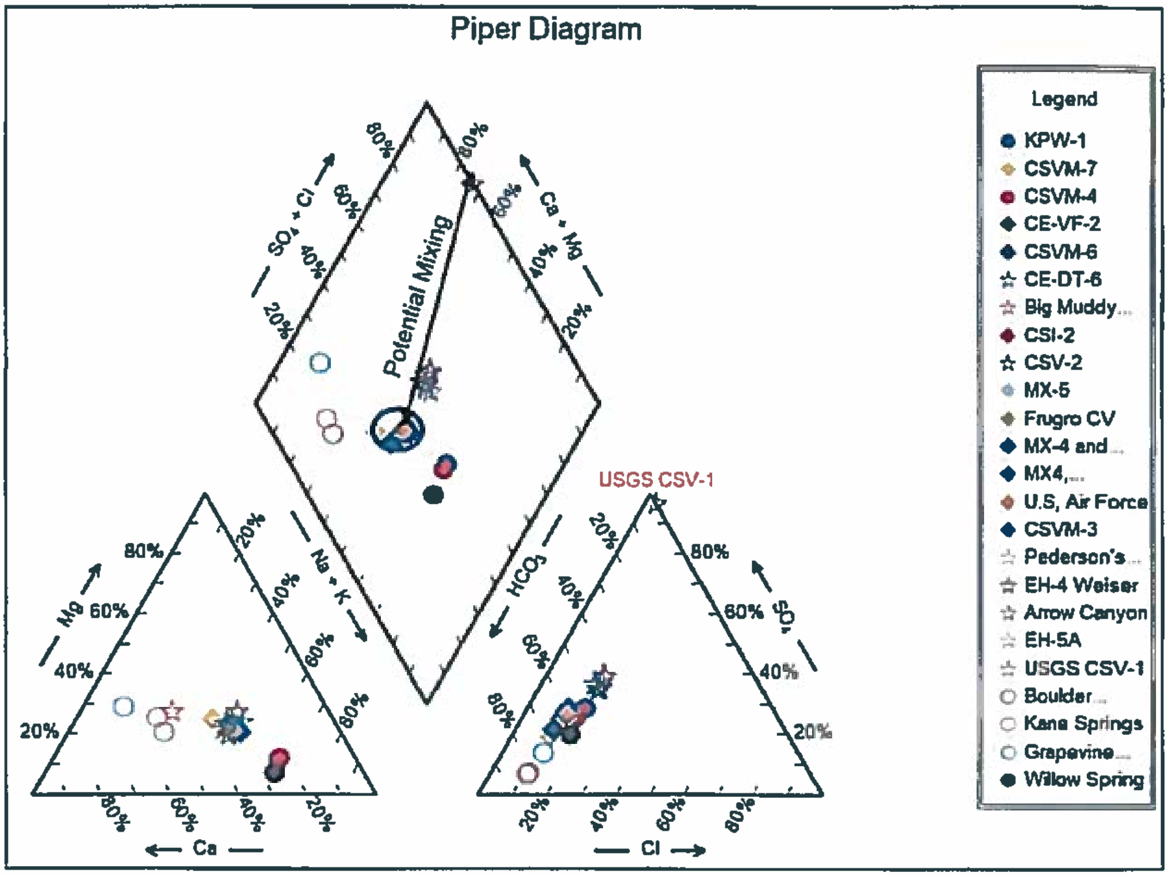

Figure 2: Piper Diagram depicting groundwater geochemistry from southern KSV, northern CSV, central CSV, Muddy River Springs, and Black Mountain basins. Circled area depicts central CSV well chemistry (solid diamonds), open stars are wells from the Muddy Springs Basin, solid circles depict southern KSV and northern CSV wells, and open circles are for northern KSV springs.

Reference: **Review of Water Level Decline in the LWRFS: Managing for Sustainable Groundwater Development, dated July 3, 2019.**

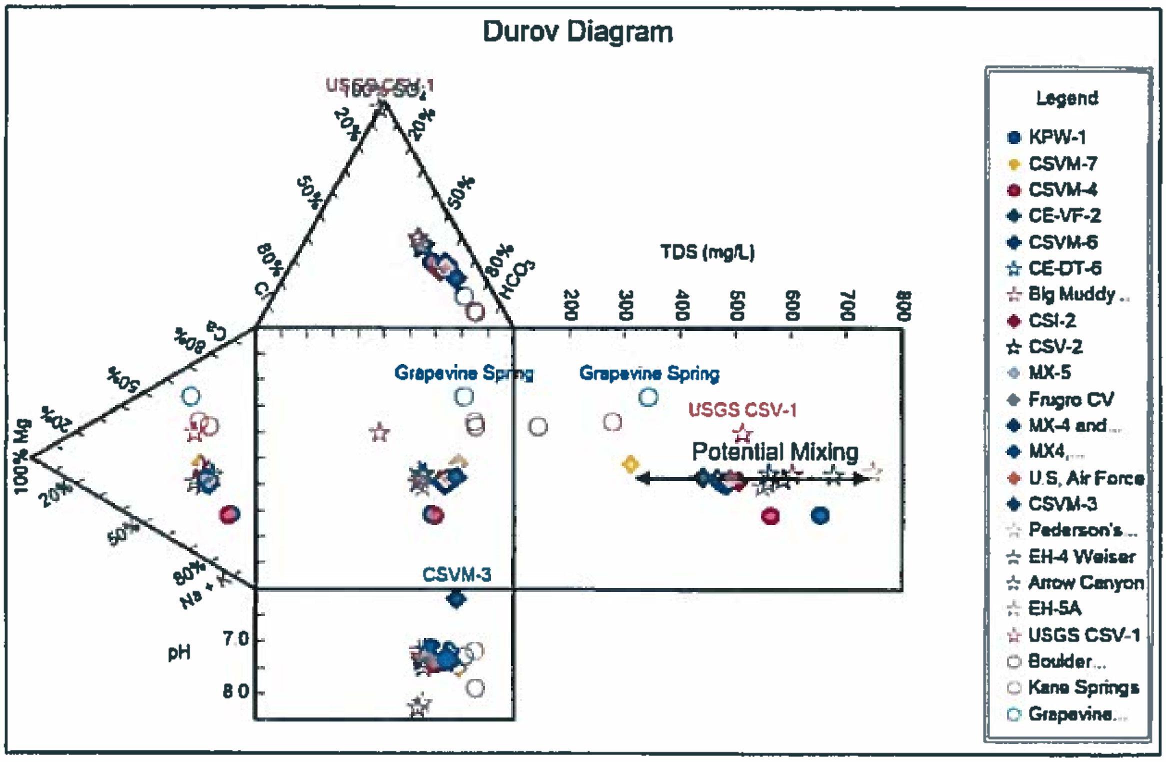

Figure 3: Durov Diagram depicting groundwater geochemistry from southern KSV, northern CSV, central CSV, Muddy River Springs, and Black Mountain basins. Circled area depicts central CSV well chemistry (solid diamonds), open stars are wells from the Muddy Springs Basin, solid circles depict southern KSV and northern CSV wells, and open circles are for northern KSV springs.

Comment 5, Appendix III, Page 54, Second Paragraph states: *Preston Big Spring (northern White River Valley) shows 11.2 pmc, Crystal Spring in Pahrangat Valley has ~6.2 pmc for an apparent age difference of 4,941* years.... *Big Muddy Spring (MRSA) has 9.7 pmc, which is not consistent with Pahranagat Valley source without significant local (younger) input suggested by Thomas and others (1996).*

It is important to note that southern KSV and northeastern CSV, represented by KPW-1 and CSVM-4, have even lower percent modern carbon values than Pahrangat Valley, with reported values of 2.7 and 4.2 pmc, respectively. Therefore, groundwater from these regions are also inconsistent with a groundwater source (capture zone) for the MRSA, as they are older than MRSA groundwater, and cannot be accounted for without a significant influx of younger water into the MRSA. Furthermore, matrix diffusion cannot account for the differences, as KSV is hydraulically up gradient of the MRSA and thus the longer groundwater flow path would result in the input of more ^{14}C dead carbon to the system, resulting in less (older) pmc values in the MRSA, not the higher pmc values (younger) that are actually observed. Instead, based on pmc data provided in *Hydrologic Assessment of Kane Springs, Hydrogeographic Areas (206): Geochemical Framework*, dated

April 2006, the more plausible source of water entering the MRSA would be from the west and from the central portions of the CSV, not from KSV.

As previously stated, the intent of this discussion is to provide additional information regarding the geochemical discussions embedded in the Report. Accordingly, based on the interpretation of available geochemical and isotope data previously provided as part of the *Hydrologic Assessment of Kane Springs, Hydrogeographic Areas (206): Geochemical Framework*, dated April 2006 study, the KSV is not part of the MRSA capture zone, as suggested in the Report. KSV is instead likely locally mixing with northeastern portions of the CSV, represented by CSVM-4. Recently collected geophysical data obtained in this area (Lincoln County Water District and Vidler Water Company, 2019) support this conclusion and suggest that the northeastern CSV and KSV are structurally isolated from the greater groundwater flow system to the south and southeast, including the MRSA.

Stantec Consulting Services, Inc.

Thomas Butler, PG, CHG, CEG
Senior Hydrogeologist/Geochemist

Phone: 925-296-2126
thomas.butler@stantec.com

References:

CH2M Hill, 2006. Hydrologic Assessment of Kane Springs Hydrographic Area (206): Geochemical Framework, Presentation to the office Nevada State Engineer, April 2006. 42 pages.

Johnson and Mifflin, 2019. Water-Level Decline in the LWRFS: Managing for Sustainable Groundwater Development, Initial Report of Mopa Band of Paiutes in Response to Order #1303. Submitted to the Nevada State Engineer July 3, 2019. 39 pages.

Lincoln County Water District and Vidler Water Company, 2019. Lower White River Flow System Interim Order #1303 report focused on the Northern Boundary of the proposed administrative unit. Submitted to the Nevada State Engineer July 3, 2019. 47 pages.

Attachment D

Technical Memorandum

Subject: Drought and Groundwater

Prepared by

Todd Umstot

Daniel B. Stephens & Associates, Inc.

TECHNICAL MEMORANDUM

To: Greg Bushner, Vidler Water Company.

From: Todd Umstot Todd Umstot

Date: August 16, 2019

Subject: Drought and Groundwater

I, Todd Umstot, from Daniel B. Stephens & Associates, Inc. (DBS&A) have reviewed the reports presented before the Nevada State Engineer (NSE) regarding Interim Order 1303 as they pertain to the inclusion of Kane Springs Valley (KSV) into the Lower White River Flow System (LWRFS), an administrative unit of six conjoined basins designated by the NSE. The NSE defines the LWRFS as the hydrographic areas (HAs) of Coyote Spring Valley (CSV) (HA 210), Hidden Valley (HA 217), Garnet Valley (HA 216), California Wash (HA 218), Muddy River Springs Area (HA 219), and the northwest portion of the Black Mountains Area (HA 215) (NSE, 2019). The KSV is located northeast of the CSV and the LWRFS. The KSV and Northern CSV are separated from the southern LWRFS by a low-permeability structure or change in lithology (NSE, 2007). I also reviewed drought, precipitation, and groundwater elevation data for the LWRFS region.

In my review, I evaluated (1) whether there has been an increase in the frequency of drought in southern Nevada over the past two decades, (2) whether the groundwater elevations in Northern CSV and KSV are influenced by drought and precipitation, and (3) whether monitoring wells CSVM-4 in Northern CSV and KMW-1 in KSV were influenced by pumping at the MX-5 well during the two-year aquifer test (November 15, 2010 through December 31, 2012) referred to as the Order 1169 Aquifer Test. I found that (1) there has been an increase in the frequency of drought in southern Nevada, (2) groundwater elevations in wells CSVM-4 and KMW-1 show a response to recharge and drought, and (3) CSVM-4 and KMW-1 respond to trends in precipitation and drought and were not influenced by pumping at MX-5 during the Order 1169 Aquifer Test.

Long-Term Trends in Precipitation and Drought Indicate an Increase in Drought Conditions

SNWA (2019) reports that southern Nevada has been wetter since 1965 than was found previously from 1895 through 1964 (SNWA, 2019, section 5.1.1), and therefore drought has not influenced recent water levels. However, the Palmer Drought Severity Index (PDSI) (NOAA, 2019) for southern Nevada (Nevada Climate Divisions 3 and 4) indicates an increase in drought conditions over recent decades (Figures 1 and 2). The PDSI measures the cumulative departure in the surface water balance based on precipitation, temperature, and soil moisture conditions. The PDSI for Nevada Climate Division 4 indicates that the occurrence of drought is higher in recent decades. The PDSI from 1895 through 1964 had an occurrence of drought in 58 percent of the months. Since 1965, drought conditions have occurred in 69 percent of the months. Figure 3 shows the occurrence of drought by decade for Nevada Climate Divisions 3 and 4. The 1980s were relatively wet compared to other decades, but subsequent decades have shown an increased occurrence of drought. Long-term trends in groundwater levels are affected by an increase in drought conditions (e.g., GGI, 2019, p. 3). A long-term increase in drought will lead to a general decline in groundwater levels and spring flows without any groundwater pumping. These long-term trends in water levels must be accounted for when analyzing the response of wells to the Order 1169 Aquifer Test.

The Recent Increase in Drought Conditions Affects Groundwater Elevations in Kane Springs Valley and Northern Coyote Spring Valley

The fluctuations in groundwater elevations in Kane Springs Valley at well KMW-1 and in Northern Coyote Spring Valley at well CSVM-4 are due to precipitation and drought. Figures 4 and 5 show a comparison between KMW-1 and CSVM-4, respectively, and the 12-month trailing average in the PDSI. The 12-month trailing average PDSI is the average monthly PDSI over the current month and the previous 11 months. The plots show an extraordinary wet period in the PDSI record in 2005 with a peak in fall 2005 that corresponds with a peak in groundwater elevations at CSMV-4 about a year later in fall 2006. The PDSI returns to drought conditions in 2006 and then generally increases to normal conditions by the end of 2010. The groundwater elevations at CSVM-4 and KMW-1 are relatively stable during this period with a slightly declining trend.

Next, the PDSI has a drying trend from the end of 2010 through 2014 and the groundwater elevations at CSVM-4 and KMW-1 show a corresponding steady rate of decline over this period. This drying period includes the Order 1169 Aquifer Test and an additional 20 months after the pumping at MX-5 ends in March 2013. The start of the drying trend corresponds with the start of the Order 1169 Aquifer Test. However, the end of the drying trend does not correspond with the end of pumping at the MX-5 well. The rate of decline in groundwater elevation at CSVM-4 and KMW-1 is similar before and after the MX-5 pumping, indicating that the decline observed during the aquifer test was due to an increase in drought conditions and not the pumping at MX-5. If there was a connection between the pumping at MX-5 and the CSVM-4 and KMW-1 wells, the CSVM-4 and KMW-1 wells should have had an increase in groundwater elevation after the cessation of pumping at MX-5. The lack of an increase in the groundwater elevations at CSVM-4 and KMW-1 over 20 months after the cessation of pumping at MX-5 indicates that drought has a strong influence on the groundwater elevations at wells CSVM-4 and KMW-1. This response in the groundwater elevations to drought rather than groundwater pumping is in contrast to statements by the U.S. Fish and Wildlife Service (USFWS) that "any response to dry conditions in the record is either too incremental to observe or is obscured by the simultaneous effects of ongoing water supply pumping" (USFWS, 2019, p. 27).

After precipitation in winter 2014/2015, the PDSI remains in drought conditions, but generally increases from 2015 through 2017. Groundwater elevations are stable at CSVM-4 during this period and generally increase at KMW-1. The PDSI has a drying trend in 2018 and the groundwater elevations at CSVM-4 and KMW-1 show a slight decline. The correspondence of the PDSI and the fluctuations in groundwater elevation at CSVM-4 and KMW-1 show that the fluctuations are due to long-term drought trends; any influences from pumping cannot be discerned.

Correlation Analyses do not Support that Groundwater Elevations in Kane Springs Valley and Northern Coyote Spring Valley are Hydraulically Connected to Carbonate Wells during the Order 1169 Aquifer Test

SNWA (2019) presents correlation analyses to support a hydraulic connection between the Order 1169 Aquifer Test and wells in Kane Springs Valley and Northern Coyote Spring. However, correlation does not prove causation. For example, similar regression correlation coefficients ($r^2 = 0.68$) can be obtained between KMW-1 and EH-4 as can be found between KMW-1 and CSVM-5 (Figure 6). The similarity in regression correlation coefficients implies that there is an equal hydraulic connection between EH-4 and KMW-1 as there is between KMW-1 and CSVM-5. Well CSVM-5 was reported to have no discernable response to the Order 1169 Aquifer Test (SNWA, 2019, p. 2-1), while EH-4 did show a response to the Order 1169 Aquifer Test. Therefore, the correlation analyses on their own do not support opinions on hydraulic connection.

The correlation analysis used by SNWA is flawed in that it does not account for the error in the groundwater elevation measurements. SNWA uses correlation analysis to predict that the drawdown at CSVM-4 is 0.37 foot per foot of drawdown at MX-4, and claims that this correlation provides "undeniable" evidence of the connection between CSVM-4 and MX-5 (SNWA, 2019, p. 5-17). However, SNWA has previously reported that the water levels in the CSVM-4 have an error rate of about 1 foot:

> CSVM-4 may be showing a slight response with December 2012 water levels approximately 1 ft lower than September 2010 water levels, but the transducer in CSVM-4 has had a high failure rate due to the high water temperature in the well, so fluctuations of a foot or less should not be used to infer an absolute response (SNWA, 2013, p. 36).

The correlation analysis by SNWA needs to account for the error in the water level measurements at well CSVM-4 in making the prediction of 0.37 foot per foot of drawdown at MX-4.

The correlation analysis by SNWA needs to account for the downward trend in water levels due to drought in the correlation between CSVM-4 and MX-4. The groundwater elevations at CSVM-4 continued to decline for 20 months after pumping had stopped at MX-5 in March 2013 due to drought conditions (Figures 1 and 2). The decline in groundwater elevations at CSVM-4 continued until the end of 2014, when precipitation increased. The overall rate of decline due to increased drought conditions during this period was 0.47 foot per year. The combination of a downward trend in groundwater elevations due to an increase in drought at CSVM-4 and the error rate in the measurements for the CSVM-4 indicates that the groundwater elevation data cannot support a connection between CSVM-4 and MX-5.

SNWA used a 3-month lag on EH-4 groundwater elevations when correlating EH-4 with CSVM-4 (SNWA, 2019, Figure 5-10) and a 3-month lag on MX-4 groundwater elevations when correlating MX-4 with CSVM-4 (SNWA, 2019, Figure 5-14), but SNWA did not provide any support on the use of the 3-month lag. No lags were used for any other well correlations. The 3-month lag increased the correlation coefficient from 0.77 to 0.82 for the correlation between EH-4 and CSVM-4 and increased the correlation coefficient from 0.71 to 0.78 for the correlation between MX-4 and CSVM-4. The removal of the 3-month lag decreased the SNWA estimated rate of drawdown from 0.37 foot per foot of drawdown in MX-4 to 0.33 foot per foot of drawdown in MX-4.

The groundwater elevations at well MX-4 used by SNWA (2019) in their correlation analyses are inconsistent with the heads previously reported by SNWA and the heads reported by the NSE. Figure 5-14 in SNWA (2019) plots the MX-4 well with observed heads greater than 1,822 feet above mean sea level (feet msl) between November 2010 and April 2013. However, the maximum head observed during this period at well MX-4 was 1820.2 feet msl in November 2010, as was shown previously by SNWA in their report (SNWA, 2013, Figure C-54). The correlation analyses presented by SNWA (2019) between MX-4 and other wells appear to be in error.

References

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NSE. 2019. Interim Order 1303 designating the administration of all water rights within Coyote Spring Valley hydrographic basin (210), a portion of Black Mountains Area basin (215), Garnet Valley basin (216), Hidden Valley basin (217), California Wash basin (218), and Muddy River Springs Area (Aka Upper Moapa Valley) basin (219) as a joint administrative unit, holding in abeyance applications to change existing groundwater rights, and establishing a temporary moratorium.

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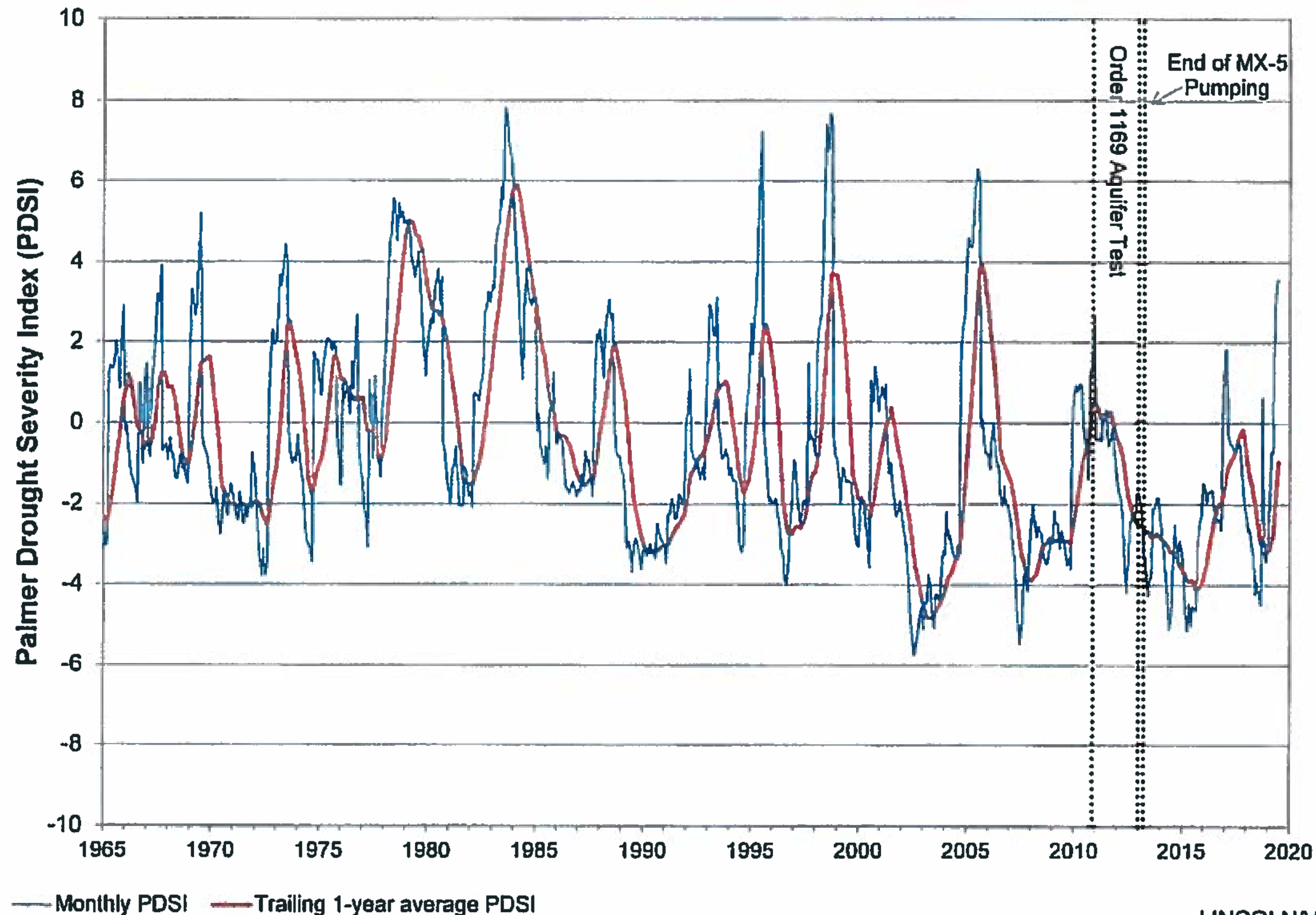

LINCOLN/VIDLER

Palmer Drought Severity Index for Nevada Climate Division 3

Daniel B. Stephens & Associates, Inc.

8/14/19

Figure 1

SE ROA 36485

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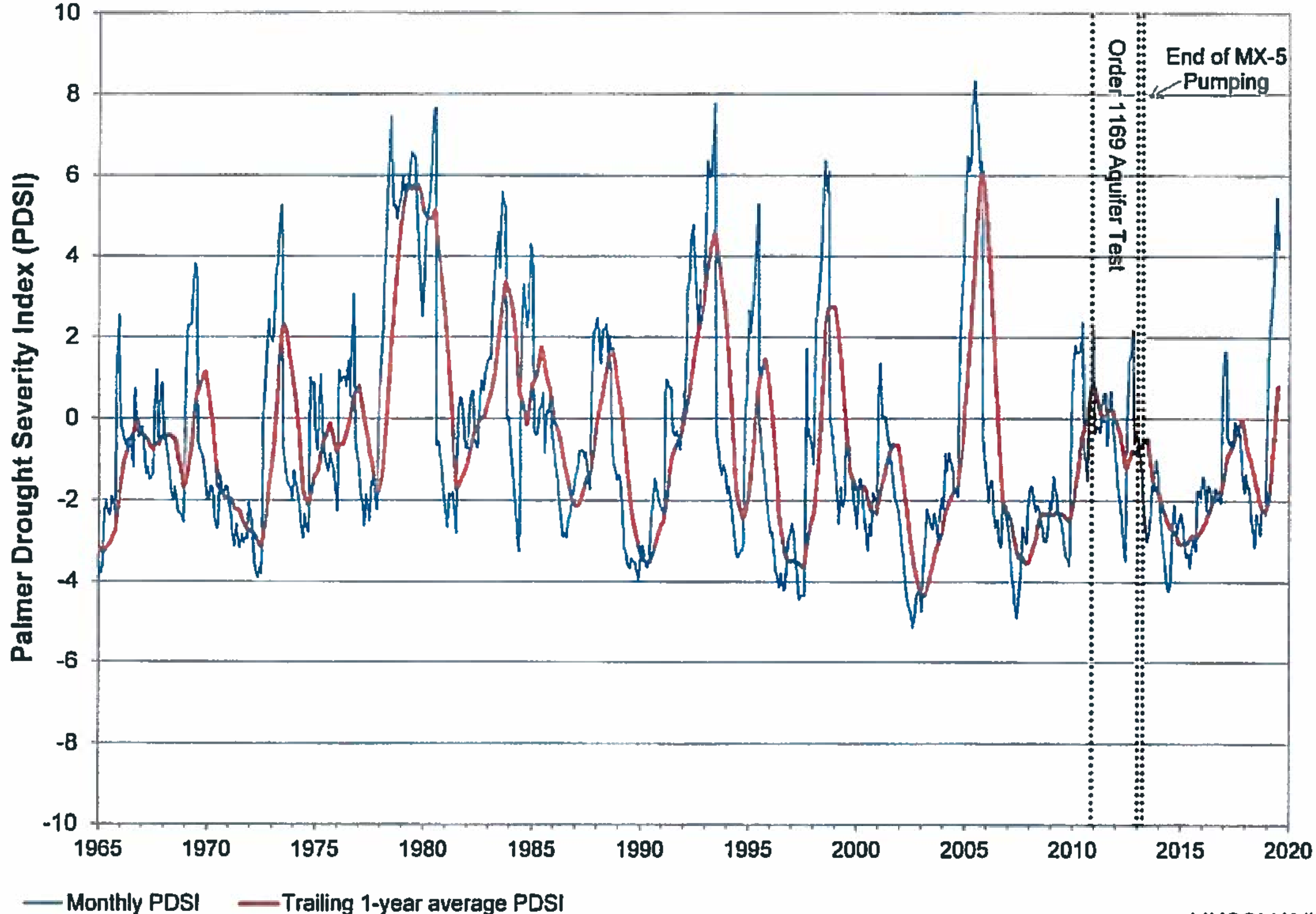

LINCOLN/VIDLER

Palmer Drought Severity Index for Nevada Climate Division 4

Daniel B. Stephens & Associates, Inc.

8/14/19

Figure 2

SE ROA 36486

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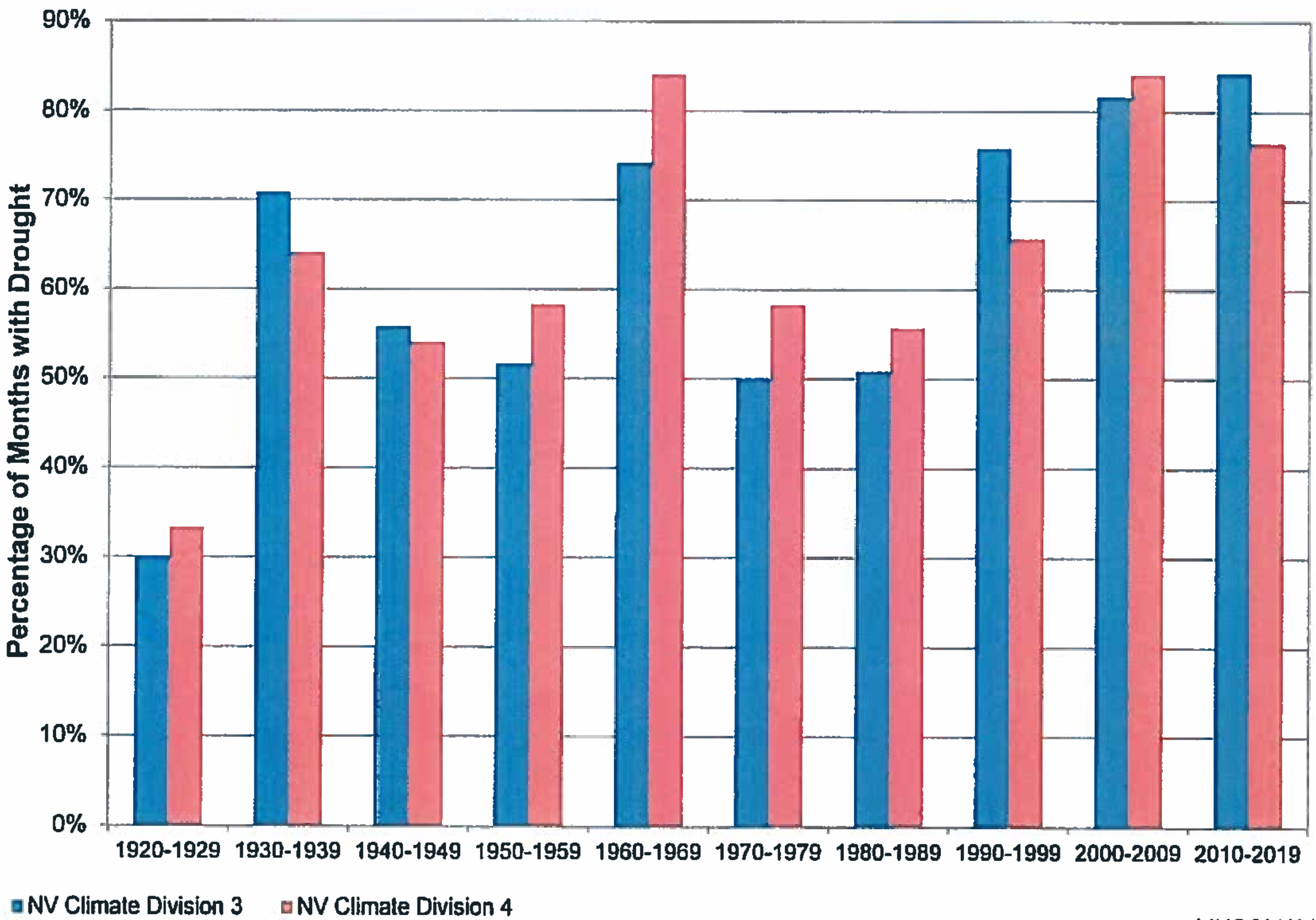

LINCOLN/VIDLER

Occurrence of Drought in Southern Nevada by Decade from Palmer Drought Severity Index

Daniel B. Stephens & Associates, Inc.

8/14/19

Figure 3

SE ROA 36487

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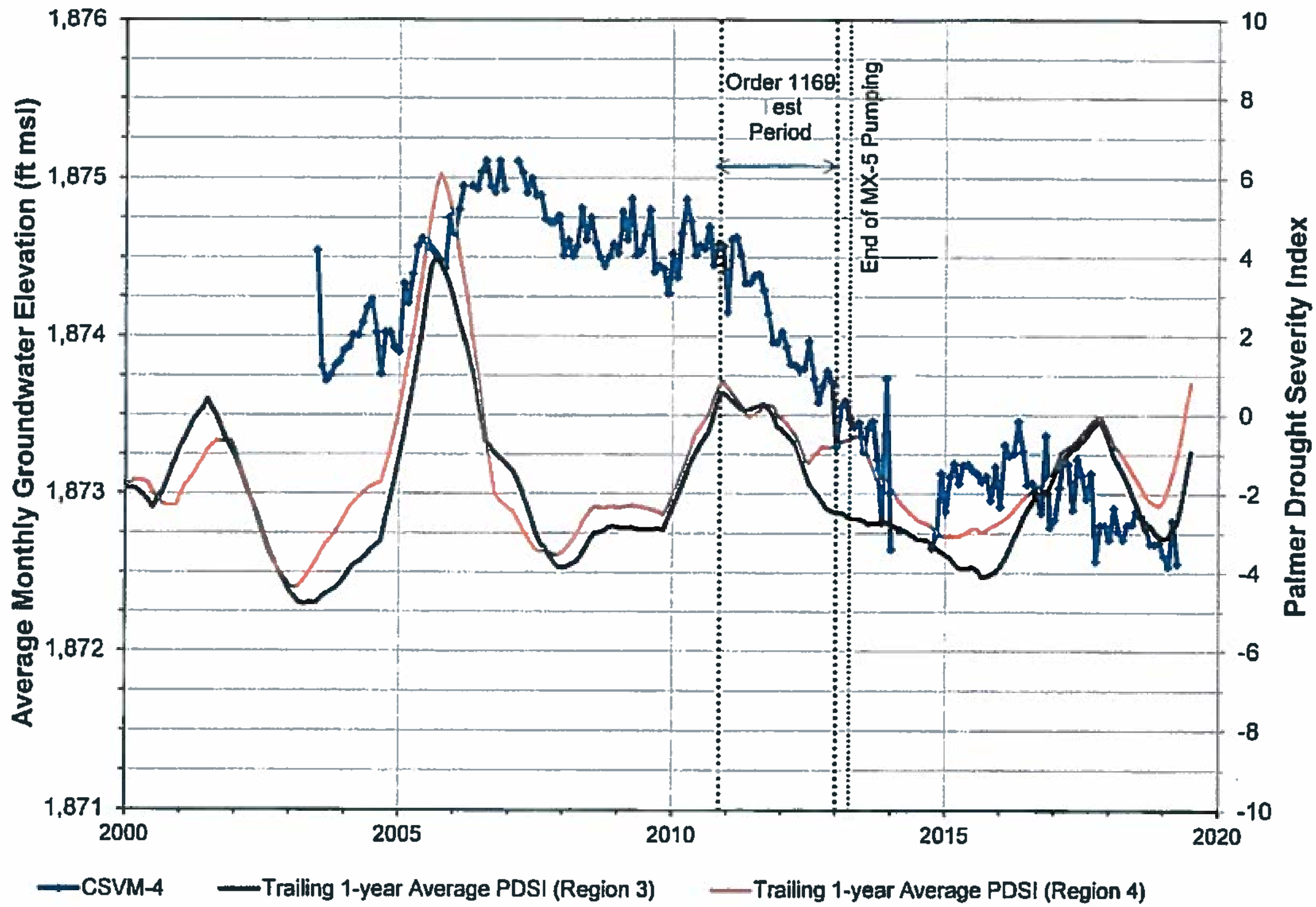

LINCOLN/VIDLER

Comparison of Palmer Drought Severity Index to Groundwater Elevation at CSVM-4

Daniel B. Stephens & Associates, Inc.

8/14/19

Figure 4

SE ROA 36488

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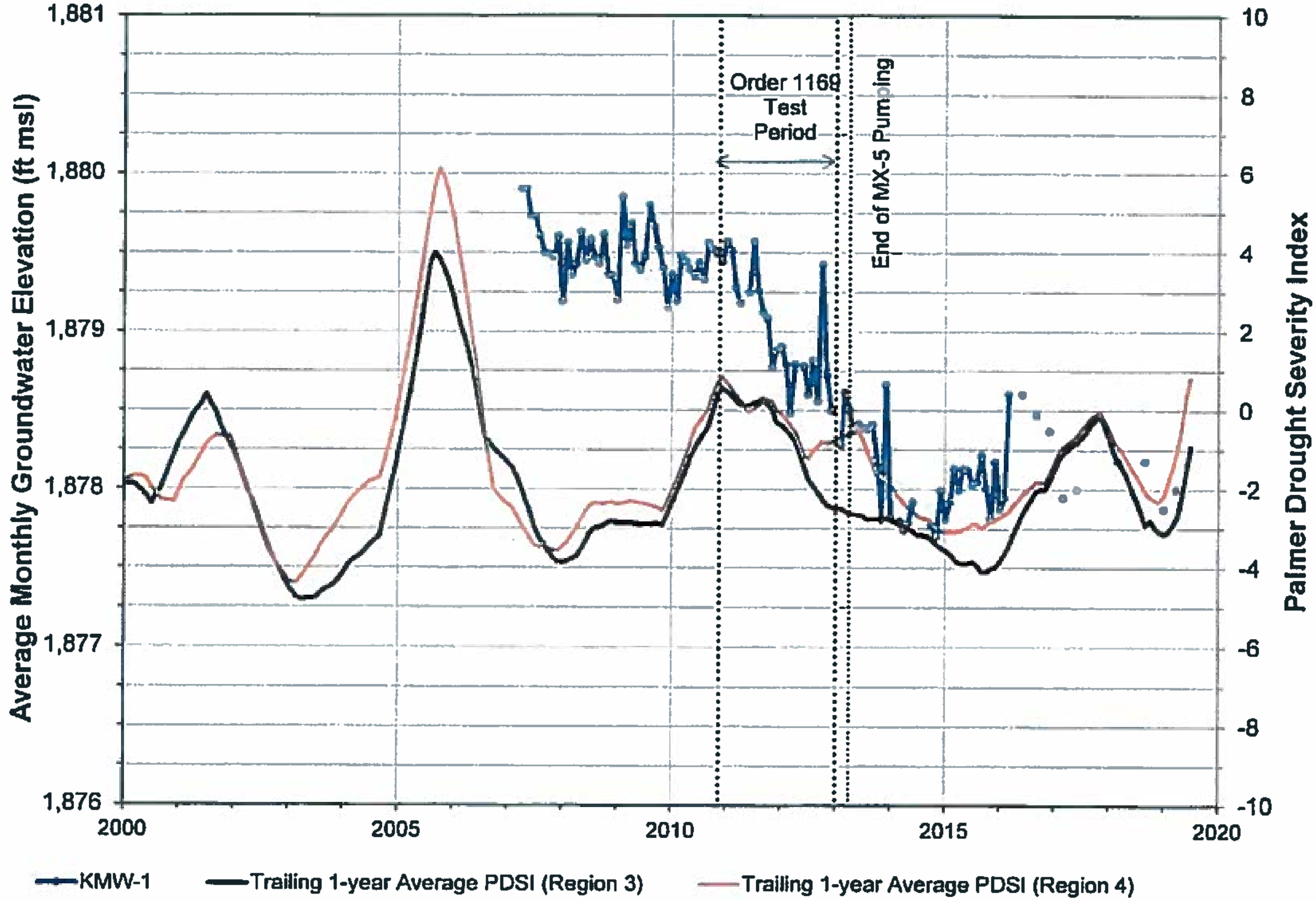

LINCOLN/VIDLER

Comparison of Palmer Drought Severity Index to Groundwater Elevation at KMW-1

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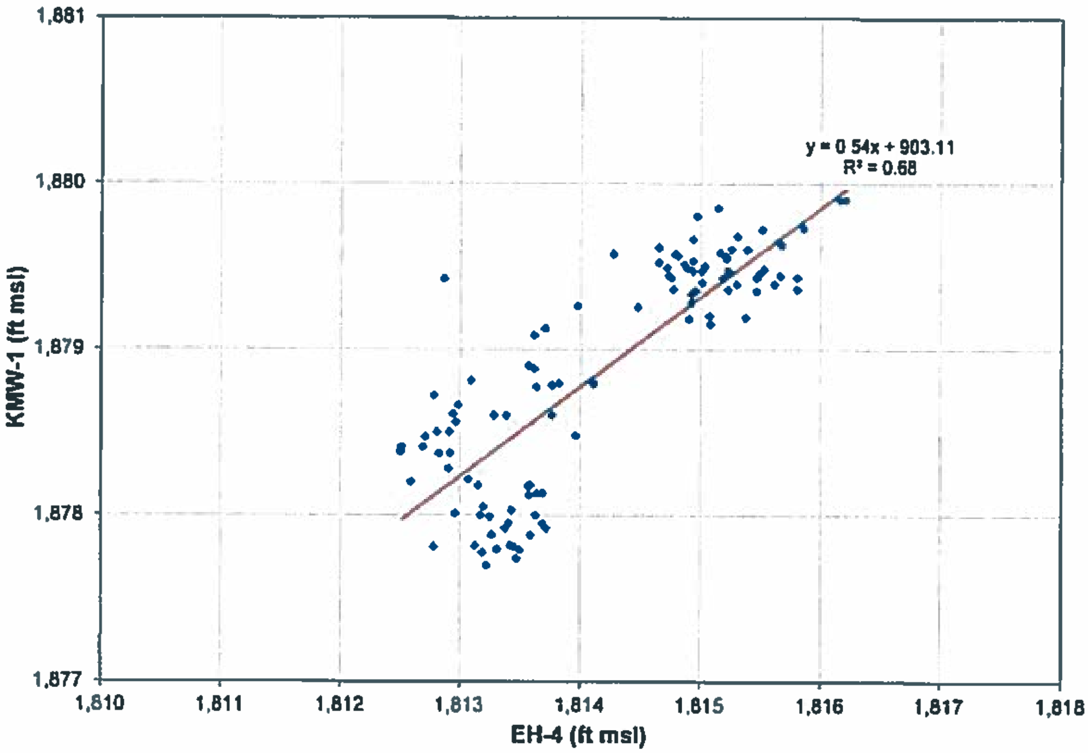
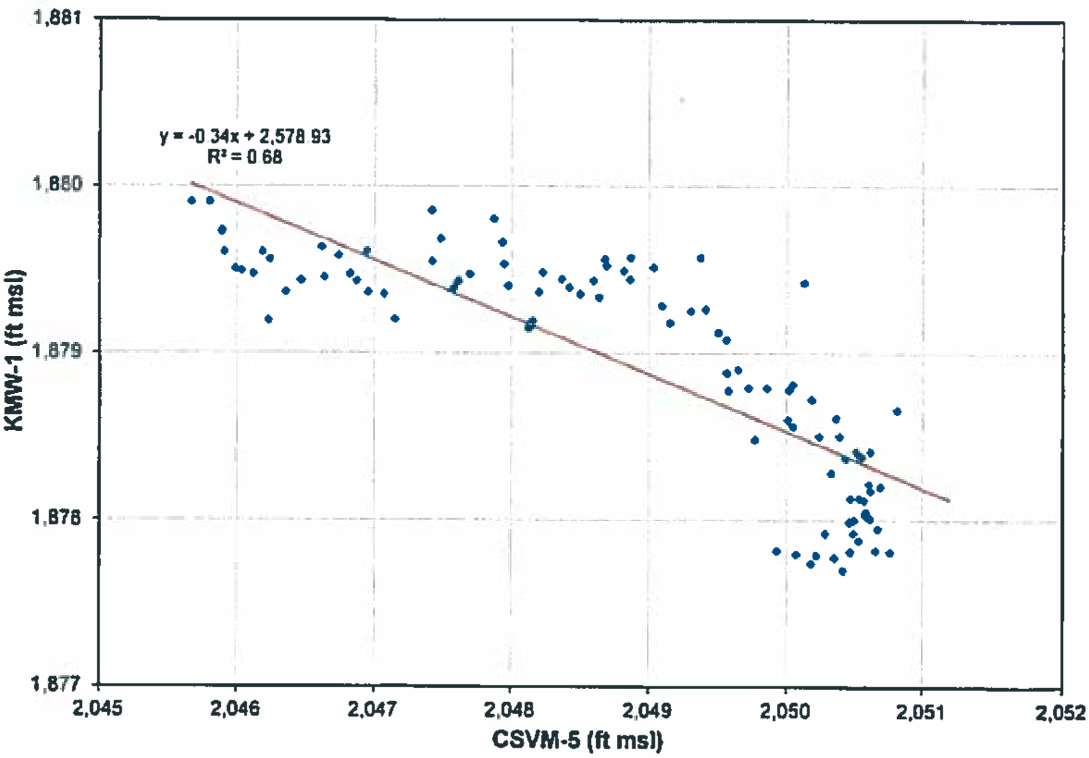
8/14/19

Figure 5

SE ROA 36489





LINCOLN/VIDLER

Correlation of KMW-1 with EH-4 and CSVM-5

Figure 6

Daniel B. Stephens & Associates, Inc.

8/14/19

Q:\Projects\L T08 0105_Vidler\Production\TechMemo 8-19\Figures\Word\Fig06_WL Crrltn.doc

Attachment E

Technical Memorandum

Re: Zonge International, Inc., Rebuttal Response to the July 3, 2019 Reports Submitted to the Nevada State Engineer in Response to IO#1303.

Prepared by

Norman Carlson

Zonge International, Inc.

Zonge

TRUSTED GEOPHYSICS

Zonge International, Inc.
3322 East Fort Lowell Road
Tucson, Arizona 85716 USA

PH 520.327.5501
FX 520.325.1588
www.zonge.com

August 16, 2019

Technical Memorandum

To: Greg Bushner
Vice President of Water Resources Development
Vidler Water Company
3480 GS Richards Blvd., Suite 101

Re: Zonge International, Inc., Rebuttal Response to the July 3, 2019 Reports Submitted to the Nevada State Engineer in Response to IO #1303.

This response is provided based on review of the Coyote Springs Investment, LLC (CSI) IO #1303 Report discussing the April 2019 Geophysical Investigation.

As noted in the CSI IO #1303 Report, one of the primary geologic reports and map sets used in the most recent investigation of was the relatively new 2017 "Geology and Geophysics of White Pine and Lincoln Counties, Nevada, and Adjacent Parts of Nevada and Utah: the Geologic Framework of Regional Groundwater Flow Systems", by Rowley, et. al., Nevada Bureau of Mines and Geology Report 56. This significant mapping effort was intended to compile and update numerous older studies and maps. In the Introduction of the 2017 Rowley report, it notes specifically the lack of geophysics in older reports that the 2017 work is intended to update. The value of geophysics is clear in the Rowley report. In their discussion of the preparation of the map, Rowley, et. al. remind the reader that "(S)ubsurface geometries are relatively unconstrained in cross sections constructed from surface geology alone. Therefore, geophysics and well logs, when located near the line of the sections, are valuable."

In addition, in the final paragraphs of the 5-page "Conclusions", Rowley, et. al., state:

> "Concealed normal faults, whether defining the edges of most basins or within basins, can be located by gravity (maxspots) and AMT [audio-frequency magnetotellurics] data. Upward-continued gravity and aeromagnetic maxspots and some AMT profiles can determine which way the fault or caldera wall dips. Of the two types of geophysics, AMT profiles also provide information on depths to groundwater in some parts of basins. AMT profiles are sufficiently detailed to allow siting of wells on faults, which are the best places to locate production and monitoring wells. Ideally, the best location would be a rangefront fault of a large range with abundant recharge, near

the mouth of a perennial creek that carries some of that recharge. The objective to site a well is to drill the downthrown side of a high-angle normal fault, the larger the better, to intersect the fault beneath the water table. If the dip of this fault is not known but the direction of throw (and the depth to the water table) is, one can assume an average dip of 60 degrees, then position the drill rig with respect to the fault accordingly."

The geophysical method highlighted in the conclusion for investigating the subsurface and targeting drill holes, referred to as AMT, is the same method discussed in Lincoln/Vidler's IO #1303 Report and the CSI IO #1303 Report, referred to there as both CSAMT and AMT. AMT is a well-established geophysical method for measuring either man-made or naturally-occurring electromagnetic fields at a suite of frequencies in order to calculate resistivity at various depths in the subsurface. Many of the AMT surveys referenced in Rowley, et. al., were completed by the USGS as part of a USGS/SNWA joint funding agreement, and are published as Open-File Reports. In reviewing the AMT studies cited by Rowley, while some specific survey parameters are different from those used in Kane Springs Valley and Coyote Spring Valley, primarily due to equipment constraints such as transmitter size and power, which determines the distance between the transmitter and receiver equipment, the survey methodology and logistics are consistent with the work in Kane Springs Valley and Coyote Spring Valley.

In addition, many of the USGS reports referenced in Rowley, et. al., cite, in their introductions to the method, Zonge's description of AMT and CSAMT in our 1991 chapter in the book "Electromagnetic methods in applied geophysics", edited by M.N. Nabighian, published by the Society of Exploration Geophysicists.

We note this here primarily to highlight not only the importance of geophysics in general, but also the fact that the geophysical method used is a well-accepted, reliable technique. In decisions as important and far-reaching as the creation of the joint administrative unit, including portions of six basins, it is certainly prudent that the State Engineer base decisions on information and data from methodologies that are generally well-accepted and reliable, similar to the "Daubert Standards" established in Federal courts.

Although none of the AMT surveys included in Rowley, et. al., show results from Coyote Spring Valley, very similar results are noted in a general sense with respect to data across similar lithologies. For example, Figure 1 below shows Rowley et. al.'s Figure 28, cited from MacPhee, et. al., 2006, which is an AMT cross section crossing the southern section of Spring Valley.

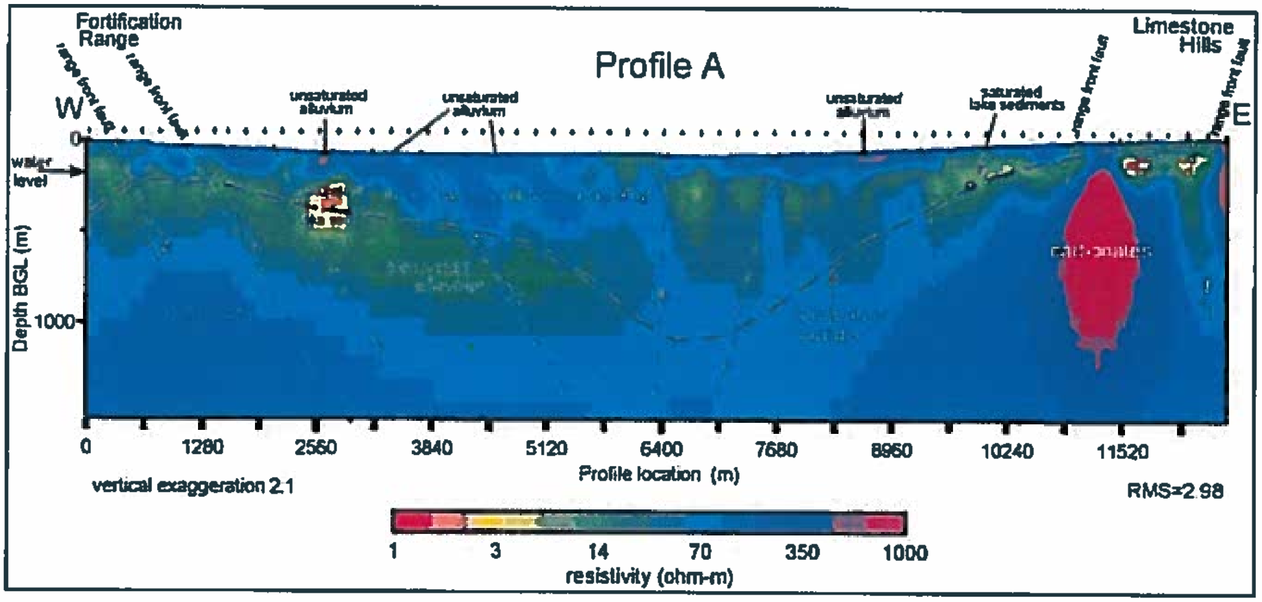


Figure 1: An AMT resistivity cross section from Spring Valley, Nevada (McPhee, et. al., 2006)

The USGS's AMT results are in good agreement with my typical results, in that carbonates are evident as very high resistivity features (1000+ ohm-meters), sharp changes are seen associated with range front faults, resistivity differences are seen associated with saturated versus unsaturated alluvium, and even some extremely low resistivities (approaching the levels of sea water) are evident in some parts of the alluvium, all of which are evident in the work in the IO #1303 Reports. The similarity of general results from different operators using different equipment systems with different processing and modeling software lends credence to the reliability of the AMT methodology. The method used for the Kane Springs Valley and Coyote Spring Valley studies is intentionally not a one-of-a-kind, "black box" system. It is a method that can be duplicated by independent scientists.

It is also useful to note that the maps and geologic cross sections (Plates 1 through 4) included in Rowley, et. al., do not include all of the faults and structure that are shown in the AMT cross sections in the Rowley report figures themselves, primarily due to simple scaling issues. Again, from Rowley's conclusions:

"Geologic maps at 1:250,000 scale cannot do justice to the actual fault complexity of the study area, for thousands of real faults cannot be shown. AMT profiles, as presented here, determined the fault architecture of parts of some basins and of their range-bounding faults, most of which were buried by young basin-fill and surficial sediments. All of the AMT profiles shown in the geophysics chapter, and especially several of the longer profiles, demonstrate this detailed complexity."

Thus, it is clear that the additional complexity delineated in the Kane Springs Valley and Coyote Spring Valley surveys when compared to Rowley's Plate 2 map is completely consistent with Rowley's discussion and final maps.

To summarize, given the amount of ground covered by alluvial material, and the resulting "unconstrained" interpretation of the subsurface, the geophysics in Kane Springs Valley and Coyote Spring Valley is very important to the proper understanding of groundwater flow. In addition, the geophysical work in Kane Springs Valley and Coyote Spring Valley is a valid use of a well-established, scientifically accepted method to further the understanding of the subsurface.

Respectfully submitted,

STATE OF TEXAS
Norman R. Carlson
Geophysics
4703
LICENSED
PROFESSIONAL GEOSCIENTIST

Norman Carlson, PG
(Texas, License # 4703)
Chief Geophysicist
Zonge International, Inc.
www.zonge.com
Offices in Tucson, AZ and Reno, NV.

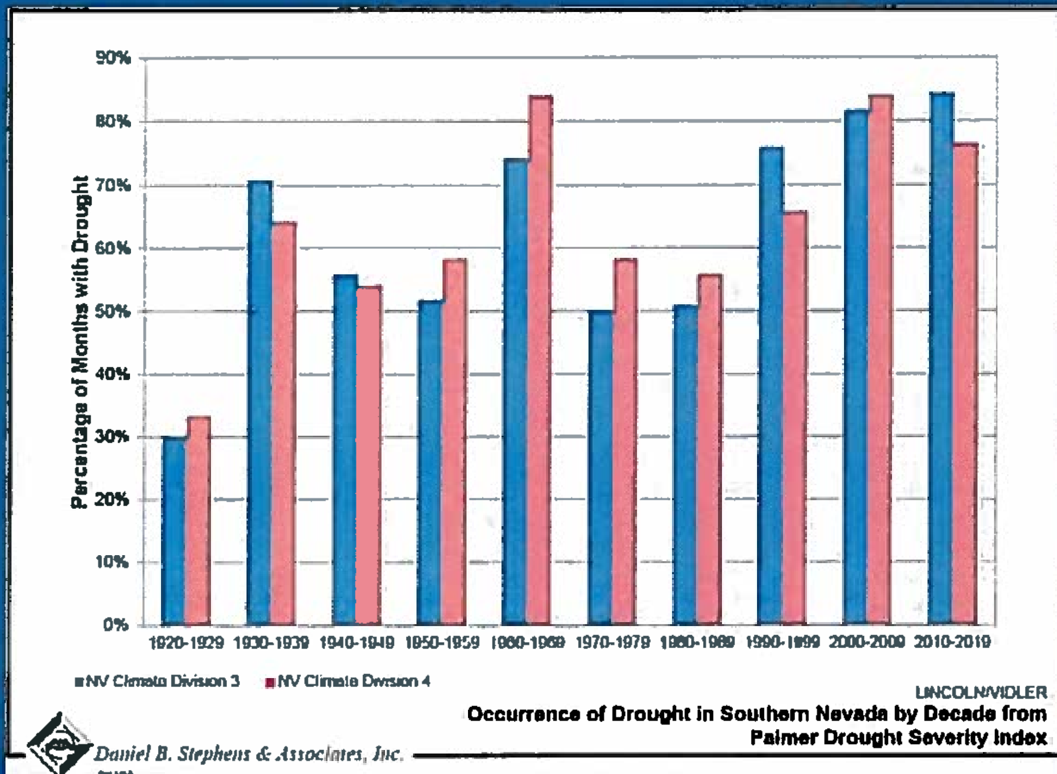
References noted above:

McPhee, D.K., Pellerin, L., Chuchel, J.E., and Dixon, G.L., 2006a, Resistivity imaging in eastern Nevada using the audiomagnetotellurics method for hydrogeologic framework studies, *in* Proceedings of the 19th Annual Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP), Seattle, Washington, April 20-6, 2006, p.712-718.

Rowley, P.D., Dixon, G.L., Mankinen, E.A., Pari, K.T., McPhee, D.K., McKee, E.H., Burns, A.G., Watrus, J.M., Ekrem, E.B., Patrick, W.G., and Brandt, J.M., 2017. "Geology and Geophysics of White Pine and Lincoln Counties, Nevada, and Adjacent Parts of Nevada and Utah: The Geologic Framework of Regional Groundwater Flow Systems", Nevada Bureau of Mines and Geology Report 56, The University of Nevada, Reno.

Zonge, K.L., and L.J. Hughes, 1991. "Controlled source audio-frequency magnetotellurics," *in* Electromagnetic Methods in Applied Geophysics, ed. Nabighian, M.N., Vol. 2, Society of Exploration Geophysicists, pages 713-809.

The Occurrence of Drought has Increased in Recent Decades



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Daniel B. Stephens & Associates, Inc.

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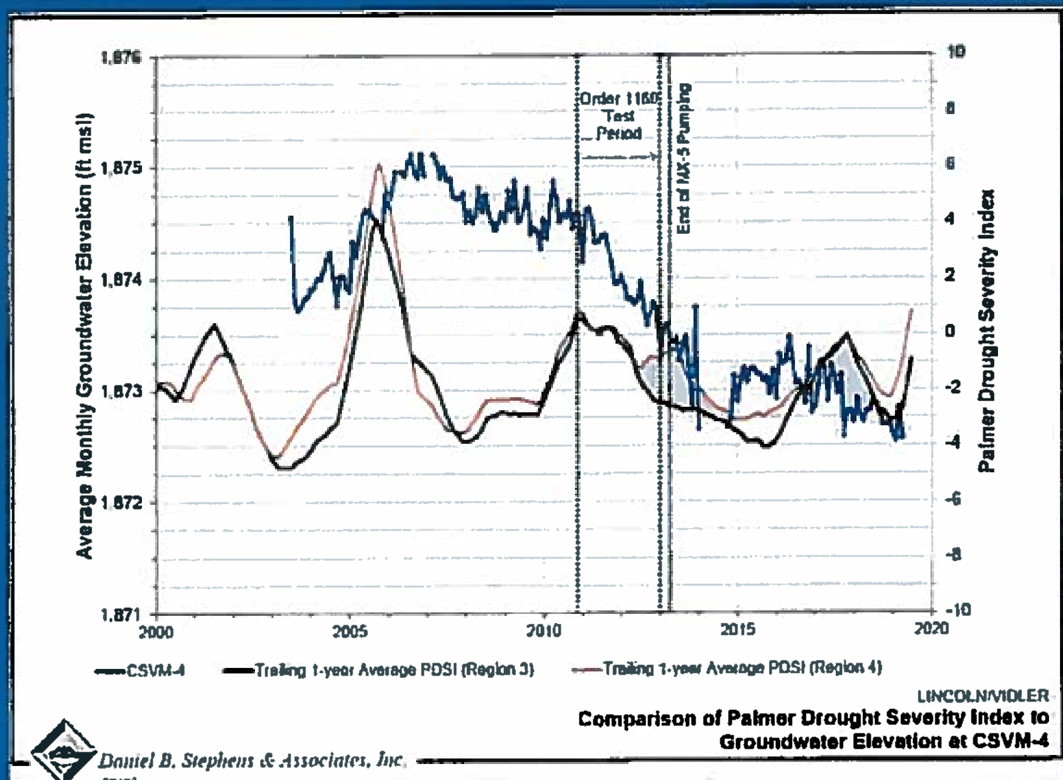
SE ROA 36586

Water Levels in Northern Coyote Spring Valley Decline Due to Drought



DBS&A
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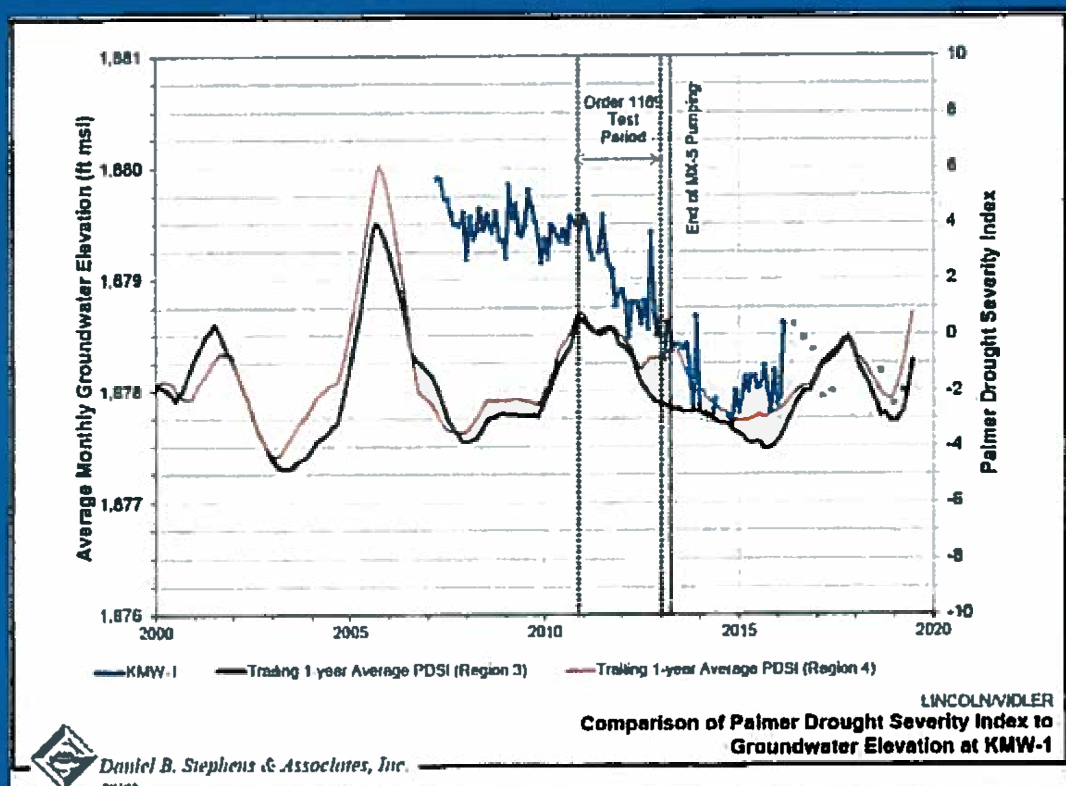
Water Levels in Kane Springs Decline Due to Drought



DBS&A
Daniel B. Stephens & Associates, Inc.

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SE ROA 36591

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Steven D. Grierson
CLERK OF THE COURT

ROA

DYLAN V. FREHNER, ESQ.
Nevada State Bar No. 9020
LINCOLN COUNTY DISTRICT ATTORNEY
181 North Main Street, Suite 205
P.O. Box 60
Pioche, Nevada 89043
Telephone: (775) 962-8073
Email: dfrehner@lincolncountynv.gov

WAYNE O. KLOMP, ESQ.
Nevada State Bar No. 10109
GREAT BASIN LAW
1783 Trek Trail
Reno, Nevada 89521
Telephone: (775) 770-0386
Email: wayne@greatbasinlawyer.com

KAREN A. PETERSON, ESQ.
Nevada State Bar No. 366
ALLISON MacKENZIE, LTD.
402 North Division Street
Carson City, Nevada 89703
Telephone: (775) 687-0202
Email: kpeterson@allisonmackenzie.com

Attorneys for Petitioners, LINCOLN COUNTY WATER DISTRICT and VIDLER WATER COMPANY, INC.

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

DISTRICT COURT

CLARK COUNTY, NEVADA

LAS VEGAS VALLEY WATER DISTRICT, and SOUTHERN NEVADA WATER AUTHORITY, et al., Petitioners, vs. ADAM SULLIVAN, P.E., Acting Nevada State Engineer, et al., Respondent. _______________________________/	Case No. A-20-816761-C Dept. No. 1 Consolidated with Cases: A-20-817765-P A-20-818015-P A-20-817977-P A-20-818069-P A-20-817840-P A-20-817876-P A-21-833572-J

LINCOLN COUNTY WATER DISTRICT AND VIDLER WATER COMPANY, INC.'S MASTER RECORD ON APPEAL CITED IN OPENING, ANSWERING AND REPLY BRIEFS
<u>(VOLUME 3 OF 3)</u>

///

Petitioners, LINCOLN COUNTY WATER DISTRICT ("LINCOLN") and VIDLER WATER COMPANY, INC. ("VIDLER"), by and through their counsel, DYLAN V. FREHNER, LINCOLN COUNTY DISTRICT ATTORNEY, WAYNE O. KLOMP of GREAT BASIN LAW, and KAREN A. PETERSON of ALLISON MacKENZIE, LTD., submit their Master Record on Appeal cited in their Opening, Answering and Reply Briefs in support of their Petition for Judicial Review.

The attached documents constitute excerpts from the Record on Appeal cited in LINCOLN/VIDLER's Opening, Answering and Reply Briefs in support of their Petition for Judicial Review.

DESCRIPTION	SE ROA NO.
Volume 1	2 – 4945
Volume 2	8058 – 36591
Volume 3	36689 – 54520

AFFIRMATION

The undersigned does hereby affirm that the foregoing **DOES NOT** contain the social security number of any person.

DATED this 11th day of January, 2022.

LINCOLN COUNTY DISTRICT ATTORNEY
181 North Main Street, Suite 205
P.O. Box 60
Pioche, Nevada 89043
Telephone: (775) 962-8073

/s/ Dylan V. Frehner
DYLAN V. FREHNER #9020
Email: dfrehner@lincolncountynv.gov

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ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

GREAT BASIN LAW
1783 Trek Trail
Reno, Nevada 89521
Telephone: (775) 770-0386

/s/ Wayne O. Klomp
WAYNE O. KLOMP #10109
Email: wayne@greatbasinlawyer.com

Attorneys for ***Lincoln County Water District***

ALLISON MacKENZIE, LTD.
402 North Division Street
Carson City, Nevada 89703
Telephone: (775) 687-0202

/s/ Karen A. Peterson
KAREN A. PETERSON #366
Email: kpeterson@allisonmackenzie.com

Attorneys for ***Vidler Water Company, Inc.***

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

CERTIFICATE OF SERVICE

Pursuant to NRCP 5(b), I hereby certify that I am an employee of ALLISON MacKENZIE, LTD., Attorneys at Law, and that on this date, I caused a true and correct copy of the foregoing document to be served on all parties to this action by electronic service to the participates in this case who are registered with the Eighth Judicial District Court's Odyssey eFileNV File & Service system to this matter.

I hereby certify that I caused a true and correct copy of the foregoing document to be served via FedEx as follow:

Clark County District Court
Attn: Hon. Bita Yeager – District. Ct. Dept. 1
Court Administration – 2nd Floor
200 Lewis Avenue
Las Vegas, NV 89101

DATED this 11th day of January, 2022.

/s/ Nancy Fontenot
NANCY FONTENOT

4871-7479-1433, v. 1

AMENDED STIPULATION FOR WITHDRAWAL OF PROTESTS

This Amended Stipulation is made and entered into between the Lincoln County Water District and Vidler Water Company, Inc. ("LCWD&VWC") and the United States Department of the Interior, Fish and Wildlife Service (FWS). Collectively, LCWD&VWC and the FWS are referred to as the "Parties".

RECITALS

A. On February 14, 2005, LCWD&VWC filed Applications 72278, 72219, 72220, and 72221, for a combined maximum duty of approximately 17,375.28 acre-feet per year (afy), with the Nevada State Engineer's Office. The above listed applications shall hereinafter be referred as the "Applications". LCWD&VWC initially intend to pump up to 5,000 afy of groundwater from the Kane Springs Valley Hydrographic Basin (hereinafter referred to as "Kane Springs Valley") pursuant to these Applications, for municipal and domestic uses associated with the Coyote Springs Project in Lincoln County.

B. The FWS filed timely protests to the granting of water rights under the Applications pursuant to the FWS' responsibilities under the Endangered Species Act and administration of the National Wildlife Refuge System. FWS holds a Nevada State water right certificate for a flow rate of not less than 3.5 cfs as measured at the Warm Springs West flume (Permit No. 56668; Certificate No. 15097 issued subject to the terms of Permit No. 56668) for the maintenance of habitat of the Moapa dace and other wildlife purposes ("FWS Water Right"). The Moapa dace (Moapa coviacea) is an endemic fish that inhabits the upper Muddy River and tributary thermal spring systems within the Muddy River Springs/Warm Springs Area in Clark County, Nevada. The Moapa dace was federally listed as endangered on March 11, 1967 (32 FR4001). FWS manages the Moapa Valley National Wildlife Refuge established in 1979 as part of the National Wildlife Refuge System.

C. LCWD&VWC assert that the withdrawal of up to 5,000 afy of groundwater from the proposed wells in Kane Springs Valley will not have an unreasonable adverse affect on endangered species in the Coyote Springs Valley or the Muddy River Springs/Warm Springs Area. LCWD&VWC propose to request the State Engineer hold in abeyance the remaining amount requested in the Applications, until a determination is made from the monitoring of the initial groundwater withdrawal that there are no unreasonable adverse affects due to LCWD&VWC's groundwater pumping.

D. The FWS together with the United States National Park Service sent a letter to the Nevada State Engineer, dated February 6, 2006, recommending that the State Engineer amend his Order 1169 to include Kane Springs Valley and these Applications. This Stipulation is entered into in part to address the FWS's concern expressed in the February 6, 2006 letter. As such, the FWS will withdraw its request to the State Engineer by so stating on the record at the beginning of the hearing when the Stipulation is presented to the State Engineer as provided in paragraph 6 of the Stipulation.

E. The FWS asserts that the proposed groundwater withdrawals from Kane Springs Valley pose a risk of adversely impacting senior federal water rights and water-related resources, as described above, and are desirous of working in a cooperative manner with LCWD&VWC to protect these resources.

F. There are a number of existing monitoring programs required by the State Engineer for existing rights and pending applications within Coyote Spring Valley Hydrographic Basin. The State Engineer has determined in Order No. 1169 (Order) that further hydrological study is needed before a final determination can be made on pending applications and new filings to appropriate water from the carbonate-rock aquifer system in Coyote Spring Valley (Basin 210), Black Mountains Area (Basin 215), Garnet Valley (Basin 216), Hidden Valley (Basin 217), Muddy River Springs (Basin 219) and Lower Moapa Valley (Basin 220) in Lincoln and Clark Counties, Nevada. While the Order does not currently include Kane Springs Valley or the Applications, the FWS and LCWD&VWC agree there is a need to develop data relating to a better understanding and analysis to assist the State Engineer in studying the impacts from the pumping of groundwater in the regional aquifer system.

G. The Parties acknowledge that Nevada Water Law provides pursuant to NRS 534.110(4) that "It is a condition of each appropriation of ground water acquired under this chapter [534] that the right of the appropriator relates to a specific quantity of water and that the right must allow for a reasonable lowering of the static water level at the appropriator's point of diversion." Further, pursuant to NRS 534.110(5), Nevada Water Law "does not prevent the granting of permits to applicants later in time on the ground that the diversions under the proposed later appropriations may cause the water level to be lowered at the point of diversion of a prior appropriator, so long as the rights of holders of existing appropriations can be satisfied under such express conditions." It is the intent of the Parties that this Stipulation provides the initial "express conditions" to allow the development of the LCWD&VWC Applications to proceed, however, such future conditions may be different based on implementation of the monitoring, management and mitigation plan specified in Exhibit A, attached to this Stipulation and made a part hereof.

H. The State Engineer has set an administrative hearing on the protests of the FWS and other protestants commencing April 4, 2006.

I. The Parties acknowledge that White Pine County, Wayne, Ruby and Bevan Lister, and the United States National Park Service have lodged protests to the Applications, but that those entities are not Parties to or in any way bound or prejudiced by this Stipulation. Further, these protestants may enter into stipulations with LCWD&VWC concerning the LCWD&VWC Applications. Such stipulations shall not require the participation of the FWS nor modify in anyway the intent or content of this Stipulation, nor shall the FWS be bound or prejudiced by such stipulations.

J. The Parties agree that the preferred conceptual approach for protecting senior federal water rights from injury and federal water-related resources from unreasonable adverse impacts from ground water pumping is through the use of monitoring, management and mitigation of groundwater pumping. The common goal of the Parties is to manage the development of the regional carbonate-rock aquifer and overlying basin-fill aquifer systems as a water resource without causing any injury to senior federal water rights and/or unreasonable adverse impacts to federal water-related resources. Groundwater and the effects of pumping need to be properly monitored and managed to avoid adverse impacts to the water rights and water resources of the FWS. To accomplish this goal, there is a need to obtain accurate and reliable information of the aquifer's response to pumping stresses and the impact of that pumping on water rights and resources of interest. This is to be accomplished by implementing the monitoring, management and mitigation plan as set forth in Exhibit A to this Stipulation. The Parties have determined that it is in their best interests to cooperate in the collection of additional hydrologic and hydrogeologic information as set forth in Exhibit A to this Stipulation.

K. The Parties desire to resolve the issues raised by the protests according to the terms and conditions contained herein.

L. On April 10, 2006, LCWD & VWC filed application nos. 74147, 74148, 74149, and 74150 to appropriate underground water in Kane Springs Valley Hydrographic Basin (subsequent applications). Each of these subsequent filings are identical in quantity (in cfs and acre-feet per year) and point of diversion to the water right applications which are the subject of the Stipulation (application nos. 72218, 72219, 72220, and 72221). LCWD & VWD filing of the subsequent applications was precautionary in nature, and was made to protect Lincoln County Water District and Vidler Water Company's standing in the Kane Springs Hydrographic Basin in the event that applications 72218, 72219, 72220, or 72221 are denied by the State Engineer on a technical or administrative ground. The filing of the subsequent applications raises the same concerns by the FWS as stated in Recital E above. In lieu of filing protests to the subsequent applications, the parties agree that the subsequent applications shall be subject to the terms and conditions of this Amended Stipulation and do not in any way supplement applications 72218, 72219, 72220, and 72221, which are currently under consideration by the State Engineer.

NOW, THEREFORE, in consideration of the mutual promises and covenants contained herein, the Parties do agree as follows:

1. The FWS hereby expressly agrees to withdraw its protests to the Applications and agrees that the Nevada State Engineer may rule on the Applications based upon the terms and conditions set forth herein. The FWS agrees not to file protests to the subsequent applications based on the inclusion of the subsequent applications in this Amended Stipulation (hereinafter referred to as "Stipulation") and that the terms and condition of this Stipulation apply equally to the subsequent applications. Hereinafter in this Stipulation, the term "Applications" shall also refer to the subsequent applications. It is expressly understood that this Stipulation is binding only upon the Parties hereto and their successors, transferees and assigns, and shall not bind or seek to bind or prejudice

any other Parties or protestants, including the United States as trustee on behalf of the any Indian tribe. The execution and filing of this Stipulation with the State Engineer shall have the effect of withdrawing the FWS protests as provided for in Nevada Administrative Code § 533.150.

2. The Parties agree to implement the Monitoring, Management and Mitigation plan, attached hereto "Exhibit A", which is expressly incorporated into this Stipulation as if set forth in full herein upon the State Engineer's granting of the Applications, in total or in part, and upon the terms and conditions contained in Exhibit A.

3. This Stipulation does not waive any authorities of the FWS or the United States, including any other agency or bureau not specified in this Stipulation, nor relieves LCWD&VWC, or any party acting in conjunction with or through LCWD&VWC from complying with any federal laws, including, but not limited to, the National Environmental Policy Act, the Endangered Species Act, the Federal Land Policy and Management Act, and any and all rules and regulations thereunder. It is the expressed intention of the Parties that by entering into this Stipulation, the FWS and the United States are waiving no legal rights of any kind, except for the withdrawal of its protests as provided in Paragraph 1 of this Stipulation. Likewise, LCWD&VWC, or any party acting in conjunction with or through LCWD&VWC, by entering into this Stipulation, are not waiving any legal rights of any kind, except as expressly provided in this Stipulation and its Exhibit A.

4. Further, except as expressly stated in this Stipulation or its Exhibit A, this Stipulation does not affect any legal or administrative process or proceeding concerning rights-of-way or any action that may be necessary to further the development and/or use of the water sought under the Applications.

5. The Parties expressly acknowledge that the Nevada State Engineer has, pursuant to both statutory and case law, broad authority to administer groundwater resources in the State of Nevada and, furthermore, that nothing contained in this Stipulation shall be construed as waiving or in any manner diminishing such authority.

6. The Parties agree that a copy of this Stipulation shall be submitted to the Nevada State Engineer prior to the commencement of the administrative proceedings scheduled to begin on April 4, 2006. The Parties shall request on the record at the beginning of the scheduled proceeding, that the State Engineer include Exhibit A of the Stipulation as part of the permit terms and conditions, in the event that he grants Applications 72278, 72219, 72220, and 72221, in total or in part. The FWS, at its option, may attend the hearing, but will present no issues or statements unless necessary to explain or defend this Stipulation or Exhibit A.

7. Notices. If notice is required to be sent by the Parties, the addresses are as follows:

If to FWS:

Supervisor
Nevada Field Office
Fish and Wildlife Service
1340 Financial Blvd., #234
Reno, NV 89502

If to LCWD&VWC:
Chairman
Lincoln County Water District
P.O. Box 685
Pioche, NV 89043

And:
Dorothy Timian-Palmer
Vidler Water Company, Inc.
704 W. Nye Lane, Suite 201
Carson City, NV 89703

8. LCWD&VWC may transfer or assign its interest in the water rights here involved. Any and all transferees and assignees shall be bound by the terms and conditions of this Stipulation. As a condition to any such transfer or assignment, the transferee and/or assignee shall execute a stipulation expressly stating it is bound to all of the terms and conditions of this Stipulation.

9. This Stipulation shall be governed in accordance with the laws of the State of Nevada to the extent not inconsistent with federal law.

10. Copies of all correspondence between and data gathered by the Parties pertinent to the terms of Exhibit A shall be submitted to the Nevada State Engineer. It is the intentions of the Parties hereto that the Nevada State Engineer shall be kept informed of all activities in the same fashion as are the Parties hereto.

11. By entering into this Stipulation, the FWS does not become a party to any proceeding other than the protest proceeding referenced above or waive its immunity from suit or consent to or acknowledge the jurisdiction of any court or tribunal. Nothing in the Stipulation shall affect any federal reserved water rights of the FWS or the United States on behalf of any Indian Tribe and the FWS by entering into this Stipulation do not waive or prejudice any such rights. The FWS reserves all legal rights, of any kind, it possesses pursuant to or derived from Executive Orders, acts of Congress, judicial decisions, or regulations promulgated pursuant thereto. Neither party waives its rights to seek relief in any appropriate forum of its choice not expressly prohibited by this Stipulation.

12. Any commitment of funding by the FWS or Lincoln County Water District in this Stipulation or otherwise is subject to appropriations by Congress or the governing body of the Lincoln County Water District as appropriate.

13. This Stipulation may be amended by mutual agreement of the Parties.

14. This Stipulation sets forth the entire agreement of the Parties and supercedes all prior discussions, negotiations, understandings or agreements. No alteration of variation of this Stipulation shall be valid or binding unless contained in an amendment in accordance with paragraph 13.

15. This Stipulation is entered into for the purpose of resolving a disputed claim. The Parties agree that the Stipulation shall not be offered as evidence or treated as an admission regarding any matter herein and may not be used in proceedings on any other application or protest whatsoever, except that the Stipulation may be used in any future proceeding to interpret and/or enforce the terms of this Stipulation. Further, the Parties agree that neither the Stipulation nor any of its terms shall be used to establish precedent with respect to any other application or protest in any water rights adjudication or water rights permitting proceeding before the Nevada State Engineer or any other proceeding.

16. The terms and conditions of this Stipulation shall be binding upon and inure to the benefit of the Parties hereto and their respective, successors, transferees and assigns.

17. This Stipulation will become effective as between the Parties upon all Parties signing this Stipulation. The Parties may execute this Stipulation in two or more counterparts, which shall, in the aggregate, be signed by all Parties; each counterpart shall be deemed an original as against any Party who has signed it.

18. Other entities may become Parties to this Stipulation by mutual assent of the Parties.

19. Nothing contained herein shall limit the right of LCWD & VWC, or their successors, transferees, or assigns to assign, pledge, or encumber as security the Applications that are the subject of this Stipulation.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement on the dates written below.

UNITED STATES DEPARTMENT OF THE INTERIOR

Date: 8/1/2006

Fish and Wildlife Service

By: Steve Thompson

Title: CNO MANAGER

7-17-06

Date:

LINCOLN COUNTY WATER DISTRICT

By Randy Hornbeck

Title: Chairwoman

Date: 7-19-06

VIDLER WATER COMPANY, INC.

By [signature]

Title: Chief Operating Officer

ATTEST:

[signature]

LCWD Legal Counsel

SE ROA 36695

EXHIBIT A
for
Amended Stipulation between LCWD&VWC and the United States Fish and Wildlife Service

MONITORING, MANAGEMENT AND MITIGATION PLAN GROUNDWATER DEVELOPMENT IN KANE SPRINGS VALLEY

The purpose of this plan is to describe the agreements of Lincoln County Water District and Vidler Water Company, Inc. (LCWD&VWC) and the United States Fish and Wildlife Service (FWS) regarding the monitoring, management, and mitigation of potential impacts due to development of ground-water resources in the Kane Springs Valley area. This plan applies to proposed ground-water development in Kane Springs Valley that consists of the use of water under State of Nevada water-rights applications numbered 72218, 72219, 72220 and 72221 and the subsequent applications 74147, 74148, 74149, and 74150, filed by LCWD&VWC.

The Plan describes the LCWD&VWC and FWS (hereinafter referred to as "the parties") obligations regarding the development, monitoring, management, and mitigation related to the above numbered applications in Kane Springs Valley Hydrographic Basin for use that water in Coyote Spring Valley Hydrographic Basin.

This plan consists of four principle components, as follows:

1. *Monitoring Requirements*, related to production wells, monitoring wells, elevation control, and springflow, water quality, quality of data, and reporting;
2. *Management Requirements*, related to the creation and role of a Technical Review Team (hereinafter referred to as "the TRT"), the development and use of a numerical ground-water flow model, the establishment of action criteria, and the details of the decision-making process;
3. *Mitigation Requirements;* and
4. *Modification of the Plan*

The common goal of the parties is to manage the development of the LCWD&VWC Water Rights in their entirety from Kane Springs Valley Hydrographic Basin, without resulting in any losses to senior federal water rights or unreasonable adverse impacts to federal water resources. The parties will collaborate on technical data collection and analysis and will rely on the best scientific information available in making decisions required by the Plan.

1. Monitoring Requirements

A. Production Wells

- LCWD&VWC will record discharge and water levels in their production wells in Kane Springs Valley on a continuous basis as is feasible.

B. Monitoring Wells

LCWD&VWC, as determined by the parties to this agreement, in consultation with the Nevada State

Engineer, shall locate and construct two monitoring wells down gradient from the Kane Springs Valley ground-water production well (KMW-1). The location of the first proposed monitoring well (CSIMW-1) is to be an equal distance between the existing Southern Nevada Water Authority Monitoring Well Four (CSVM-4) and the Coyote Spring Investment monitoring well CE-VF-2. Further, CSIMW-1 will be located on the north (hydraulically upgradient) side of the interpreted southwestern extension of the Kane Springs Wash fault zone on Coyote Springs Investment property along the existing abandoned Highway 93. The second proposed monitoring well (CSIMW-2) is to be located on the south (hydraulically downgradient) side of the interpreted southwestern extension of the Kane Springs Wash fault zone on Coyote Springs Investment property along the existing abandoned Highway 93. Specifically, the second well would be sited such that the distance between the monitoring well CSIMW-1 and the aforementioned fault zone is approximately equal to the distance between the fault zone and CSIMW-2. See Attachments "A-1", "A-2", "A-3" and "A-4" to this Exhibit A. FWS shall work with LCWD&VWC in good faith to ensure that the well is located and constructed in a cost-effective manner, to enable the monitoring of the potential southward progression of groundwater level declines resulting from proposed ground-water production in Kane Springs Valley.

- All monitoring wells used as part of this plan shall be installed and water levels recorded on a continuous basis as is feasible, beginning as soon as possible after the State Engineer decision relative to the Kane Springs Valley Applications.

- The initial groundwater level would be established at the time that the pumping wells in Kane Spring Valley were ready to go on-line.

- The term "as is feasible" shall relate to mechanical failures and the issues associated with the remoteness of the locations, or other events outside the control of the parties that do not permit data collection.

- The locations and monitoring frequency of the monitoring-well network will be reviewed by the TRT on an annual basis beginning in 2007, and may be reduced or expanded in scope upon its recommendation.

C. *Elevation Control*

- LCWD&VWC will conduct a detailed elevation survey of all their wells used for monitoring as part of this plan. LCWD&VWC will cooperate in any regional plan organized by the Nevada State Engineer to determine elevation above sea level of all major spring orifices and monitoring and production wells in the Lower Colorado Flow System region. LCWD/VWC will match the Southern Nevada Water Authority's current datum relating to monitoring and production well elevations.

D. *Water Quality*

- LCWD&VWC will collect water quality samples and have them analyzed for major ions, trace elements, and isotopes at all production and monitor wells used as part of this plan (as specified in Sections 1.A and 1.B.) commencing July 1, 2007.

- Thereafter, LCWD&VWC will collect and analyze water-quality samples for major ions, trace elements, and isotopes at all production and monitoring wells used as part of this plan every five years thereafter.

- Samples will be collected, analyzed and reported according to standard methods.

- Frequency, sampling location, and water quality parameters will be reviewed by the TRT on an annual basis beginning in 2007, and may be reduced or expanded in scope upon its recommendation.

E. *Reporting*

- All data collected under or as described in this plan, shall be fully and cooperatively shared among the parties.

- Water level and production data shall be provided to the FWS within 60 days of its collection by LCWD&VWC. LCWD&VWC will use its best efforts to provide data to the FWS within 30 days of its submission to LCWD&VWC, or in the case of water quality data, within 90 days of receipt of laboratory results.

- LCWD&VWC will report the results of all monitoring and sampling under this plan in an annual monitoring report

2. <u>Management Requirements</u>

A. Action Criteria

The Parties recognize that maintenance of minimum in-stream flows in the Warm Springs area is essential for the protection and recovery of the Moapa dace. Further, the parties recognize that existing data is insufficient to determine if the groundwater development in Kane Springs Valley Hydrographic Basin, that is the subject of the Plan, affects the in-stream flows in the Muddy River Springs/Warm Springs Area, and if so, to what extent. Thus, the parties agree as follows:

1. For purposes of this paragraph A., all "Average Flow Levels" specified herein shall be determined by flow measurements at the Warm Springs West flume. Average Flow Levels will be determined to have reached a particular level within a range specified in paragraphs B(2) through (7) ("Trigger Range"): (1) if the daily average flow for each of 45 consecutive days decreases to an amount within the Trigger Range, or if the 90 day average flow over any 90 consecutive day period decreases to an amount within the Trigger Range; or (2) if the daily average flow for each of 90 consecutive days increases to an amount within the Trigger Range, or if the 135-day average flow over any 135 consecutive day period increases to an amount within the Trigger Range. Any adjustment in the rating curve for the Warm Springs West flume shall result in a pro-rata adjustment of the Trigger Ranges.

2. If the Average Flow Level decreases to an amount within the Trigger Range of 3.2 cfs or less, the Parties agree to meet as soon as practicably possible to discuss and interpret all available data and plan for mitigation measures in the event flows continue to decline; and

3. If the Average Flow Level is within the Trigger Range of 3.15 cfs or less but greater than 3.0 cfs, LCWD&VWC agree to reduce pumping from all wells in Kane Springs Valley by 50% or to a pumping level no greater than 2,500 afy, whichever results in the lesser amount of pumping, until the Average Flow Level exceeds 3.15 cfs.

4. If the Average Flow Level is within the Trigger Range of 3.0 cfs or less, LCWD&VWC agree to cease pumping from all wells in Kane Springs Valley until the Average Flow Level exceeds 3.0 cfs. However, if LCWD&VWC, together with Coyote Springs Investment, LLC ("CSI"), effectuate a reduction in the quantity of water CSI would have otherwise been entitled to pump in a given year from wells within the Coyote Spring Valley, then LCWD&VWD shall have the right to pump a like quantity of water from wells within Kane Springs Valley in that year.

B. Technical Review Team

1. Upon execution of this Stipulation, the Parties shall establish a Technical Review Team ("TRT") whose members shall include two representatives ("TRT Representatives") each from LCWD&VWC and the FWS, including at least one with substantial formal training and experience in hydrogeology ("Technical Representative"). Except as otherwise provided herein, the two TRT Representatives shall together have one vote on TRT matters. By consensus, the TRT Representatives may offer voting or non-voting TRT membership to others who provide regional monitoring records and analyses to the TRT.

2. The objectives of the TRT shall be to review existing data, make recommendations concerning the monitoring efforts required by this Plan, and determine whether other criteria, such as water levels in monitoring wells, are a better indicator of potential effects of the pumping wells on the springs in the Muddy River Springs/Warm Springs Area. Either party may advance any recommendation for consideration by the other party to modify the action criteria. However, no change in the action criteria shall occur within the first five (5) years following the effective date of the Plan. After this five year period, and if the TRT reaches a consensus on changes to the action criteria, such criteria may be changed.

3. If the TRT Representatives are unable to reach consensus on the action criteria, the Parties shall refer the matter to a qualified panel of third party reviewers ("Panel") consisting of three scientists unaffiliated with any Party and having substantial formal training and experience in hydrogeology. If the Parties cannot agree by consensus on the make-up of the Panel, one member of the Panel shall be designated by each of the following from its own ranks: U.S. Geologic Survey, Nevada State Engineer (if the Nevada State Engineer declines to participate, then the Desert Research Institute shall be substituted), and a private firm with the requisite expertise designated by a majority of the Parties ("Appointing Entities"), provided that the Parties by consensus may designate different similarly qualified Appointing Entities. If any Appointing Entity for any reason is unable or refuses to designate a member of the Panel, the Parties by majority vote shall designate a qualified replacement Appointing Entity. The purpose of the referral to the Panel will be to obtain peer review of the then-current action criteria, the data upon which it is based, all previously submitted data and reports, and any other relevant and available data and analytical materials. The Panel will be asked to make its recommendation

based on the foregoing information concerning the appropriate content of the action criteria. All Parties shall have a fair and reasonable opportunity to present factual and analytical submissions in person and/or in writing to the Panel. The Parties contemplate that a determination of the Panel on the action criteria will constitute the best available scientific information concerning the impacts on Muddy River Springs/Warm Springs Area and Muddy River flows resulting from regional groundwater pumping, and the appropriateness of any proposed pumping restriction adjustments. The cost of the Panel shall be borne equally by the Parties.

3. <u>Mitigation Requirements</u>

- LCWD&VWC will mitigate unreasonable adverse impacts either as agreed upon by the parties or after the Nevada State Engineer determines whether there are unreasonable adverse impacts due to LCWD&VWC pumping. LCWD&VWC will take the necessary steps to ensure that mitigation actions are feasible.

- As part of their commitment to the recovery of the Moapa dace, LCWD&VWC shall commit $50,000, annually for a period of five (5) years following the granting of the Applications, in total or in part, for the restoration of Moapa dace habitat outside the boundaries of the Moapa National Wildlife Refuge. Such restoration shall be conducted as agreed to by the FWS. In the event that the Applications as granted by the State Engineer total less than 2,500 afy, the parties agree to meet and renegotiate the annual funding amount to be consistent with the lesser quantity of water granted and the commitment by LCWD&VWC to participate in restoration activities of the Moapa dace. FWS acknowledges that Coyote Springs Investment LLC, a Nevada limited liability company (CSI), has dedicated certain quantities of water pursuant to a Memorandum of Agreement by and between the Southern Nevada Water Authority, the United States Fish and Wildlife Service, CSI, the Moapa Band of Paiutes, and the Moapa Valley Water District. FWS further acknowledges that CSI is the intended beneficiary of the water to be developed pursuant to the Applications. Thus, in the event that pumping of groundwater pursuant to the Applications is restricted pursuant to Section 2. A. of this Exhibit A to the Stipulation, FWS agrees to use any quantities of water dedicated by CSI pursuant to the MOA for the survival and recovery of the Moapa dace as directed in the MOA.

4. <u>Modification of the Plan</u>

- LCWD&VWC and the FWS may modify this plan by mutual agreement. The parties also acknowledge that the State Engineer has the authority to modify this plan. In addition, LCWD&VWC and the FWS may individually or jointly petition the State Engineer to modify this plan in the event that mutual agreement cannot be reached. Any such petition shall only be filed after 90 days written notice to the remaining party. Either LCWD&VWC or the FWS may submit written comments to the State Engineer regarding the merits of any such petition for modification.

and the LWRFS above the Warm Springs area (Figure 1). As shown on figure 3, the gradient between KMW-1 and CSVM-4 is 4.9×10^{-4} ft/ft. The gradient calculated on a straight line between KMW-1 and EH-5B (immediately up-gradient from the Warm Springs area) is 5.9×10^{-4} ft/ft. Figure 3 shows additional gradients calculated between the upper CSV and the lower CSV, and between the lower CSV and the Warm Springs area. Gradients in these areas are between 1.1×10^{-4} ft/ft and 7.6×10^{-4} ft/ft.

Groundwater gradients are consistent between KSV, upper CSV, CSV, and the Warm Springs Area. While the groundwater elevations in individual wells change over large distances, the overall groundwater gradient remains very flat. The flat gradient that persists throughout the region is indicative of a highly transmissive aquifer that would allow pumping effects from KSV to be transmitted to the Warm Springs Area. Variations in groundwater elevations do not require the presence of a buried structure that would truncate the LWRFS.

Thank you for the opportunity to provide rebuttal comments on submittals on the Interim Order 1303. Please contact either Joe Davis with the Moapa Valley Water District at 702-397-6893; joe@moapawater.com (601 N. Moapa Valley Blvd., Overton Nevada, 89040) or Jay Lazarus with Glorieta Geoscience, Inc. at 505-983-5446 x111; lazarus@glorietageo.com (PO Box 5727 Santa Fe, NM 87502) with any questions or comments.

Sincerely,

Joseph Davis

Joseph Davis
General Manager
Moapa Valley Water District

Sincerely,

Jay Lazarus

Jay Lazarus
Pres. /Sr. Geohydrologist
Glorieta Geoscience, Inc.

IN THE OFFICE OF THE STATE ENGINEER

OF THE STATE OF NEVADA

IN THE MATTER OF THE ADMINISTRATION AND MANAGEMENT OF THE LOWER WHITE RIVER FLOW SYSTEM WITHIN COYOTE SPRING VALLEY HYDROGRAPHIC BASIN (210), A PORTION OF BLACK MOUNTAINS AREA HYDROGRAPHIC BASIN (215), GARNET VALLEY HYDROGRAPHIC BASIN (216), HIDDEN VALLEY HYDROGRAPHIC BASIN (217), CALIFORNIA WASH HYDROGRAPHIC BASIN (218), AND MUDDY RIVER SPRINGS AREA (AKA UPPER MOAPA VALLEY) HYDROGRAPHIC BASIN (219). LINCOLN AND CLARK COUNTIES, NEVADA.	)	**INTERIM ORDER 1303**

MUDDY VALLEY IRRIGATION COMPANY
EXHIBIT NO. 1
REBUTTAL REPORT ATTACHED

Muddy Valley Irrigation Company

P. O. Box 665
Overton, NV 89040

August 15, 2019

Mr. Tim Wilson, P. E.
Acting State Engineer
Nevada Division of Water Resources
Department of Conservation and Natural Resources
301 South Carson Street, Suite 2002
Carson City, Nv 89701
twilson@water.nv.gov

RE: Muddy Valley Irrigation Company's Rebuttal
Report: Interim Order 1303

Dear Mr. Wilson:

As requested in Order 1303, the Muddy Valley Irrigation Company (hereafter "MVIC or "Company") submits this Rebuttal in response to the Reports filed on July 3, 2019. Said July 3, 2019 Reports were filed by twelve entities who expressed various opinions on the questions presented relative to the amount of groundwater that may be pumped within the Lower White River Flow System ("LWRFS") without conflicting with the fully appropriated and adjudicated waters of the Muddy River.

As a preface to its Rebuttal responses MVIC first observes that pursuant to NRS 533.024(1)(e), Order 1303's goal (p 11) seems to be for LWRFS groundwater permittees to propose a conjunctive management plan remedy. Such a plan, if amenable to senior surface water right holders, could mitigate impacts caused by groundwater pumping which is currently diminishing Muddy River spring and river flows. This goal, if not achieved, arguably limits the State Engineer's options in view of appears to be the present stakeholder consensus that pumping of groundwater (alluvial and carbonate) within the LWRFS has a direct connectivity with Muddy River flows.

MVIC's Rebuttal hereinbelow per Order 1303's direction addresses some of the specific (whether individual stakeholder report or combined stakeholder reports) conclusions relative to MVIC's interests in this proceeding.

I. Introduction

MVIC owns the majority of the Muddy River decreed surface water rights, which rights are senior to all groundwater rights within the LWRFS. A summary of MVIC's history rights and responsibilities follows:

MVIC has been in existence as a Nevada corporation since 1895 for purposes which include the acquisition of water rights and the construction operation and maintenance of their associated irrigation works of diversion and distribution for the Company's and its shareholders "beneficial use of Muddy River water within the Moapa Valley.

All Muddy River water rights including MVIC's were adjudicated in <u>Muddy Valley Irrigation Company v. Moapa and Salt Lake Produce Company et al</u> ("Decree") in 1920 by the 10th Judicial District Court, (now the Eighth District) for the State of Nevada ("Court"). The Decree is very explicit in its adjudication of any and every right and to the certain parties entitled to the use of Muddy River water.

The Decree determined that with the exception of the rights of the other named defendants, that MVIC is the holder of all rights in the Muddy River and all of said water rights are vested rights acquired by valid appropriation and beneficial use prior to March 1, 1905. That they are also considered as equal in rank without one having priority over any other, that the Muddy River is to be operationally divided into two parts (as far as practicable) the upper and the lower, and that the Muddy River is fully adjudicated; specifically holding:

> "Muddy Valley Irrigation Company is declared and decreed to have acquired by valid appropriation and beneficial use and to be entitled to divert and use… all of the waters of said Muddy River, its head waters, sources of supply and tributaries said water sources, supply save and accept the several amounts and rights hereinbefore specified and described as awarded and decreed…". Decree, p 20, par 7.

Not only did the Court hold that MVIC owns all the water rights not decreed to others, but that the Company is to divert all those waters for the use of the shareholders.

The Court provides for the State Engineer to supervise the Muddy River with the administration and control of the lower Muddy River provided by MVIC:

> "The Muddy Valley Irrigation Company, although under the supervision and control of the state engineer and commissioner shall subject to said supervision and general control, distribute and control the distribution of the waters diverted and conveyed by its works to its stockholders and other persons obtaining waters by means thereof." Decree, p 21, par 9,

and further:

> "That the aggregate volume of the several amounts and quantities of water awarded and allocated to the parties…**is the total available flow of the said Muddy River and consumes and exhausts all of the available flow in the said Muddy River, the head water, sources of supply and tributaries**" (emphasis added) Decree, p 22, par12.

The Court also ordered a perpetual restraint and injunction against any party from interfering with any adjudicated rights and grants the State Engineer authority to enforce the adjudicated Muddy River water rights. Decree, p21, par 14.

The above history of the Company's and the other senior surface water rights adjudicated and protected by the Decree is provided as context for MVIC's interests with respect to LWRFS groundwater development determinations in this proceeding.

There are currently just over 250 individual shareholders holding shares in the Company. As a Nevada corporation MVIC has a duty to preserve and protect its valuable Nevada water rights. Said water rights are assets of the Company acquired for the benefit of the shareholders. The shareholders are the equitable owners of MVIC's Muddy River water rights in their respective proportionate interest (shares owned) in the Company.

II. Rebuttal Response Order 1303

a. The geographic boundary of the hydrologically connected groundwater and surface water systems comprising the LWRFS

MVIC does not disagree with the Nevada State Engineer ("NSE") Order 1303 geographic boundary determinations for the LWRFS.

b. The information obtained from the Order 1169 aquifer test and subsequent to the aquifer test and Muddy River headwater spring flow as it relates to aquifer recovery since the completion of the aquifer test.

MVIC concurs with the discussion points at Section 8.2 of the Southern Nevada Water Authority ("SNWA") Report.

c. The long-term annual quantity of groundwater that may be purged from the Lower White River Flow System, including the relationship between the location of pumping on discharge to the Muddy River springs and the capture of Muddy River flow.

MVIC concurs with the technical analysis and conclusions in the SNWA Report at Section 8.2-8.4, where SNWA states that groundwater production in the MRSA and to a lesser extent the rest of the LWRFS has depleted Muddy River stream flows and thus conflicts with Muddy River Decree senior surface water rights.

d. The effects of movement of water rights between alluvial wells and carbonate wells on deliveries of senior rights to the Muddy River.

MVIC concurs with the SNWA Report at Section 8.4 changing points of diversion from the MRSA alluvial reservoir to locations in the carbonate aquifer will delay but not prevent reduced spring discharges and Muddy River flows.

As part of its Order 1303, section d filing, the MBP's Report (p 24, par 2) observes that groundwater allocations in the MRSA beginning in 1948 are not consonant with the Decree because the alluvial aquifer is intimately connected with the Muddy River. Based on the now available technical information related pumping data, this is certainly an accurate statement. There is however a statement further down in the same paragraph that should be noted for correction that reads: "Groundwater rights in the MRSA are nearly all junior to those who hold surface water rights under the Muddy River Decree". Rights to the entire Muddy River, including all waters, sources and flows were adjudicated by the Court, which determined that all surface water rights therein vested prior to March 1, 1905 (Decree, p 20, par 8). Muddy River surface water rights are senior in priority to all LWRFS groundwater rights.

e. Any other matters believed to be relevant to the State Engineer's analysis.

MVIC concurs with the conclusions presented by the SNWA Report at Section 8.5. MVIC restates its initial comments above (p1, par2) that absent a mutually agreeable LWRFS conjunctive management plan, the remedy options available to the State Engineer in this Order 1303 proceeding are limited.

Sincerely,

Todd Robison
MVIC'S Chairman of the Board

In the 2011 State Engineer hearing on pending applications for groundwater in Delamar, Dry Lake and Cave Valleys, SNWA presented evidence and expert testimony in support of subsurface flow that bypassed the Muddy River and springs, flowing in the subsurface south from the Muddy River Springs Area to California Wash. The groundwater then exited the LWRFS somewhere along the southern or southeastern perimeter of the area. This amount was estimated to be 9,900 afy. The State Engineer accepted this evidence and expert testimony in Rulings 6254 through 6261. The source of that water was groundwater recharge distributed among all of the upgradient basins, including those basins in which SNWA had applications to appropriate groundwater. SNWA now argues that probably all of the groundwater in the LWRFS discharges to the Muddy River and springs, and that there is no bypass flow. NVEnergy disagrees.

Other respondents to Order 1303 information requests also believe that some amount of groundwater bypasses the Muddy River. The Moapa Band of Paiutes argue that perhaps up to 40,000 afy flows through Hidden and Garnet Valleys to the Las Vegas Valley. The City of North Las Vegas believes that there is some amount of subsurface discharge in the southeast portion of the LWRFS, but do not go so far as to estimate the amount. NV Energy agrees that there is some amount of groundwater that bypasses the Muddy River and springs. The amount is unclear, but SNWA argued in the 2011 hearing that the amount is 9,900 afy, and the State Engineer agreed. There is an approximately 40-mile perimeter east of California Wash and south of Garnet Valley and the Black Mountains Area where there is a potentiometric gradient to the east and south, away from the LWRFS. It seems impossible that the entire perimeter of the LWRFS is impermeable. Given the existing gradients, the thickness of the carbonate aquifer, and the length of the perimeter, it is possible that 10,000 afy could exit the LWRFS to the Las Vegas Valley or to the lower portions of the Black Mountains Area or Lake Mead.

The likelihood of subsurface flow bypassing the Muddy River and springs is important because that means that it is possible to capture groundwater discharge without causing a 1:1 depletion of the Muddy River or springs. The post-Order 1169 analyses discussed above show clear evidence that steady state conditions are being reached in the Muddy River Springs Area with 7,000 to 8,000 afy of carbonate pumping. The depletion of the Muddy River with this amount of pumping appears to be on the order of 2,300 to 3,750 afy, and is not increasing. Using these figures, impacts to the Muddy River appear to be on the order of 25% to 50% of the amount of groundwater pumped under the current pumping regime. NVEnergy agrees with respondents MBOP, North Las Vegas and others that groundwater pumping at locations further south, toward the southern boundary of the LWRFS, are likely to have less effect on the Muddy River and springs than pumping in Coyote Spring Valley or the Muddy River Springs Area.

The effects of movement of water rights between alluvial wells and carbonate wells on deliveries of senior decreed rights to the Muddy River.

Respondents to Order 1303 generally agree that pumping from the alluvial aquifer in the Muddy River Springs Area impacts the Muddy River flows and deplete those flows on a near 1:1 ratio in a short period of time. SNWA also argues that carbonate pumping in the LWRFS will have a 1:1 effect on discharge from the springs and the Muddy River, but the time frame is longer for these effects to occur. NV Energy disagrees with SNWA that all pumping will ultimately deplete the Muddy River at a 1:1 ratio. As discussed above, water levels, spring flows, and the flow of the Muddy River at the Moapa gage have essentially stabilized under the current pumping regime. Depletion of the Muddy River at Moapa was 3,750 acre-feet in 2015, 3,598 acre-feet in 2016, 3,569 acre-feet in 2017, and decreased to about 2,300 acre-feet in 2018 (SNWA Fig 5-3 and Table 7-2), increases in flow that occurred during a time period that carbonate aquifer pumping was relatively stable. Furthermore, because there does appear to be

Assessment of Lower White River Flow System Water Resource Conditions and Aquifer Response

PRESENTATION TO THE OFFICE OF THE NEVADA STATE ENGINEER

Prepared by

Southern Nevada Water Authority

Las Vegas Valley Water District

June 2019

2.0 SOURCES OF INFORMATION

This assessment required a review of the existing literature and the use of large quantities of data acquired from various sources. Depth to water measurements for wells and discharge measurements for the Muddy River and selected springs located in the LWRFS were assembled into an extensive database. These data were analyzed to evaluate current groundwater conditions, hydraulic gradients and flow directions, and aquifer responses to natural and anthropogenic stresses.

2.1 Previous Investigations

Previous investigations completed by SNWA, the LVVWD, and others that are relevant to this assessment are summarized in this section. Such investigations started with the reconnaissance studies initiated in the late 1940s and have continued since. Only relevant studies documented after the issuance of NSE's Order 1169A in December 2012 are summarized in this section.

2.1.1 Order 1169A Reports

In the months following the completion of the 2-year aquifer test mandated by NSE Order 1169, the various stakeholders, including the MOA signatories, evaluated the test results and documented their interpretations, conclusions, and recommendations in reports submitted to the NSE in June of 2013. These reports relied upon only a few months of recovery data that were influenced by the SNWA MX-5 well which continued pumping through mid-April 2013 (see Section 5.2.3 of this report for a more detailed explanation).

SNWA (2013b)

SNWA (2013b) presents the data collected before and during the test, as well as interpretations of aquifer responses and water availability. Based on their analysis of the pre-test and test data, the major conclusions made by SNWA (2013b) are as follows:

- Changes in groundwater levels are affected by both groundwater pumping from the carbonate aquifer and changes in prevailing hydrologic conditions before and after the aquifer test.

- The aquifer test confirmed that extensive hydraulic connectivity exists in the carbonate aquifer. However, the presence of boundaries and spatial variations in hydraulic conductivity affect the carbonate aquifer's response depending on location. For example, no discernible responses were observed north of the Kane Springs Fault and west of the MX-5 and CSI wells near the eastern front of the Las Vegas Range (note: the lack of responses cited in SNWA (2013b), referred to wells CSVM-3 and CSVM-5; see Sections 5.2.2 and 5.2.3 of this report for a more detailed explanation).

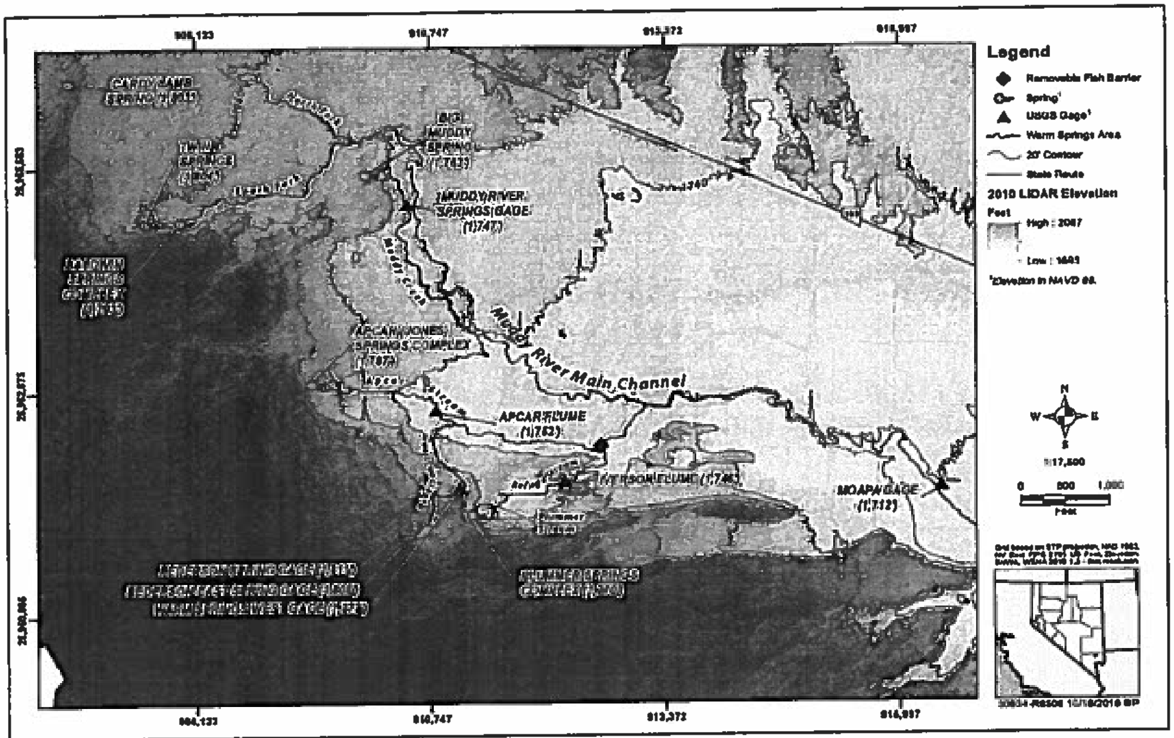

Figure 6-1
Elevation of Selected Springs and LIDAR Digital Elevation Model within the MRSA

6.1.1 Implications of Continued Pumping

Responses associated with the Order 1169 aquifer test demonstrate that the current pumping configuration within the LWRFS (i.e., pumping location, rates and duration) is not sustainable in the long-term without conflicting with senior Muddy River water rights and degrading the Moapa dace habitat in the high-elevation spring complexes. In the long-term, it is expected that any groundwater production from the carbonate system within the LWRFS will ultimately capture discharge to the MRSA (e.g., spring discharge, subsurface inflow to the alluvial reservoir and, consequently, Muddy River streamflow) because of the high aquifer diffusivity and hydraulic connectivity throughout the flow system and because the MRSA constitutes the majority, if not all, of the discharge from the flow systemThe results of the Order 1169 aquifer test indicate that for the areas directly upgradient of the MRSA (i.e., Arrow Canyon and Coyote Spring Valley), water-level responses to pumping stresses occur very quickly. As demonstrated in Figures 5-8 and 5-9, any reduction of the hydraulic head in the carbonate aquifer results in a proportional reduction in spring discharge.

The timing of impacts from groundwater production in pumping centers located farther from the MRSA, in Garnet Valley, California Wash and the Black Mountains Area, may take longer, but the properties of the aquifer are such that these impacts will eventually reach the MRSA. This is because, as the data indicate, the MRSA is hydraulically connected to the other LWRFS basins. Based on this assessment, the following conclusions are made:

7.0 DEPLETION OF MUDDY RIVER STREAMFLOW AND IMPACTS TO SNWA

Groundwater production from the MRSA alluvial reservoir and the LWRFS carbonate aquifer has depleted the flows of the Muddy River. Muddy River water rights were adjudicated in 1920 and the Muddy River Decree allocated the entire flow of the Muddy River. Therefore, groundwater production (whose associated rights are all junior in priority) that causes a depletion in streamflow also conflicts with the decreed rights on the river.

SNWA has significant assets associated with the Muddy River through its ownership and leases of water rights and MVIC shares, and uses these assets to create Tributary Conservation ICS credits in the Colorado River and Lake Mead. SNWA has spent over $80,000,000 on the acquisition of water rights on the Muddy River for the purpose of creating ICS credits. These credits compose a critical component of the SNWA water-resources portfolio that is needed to supply current and future water demands for a growing community with a population of over 2 million people and more than 40 million annual visitors (SNWA, 2018a).

This section describes SNWA's water-resource assets associated with the Muddy River, how they have been used to create ICS credits, and how SNWA has been impacted by Muddy River streamflow depletions caused by groundwater production within the LWRFS. The ensuing discussion describes these assets in relation to the Upper and Lower Muddy River reaches distinguished by the location of the USGS Muddy River near Glendale gaging station (MR Glendale gage) (Figure 7-1).

7.1 Upper Muddy River

Decreed water rights within the Upper Muddy River are individually owned with specific Places of Use to which water associated with the right is applied. Since 2006, SNWA has entered into lease agreements for some of these rights and has purchased others. Leased volumes may vary year to year as documented within the annual Muddy River ICS Certification reports (SNWA, 2009c; 2011a and b; 2012a and b; 2013c; 2015b and c; 2016b; 2017b; 2018c). Within the Upper Muddy River, SNWA leases or owns the following water rights;

- Up to 2,001 afy leased from the Church of Latter Day Saints (expires January 1, 2027)
- 111 afy of former Cox and Mitchell rights (SNWA-owned)
- 1,040 afy of former Hidden Valley rights (SNWA-owned)
- Up to 3,700 afy of rights held in a long-term lease by the Moapa Band of Paiutes and subleased to SNWA (expires December 31, 2026)
- 811 afy of former Knox and Holmes rights (SNWA-owned)
- Up to 3,000 afy of rights leased from MVIC (expires December 31, 2026).

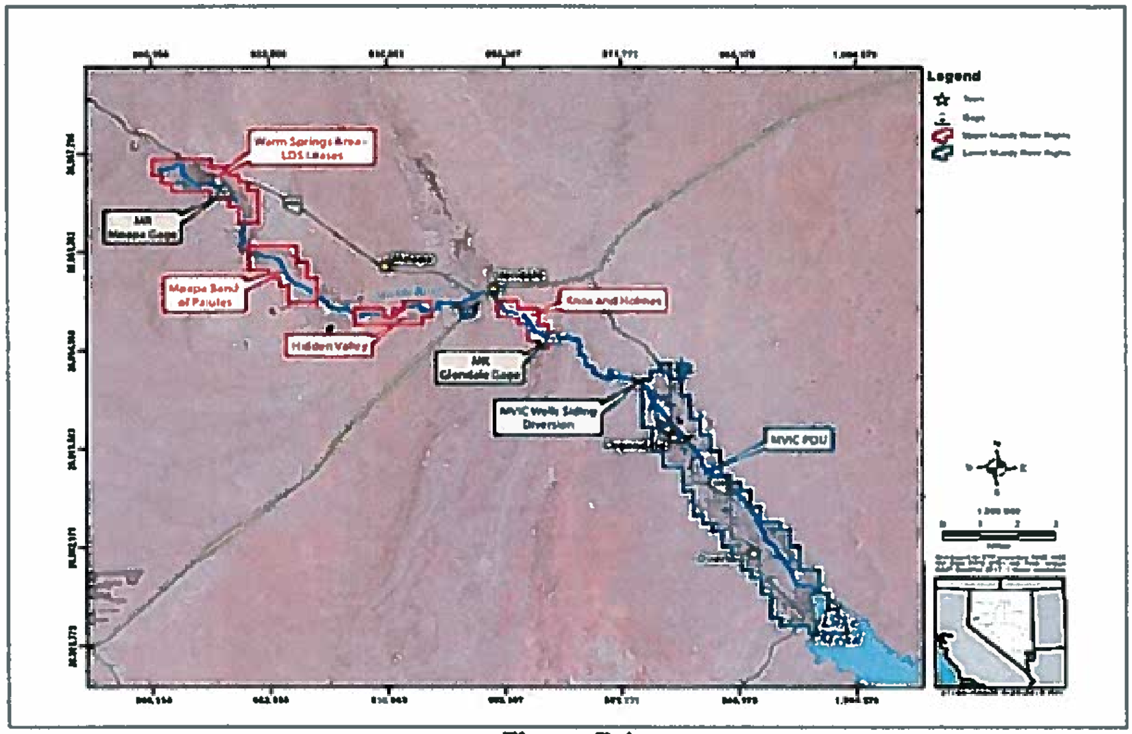

Figure 7-1
Upper and Lower Muddy River Reaches

7.2 *Lower Muddy River*

Decreed water rights within the Lower Muddy River are held by MVIC, which holds the largest quantity of decreed rights on the Muddy River. MVIC decreed Muddy River water rights are owned by MVIC shareholders through ownership of shares of preferred and common MVIC stock. There are 2,432 preferred shares and 5,044 common shares in MVIC. MVIC's operations and covenants define preferred shares as 100 percent of the Muddy River summer flow and 75 percent of the winter flow. Common shares represent the remaining 25 percent of the winter flow. In addition to their decreed and certificated rights, the 1920 Muddy River Decree states that MVIC can divert any additional unused Muddy River flows that reach their diversion structure on the Muddy River. Consequently, the actual water that MVIC splits among its shareholders varies from year to year based on the actual divertible flows that reach their diversion structure. MVIC delivers water to its shareholders through a network of concrete-lined ditches and pipes.

Currently, SNWA controls, through purchases and leases, 1,166 preferred shares and 3,208 common shares. The volume of water represented by these shares changes from year to year based on the flow of the river as measured at the MR Glendale gage. In 2018, SNWA shares represented approximately 10,000 af.

7.3 SNWA Tributary Conservation ICS Credits

SNWA relies upon Muddy River water rights and MVIC shares it owns and leases to create Tributary Conservation ICS credits. SNWA is allowed to store the water associated with these credits in Lake Mead, or divert it at its intakes in Lake Mead for delivery to water purveyors in the Las Vegas Valley.

The criteria for the development and delivery of ICS was established in the Record of Decision for Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead, December 13, 2007 (USBR, 2007). Tributary Conservation ICS is one of several types of ICS and allows a Contractor, as defined in the Guidelines, to increase tributary flows into the mainstream of the Colorado River within its state for ICS credits. ICS credits are limited to flows associated with water rights that have been used for a significant period of years and were perfected prior to the effective date of the Boulder Canyon Project Act of June 25, 1929. ICS has been declared a beneficial use under Nevada Revised Statute 533.030.

To generate ICS credits, the Guidelines require a Contractor, SNWA in this case, to submit ICS plans of creation and certification reports. Plans of creation are written to demonstrate how the ICS will be created in the ensuing year, and certification reports are used to document the creation of ICS for the previous year. NSE Order 1194 requires the submittal of an annual report to the NSE that provides a full accounting of adjudicated Muddy River water rights, owned or controlled by the Contractor, that have been conveyed through the Muddy River to the Colorado River for the creation of ICS. The certification reports must comport with this order. SNWA has created 157,824 af of Muddy River Tributary Conservation ICS credits since the Guidelines were instituted in 2008 (SNWA, 2009c; 2011a and b; 2012a and b; 2013c; 2015b and c; 2016b; 2017b; 2018c). Annual ICS credits created by SNWA are presented in Table 7-1. The 2018 ICS data are not included here as the Certification Report has not yet been finalized and approved.

7.3.1 Impacts to SNWA as a Result of Muddy River Streamflow Depletions

As described in Section 5.1.4, Muddy River streamflow has been depleted by groundwater production from both the MRSA alluvial reservoir and LWRFS carbonate aquifer. Figure 5-4 demonstrates that groundwater production within the MRSA accounts for the MR Flow Deficit observed for the period of analysis. Production wells completed in the alluvial reservoir adjacent to the Muddy River capture groundwater that would otherwise discharge to the river. In addition, MRSA production wells completed in the carbonate aquifer capture water that would otherwise replenish the alluvial reservoir though diffuse subsurface flow or discharge from discrete springs. Capturing this groundwater depletes the source of supply to the alluvial reservoir and springs, thereby, depleting the streamflow. Groundwater production from other production wells located within the LWRFS also impact the MRSA discharge, and therefore the Muddy River flow. However, the impacts are not readily discernible in the streamflow record because of their relatively small magnitude compared to the flow of the river and the masking effect caused by recharge variability.

Muddy River streamflow depletions have had, and will continue to have, a direct impact on the volume of water associated with MVIC shares and, consequently, the water resources SWNA is able to secure through the creation of ICS credits. As previously described, the volume of water represented by MVIC shares is determined by the annual flows in the Muddy River. As the flows

Table 7-1
SNWA's Muddy River Tributary Conservation ICS Credits

Year	Tributary Conservation ICS Credits (af)		
	Upper Muddy River	Lower Muddy River	Annual Total
2008	2,112	4,983	7,095
2009	5,812	7,395	13,207
2010	8,622	8,161	16,783
2011	9,420	7,142	16,562
2012	9,929	7,384	17,313
2013	10,390	7,033	17,424[a]
2014	6,471	8,627	15,098
2015	9,963	8,509	18,472
2016	9,963	8,283	18,246
2017	9,963	7,660	17,624[a]
		GRAND TOTAL	157,824

[a]Differences in annual totals are the result of rounding.

have diminished as a result of groundwater production, so too has the volume of water associated with the shares that are owned by the individual MVIC shareholders, including SNWA. The impact to MVIC was estimated for the period 2008 through 2017 by summing the annual differences between the predevelopment baseflow and the natural flow as measured at the MR Moapa gage, which totaled over 46,000 af. The predevelopment baseflow was derived using streamflow records for a period of below-normal hydrology; therefore, using it as a reference point leads to conservatively low estimates of streamflow depletion. Table 7-2 presents the impacts these streamflow depletions have had on SNWA ICS credits. To quantify the impacts, the following steps were taken:

1. The natural flow as a percentage of the predevelopment baseflow was derived for each year of ICS creation using the annual flood-adjusted flow records of MR Moapa gage. The natural flow record was derived by accounting for all surface-water diversions above the gage as described in Section 5.1.3, and represents the water available for uses downstream of the gage, including the creation of ICS from MVIC shares. The computed percentage is less than 100 when the baseflow has been depleted by groundwater production, as was the case during the period of ICS creation. By using the MR Moapa gage, it is assumed that all gains/losses (i.e., diversions, ET) between the MR Moapa and MR Glendale gages remained essentially the same for the period of analysis.

2. The potential ICS credit that would have been created had the streamflow not been depleted was computed by dividing the ICS credit certified for each year by the percentage of natural flow computed in Step 1. The potential ICS is always greater than the certified ICS when the baseflow has been depleted by groundwater production.

3. The impacts were quantified by computing the difference between the potential and certified ICS volumes. The values are listed in Table 7-2 and presented in Figure 7-2. The total

estimated impact from 2008 through 2017 is 12,040 af. The cost to purchase additional water to replace the lost flows is estimated to be $2,288,746 using the annual value of leased shares.

Table 7-2
Impacts of MR Streamflow depletions on SNWA ICS Credits

Year	Certified ICS Credits (af)	Natural Flow at MR Moapa Gage[a] (af)	Natural Flow as Percentage of Predevelopment Baseflow[b] (%)	Potential ICS Credits (af)	Impact to SNWA ICS Credits (af)	Lease Cost per Acre-Foot	Replacement Water Costs
2008	4,983	29,016	86	5,794	(811)	$283.33	$229,781
2009	7,395	29,784	88	8,403	(1,008)	$283.33	$285,597
2010	8,161	29,493	87	9,380	(1,219)	$283.33	$345,379
2011	7,142	28,405	84	8,502	(1,360)	$184.17	$250,471
2012	7,384	28,184	83	8,896	(1,512)	$184.17	$278,465
2013	7,033	28,586	84	8,373	(1,340)	$184.17	$246,788
2014	8,627	28,302	83	10,394	(1,767)	$130.00	$229,710
2015	8,509	30,150	89	9,561	(1,052)	$130.00	$136,760
2016	8,283	30,302	89	9,307	(1,024)	$145.00	$148,480
2017	7,660	30,331	89	8,607	(947)	$145.00	$137,315
			TOTAL		(12,040)		$2,288,746

[a]MR Moapa Gage values are the Flood-Adjusted Natural Flow as shown in Figure 5-3
[b]Predevelopment baseflow estimate of 33,900 afy was used in calculation.

7.4 Potential for Increased Damages due to Additional Carbonate Groundwater Production

The MR Flow Deficit is, at this time, primarily the result of alluvial and carbonate groundwater production within the MRSA. However, as described in Section 6.1, any groundwater production from the carbonate system within the LWRFS will ultimately capture groundwater discharge to the MRSA and, consequently, deplete Muddy River streamflow. These impacts conflict with the senior water rights adjudicated in the 1920 Muddy River Decree and affect the ability of SNWA to create ICS credits for which significant investments have been made.

Changing points of diversion to move groundwater production out of the MRSA to locations sourced by the carbonate aquifer will not mitigate these conflicts, only delay their inevitable occurrence. Such changes would exacerbate issues associated with the already over-appropriated carbonate aquifer by accelerating the timing of impacts to sensitive springs due to the additional groundwater production. The timing of impacts will vary based on the magnitude, duration, and location of groundwater production. The impacts may occur relatively quickly, within weeks or months, if additional groundwater production were to occur in areas directly upgradient from the MRSA. Groundwater production in areas farther away, may take longer, but the properties of the aquifer are such that these impacts will eventually result in reduced spring discharge and depletions of Muddy River streamflow.

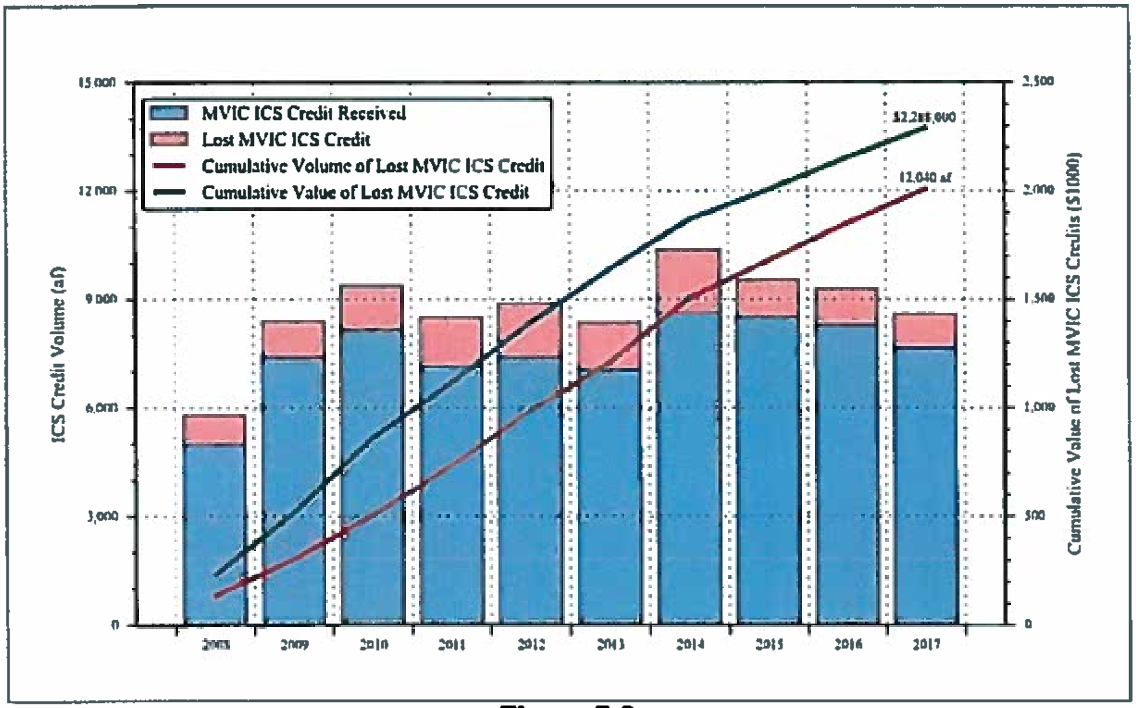

Figure 7-2
SNWA's Tributary ICS Credits and Credits Lost as a Result of Groundwater Production

8.0 RESPONSES TO NSE INTERIM ORDER 1303

An assessment of the current water-resource conditions for the LWRFS was performed and an analysis was completed to evaluate hydrologic responses to natural and anthropogenic stresses observed at various locations of interest. The analysis considered time-series data for several variables that describe the historical conditions of the hydrologic system over a period of decades. The analysis focused on the historical behavior of the Muddy River streamflow and the carbonate aquifer composing the LWRFS. The results and conclusions from this assessment are summarized in this section corresponding to the questions posed by the NSE in Order 1303.

A. Geographic Boundary of the LWRFS

The boundary of the LWRFS should be as defined by the NSE in Order 1303. The LWRFS is underlain by an interconnected distribution of carbonate rocks that constitute a laterally extensive and continuous aquifer extending beneath the basins and across the ranges. The data presented in Section 5.0 demonstrate that the aquifer responds similarly to changes in both groundwater production and recharge throughout the six basins composing the LWRFS. Observed trends are uniform across the system, with only slight variations in the magnitude of the responses. Drawdown responses to pumping stresses are small throughout the region; however, they are unequivocal and occur in very short time frames given the distances between the pumping centers and points of observation. This demonstrates the aquifer has a very high degree of hydraulic connection and should be treated as a single administrative unit.

B. Hydrologic responses to the cessation of the Order 1169 aquifer test

An analysis of the hydrologic responses to natural and anthropogenic stresses at wells and springs representative of the carbonate aquifer was performed for the LWRFS. Time-series charts of groundwater levels and gage records for the Pederson Spring and Warm Springs West gages were prepared for the period 1993 to 2018.

Small changes in the hydraulic heads (on the order of only 2-3 ft) have resulted in significant changes in the discharges from high-elevation springs. Additionally, the lack of any significant recovery response after the completion of the Order 1169 aquifer test and the fact that the system has yet to recover to pre-test levels are critical observations. These observations indicate that the aquifer has a very high transmissivity and low storage capacity (i.e., high aquifer diffusivity). As a result, the system is very sensitive to recharge and pumping stresses. The analysis observations and conclusions are listed below:

- Widespread responses to pumping stresses associated with the NSE Order 1169 aquifer test were observed in groundwater-level and spring-discharge records across all six basins of the LWRFS;

- High-elevation springs in the MRSA are highly sensitive to changes in carbonate groundwater levels and are most susceptible to impacts associated with carbonate groundwater production;
- By the end of the aquifer test, discharge from Pederson Spring decreased by about 0.15 cfs (to about 1/3 of baseflow).
- Spring discharge as measured at the Warm Springs West gage decreased about 0.3 cfs (< 10% of baseflow).
- Continuation of the aquifer test or pumping from the MX-5 well would have reduced flows at the Warm Springs West gage to the initial 2006 MOA trigger level (3.2 cfs), and lower depending on the duration.
- Groundwater levels and spring discharge rates have not recovered to pre-test levels.
- Recovery achieved its maximum levels between the first quarters of 2015 and 2016, or a period of time approximately equal to the duration of the pumping period.
- Carbonate groundwater levels and spring discharge-rates have declined since 2016.
- Flow measured at the Warm Springs West gage will reach Trigger Ranges sooner and at lower production rates than contemplated in the 2006 MOA if pumping in Coyote Spring Valley resumed at levels commensurate with the Order 1169 aquifer test.
- Given the current rates of carbonate groundwater production, recovery of groundwater levels and spring discharges to pre-test levels is not possible without extraordinary hydrology such as the 2004-2005 winter-season precipitation; and
- Even with such extraordinary hydrology, subsequent years of lesser precipitation with similar groundwater production volumes will result in a resumption of declining trends as has been observed in the historical record.

C. Groundwater production and the capture of the Muddy River (springs and river flows)

An evaluation of Muddy River streamflow was performed to identify the likely causes of a long-term trend of declining streamflow observed in the record of the MR Moapa gage since the early 1960s. Long-term climate variability and changes in land use were ruled out as major contributors to the decline. Annual records of winter-season precipitation, a reflection of climate conditions, indicate that the average annual precipitation during the period of declining streamflow (post-1965) is not substantively different than the average for the period prior to the decline (pre-1965). Land-use changes during this period may have had very short-term effects, but the incremental changes in consumptive uses above the gage have been minimal. Thus, the causes of the streamflow decline have been surface-water diversions above the MR Moapa gage and LWRFS groundwater production.

A period from 1993 to 2018, in which comprehensive records of Muddy River streamflow, surface-water diversions and groundwater production are available, were analyzed to estimate the

MR Flow Deficit. An average annual natural-flow record was constructed by adding annual surface-water diversions to the flood-adjusted flow record of the MR Moapa gage. The annual MR Flow Deficit was estimated by computing the difference between the average annual pre-development flow of the Muddy River and the natural-flow record. An analysis was performed to determine whether MRSA groundwater production could account for the MR Flow Deficit. The results of the analysis yielded the following observations and conclusions:

- Muddy River streamflow declined from a pre-development condition of 33,900 afy to a minimum of about 22,000 af in 2003.
- Since 2003, streamflow has steadily increased to its current rate of over 30,000 afy as a result of reduced surface-water diversions and MRSA groundwater production.
- The MR Flow Deficit peaked at about 7,500 af in 2003 and was about 2,300 af in 2018.
- MRSA groundwater production above the MR Moapa gage peaked in 2000 at 7,850 af, and was 1,990 af in 2018.
- Groundwater production from the MRSA alluvial reservoir depletes Muddy River streamflow on a 1:1 basis.
- Groundwater production from MRSA carbonate wells deplete Muddy River streamflow approaching a 1:1 basis. Groundwater production from other carbonate wells in the LWRFS deplete streamflow; however, their effect cannot be readily detected from the measurements.
- A significant increase in carbonate groundwater production, such as that which occurred during the NSE Order 1169 aquifer test, will cause sharp declines in carbonate-aquifer water levels and spring discharges.

An analysis was conducted to estimate the contribution of various springs to the total MRSA discharge over a period of several years and under different stress conditions. Ratios of spring discharge to total MRSA discharge were computed for the Pederson Spring Complex (as measured by the Warm Springs West gage), Baldwin Spring, and Jones Spring. Ratios were computed for the period 2001 to 2012 and were found to be relatively constant at 0.076, 0.061, and 0.034 (or 7.6, 6.1, and 3.4 percent of the total MRSA discharge), respectively. The fact that the ratios do not change under variable stress conditions indicates that the springs respond commensurately with the hydraulic head in the carbonate aquifer.

The ratio derived for the Warm Springs West gage was used to calculate reductions in the MRSA discharge that correspond to potential flow conditions at the Warm Springs West gage. Knowing that a reduction in the MRSA discharge could only be caused by a lowering of the hydraulic head in the carbonate aquifer, limits on production from the carbonate aquifer were quantified by calculating reductions in MRSA discharge (from predevelopment conditions) that correspond to selected discharge levels at the Warm Springs West gage, including trigger ranges set in the 2006 MOA. For example, a reduction of 0.62 cfs in the Warm Springs West discharge, from 3.82 to 3.20 cfs, corresponds to a decrease of approximately 8.16 cfs, or 5,908 afy in MRSA discharge. This value represents the long-term average annual production from the carbonate aquifer that can occur while still maintaining an average flow rate of 3.20 cfs at the Warm Springs West gage.

The results of the Order 1169 aquifer test demonstrate that for the areas directly upgradient of the MRSA (i.e., Arrow Canyon and Coyote Spring Valley), impacts propagate to the high-elevation springs within a matter of weeks or months. In the long-term, the location of the production wells does not matter, groundwater withdrawn anywhere within the connected carbonate aquifer or the MRSA alluvial reservoir will impact the MRSA discharge and, consequently, deplete Muddy River streamflow. These impacts have already occurred, resulting in conflicts with senior water rights. In the short term, it is preferable to keep groundwater production away from the MRSA to protect flows in the high-elevations springs that are critical habitat for the Moapa dace while groundwater production is managed to a lower threshold.

The impacts of Muddy River streamflow depletions were analyzed and quantified. Groundwater production in the MRSA and, to a lesser extent, the rest of the LWRFS has depleted Muddy River streamflows and conflicted with senior surface-water rights adjudicated in the 1920 Muddy River Decree. Streamflow depletions between 2008 and 2017 have resulted in SNWA losing an estimated 12,040 af of potential Tributary Conservation ICS credits at a replacement cost of almost $2.3 million.

These data indicate that pumping simply cannot occur without conflicting with senior rights. While it is unreasonable to assume that all pumping in the LWRFS would be eliminated, it should not be permitted to continue without strict regulatory oversight and appropriate mitigation to affected senior water-right holders and adequate protections for the Moapa dace. If the conflicts with senior water-right holders are adequately addressed, the total annual groundwater production should be managed between 4,000 – 6,000 afy over the long-term.

D. The effects of moving water rights between alluvial wells and carbonate wells

Production wells completed in the alluvial reservoir adjacent to the Muddy River capture groundwater that would otherwise discharge to the river. In addition, MRSA production wells completed in the carbonate aquifer capture water that would otherwise replenish the alluvial reservoir through diffuse subsurface flow or discharge from discrete springs. Capturing this groundwater depletes the source of supply to the alluvial reservoir and springs, thereby, depleting the streamflow. In each case, this groundwater production conflicts with senior Muddy River water rights.

Changing points of diversion to move groundwater production from the MRSA alluvial reservoir to locations sourced by the carbonate aquifer will not mitigate these conflicts, only delay their inevitable occurrence. Such changes would exacerbate issues associated with the already over-appropriated carbonate aquifer by accelerating the timing of impacts to the high-elevation springs due to the additional groundwater production. The timing of impacts will vary based on the magnitude, duration, and location of groundwater production. The impacts may occur relatively quickly, within weeks or months, if additional groundwater production were to occur in areas directly upgradient from the MRSA. Groundwater production in areas farther away, may take longer, but the properties of the aquifer are such that these impacts will eventually result in reduced spring discharge and depletions of Muddy River streamflow.

E. Any other matter believed to be relevant to the NSE's analysis

In summary, all groundwater production within the LWRFS from the MRSA alluvial reservoir or carbonate aquifer will impact discharge to the MRSA and result in Muddy River streamflow depletions. Any streamflow depletion constitutes a conflict with senior-priority Muddy River water rights and must be mitigated. In addition, groundwater production from the carbonate aquifer has been shown to impact springs that provide critical habitat for the Moapa dace. The dramatic increase in Coyote Spring Valley groundwater production during the implementation of the Order 1169 aquifer test demonstrated that these impacts can occur in very short time frames.

2.0 Isolated Flow Paths and LWRFS Boundary Flow

Data do not support interpretations of hydraulically-isolated flow paths, capture zones, or structural blocks within the LWRFS. Using terms like "hydraulically isolated" or "barrier to groundwater flow" implies there is no hydraulic communication (flow or pressure response) from one part of the carbonate aquifer to another. In fact, what has been observed throughout the LWRFS domain is a high-degree of hydraulic connectivity as discussed and presented in Burns et al. (2019, pp. 5-6 to 5-18). Various Stakeholders have asserted that there are carbonate rocks within the LWRFS that are hydraulically isolated from the carbonate aquifer, which is the source of discharge to the Muddy River Springs Area (MRSA). Others have asserted new interpretations of the LWRFS flow regime. These assertions are based on erroneous interpretations of the hydrogeologic framework, hydraulic gradients, or other speculative lines of evidence, and are addressed in the following sections.

2.1 Northern Coyote Spring Valley

Bushner (2019) asserts that there are "science-based reasons" to exclude Kane Springs Valley and northern Coyote Spring Valley from the LWRFS. Bushner (2019) relies primarily on new geophysical surveys and an implausible interpretation of the hydrogeologic framework in which a new, unmapped fault is postulated in northeastern Coyote Spring Valley. The fault is referred to as the "Northern LWRFS Boundary Fault" and is interpreted to bear a strike perpendicular to the range-front faults of the Delamar Mountains and Meadow Valley Mountains, and the Kane Springs Fault Zone, which is the dominant structural feature in this area. The orientation of the fault also happens to be coincident with the boundary of the two basins.

Bushner (2019) presents model interpretations of Controlled Source Audio Frequency Magneto Telluric (CSAMT) data collected along new transects in northern Coyote Spring Valley and Kane Springs Valley. These new transects corroborate previous interpretations of the geologic framework by Rowley et al. (2011) and the structural significance of the range-bounding faults and Kane Springs Fault Zone. Bushner (2019) suggests the so called "*Northern LWRFS Boundary Fault*" is present because the high resistivity rocks associated with the outcropping of carbonate rocks between KPW-1 and CSVM-4 is reflected in Line 10 but not Line 11 of the geophysical transects. Bushner (2019) concludes the presence of a normal fault between the two lines because of this difference. However, the fault can not be discerned in the east-west transect of Line 12 in Bushner (2019). In fact, this transect supports the interpretation of Rowley et al. (2011, cross section L-L'). A comparison of the two is presented in Figure 2-1, which demonstrates their similarity and the absence of the unmapped fault. Applying the Bushner (2019) logic, there should also be a normal fault on the northeast end of this outcrop because transect Line 2 demonstrates its diminishing presence. This report adopts the previous work of Rowley et al. (2011; 2017) and Pampeyan (1993) who describes the area as follows:

> *"Splays of the Kane Springs Wash fault cut alluvial fan deposits and mark the north edge of an isolated block of Devonian strata near the mouth of Kane Springs Wash."*

Interpretations of the framework in this area are important because they inform interpretations of groundwater flow. Bushner (2019) uses the postulated "*Northern LWRFS Boundary Fault*" as part of the rationale for excluding northern Coyote Spring Valley from the LWRFS. However, the

The Order 1169 Study has proven that (1) the individual basins are hydraulically connected; (2) groundwater production in these basins has impacted MRSA spring discharge and Muddy River streamflow which has resulted in conflicts with senior water rights; and (3) the LWRFS is over-appropriated. It is because of these facts that the NSE has requested estimates of "*...the long-term annual quantity of groundwater that may be pumped from the Lower White River Flow System, including the relationships between the location of pumping on discharge to the Muddy River Springs, and the capture of Muddy River flow.*"

As previously mentioned, the sustainable yield of the LWRFS is inexorably linked to the occurrence, or potential occurrence, of conflicts with senior rights. If impacts to spring discharge and Muddy River streamflow are mitigated and conflicts with senior water-right holders adequately addressed, hydraulic heads and MRSA discharge could be managed so that long-term annual groundwater production could be sustained between 4,000 and 6,000 afy (Burns et al., 2019). Without addressing these conflicts, annual carbonate groundwater production should be managed to reduced, rather than current or increased volumes.

6.0 ASSESSING RISK TO MOAPA DACE HABITAT

CSI incorrectly concludes that groundwater pumping in the MRSA and surface-water diversions on the Muddy River have a much greater impact on the spring and surface flows that support Moapa dace than pumping in Coyote Spring Valley (Reich and Moran, 2019). As explained above and in Burns et al. (2019), this is not the case. Maintaining spring flows in the Warm Springs Area is critical to protecting Moapa dace and avoiding Endangered Species Act violations (Marshall and Williams, 2019).

CSI also incorrectly concludes that flow data at the MR Moapa gage shows that resources supporting Moapa dace can be managed sustainably with pumping up to 5,280 afy in Coyote Spring Valley (Reich and Moran, 2019). CSI attempts to support this conclusion in-part by saying that flows at the gage did not decline during the aquifer test (Reich and Moran, 2019). However, this errant analysis ignores the large Warm Springs Area fire that killed many trees and reduced vegetative uptake of water in 2010 (Burns et al., 2019, p. 5-2; Marshall and Williams, 2019, Appendix C p. C-3), and the large reductions in Warm Springs Area surface-water diversions that occurred in 2011-2013 (Burns et al., 2019, pp. 4-5 and Appendix B p. B-1). CSI also appears to suggest that as long as flows at the MR Moapa gage are maintained, the needs of Moapa dace will be met. However, CSI does not acknowledge the ecology of the species, or the fact that the triggers established to protect Moapa dace under the Muddy River Memorandum of Agreement (MOA) (MOA, 2006), described in both Marshall and Williams (2019) and USFWS (2019), are established at the Warm Springs West gage, not the MR Moapa gage.

It is inadequate to assess risk to Moapa dace based solely on conditions at the MR Moapa gage. Surface-water diversions near that gage can have large effects on flow measurements while having very limited effects on Moapa dace habitat. For example, the diversion directly above the MR Moapa gage historically had large impacts on flow measurements (Burns et al., 2019, pp. 4-4 to 4-5, 5-4, and Appendix B p. B-1), but the diversion point is already in sub-optimal habitat, and it is located downstream of 97 percent of the species' range (Marshall and Williams, 2019, pp. 2-2 and 3-1 to 3-3).

Application No. 21873   Certificate Record No. 8325 Book 26 Page 8325

THE STATE OF NEVADA
CERTIFICATE OF APPROPRIATION OF WATER

WHEREAS, Stephen F. Turner - Agent has presented to the State Engineer of the State of Nevada Proof of Application of Water to Beneficial Use, from Muddy River through company ditches and irrigation system for irrigation and domestic purposes. The point of diversion of water from the source is as follows: NW¼ NE¼ Sec. 21, T. 15 S., R. 67 E., M.D.B.&M., or at a point from which the SE corner of Sec. 28, T. 15 S., R. 67 E., M.D.B.&M., bears S. 11° 12' E., a distance of 10,131.06 feet, situated in Clark County, State of Nevada.

NOW KNOW YE, That the State Engineer, under the provisions of NRS 533.425, has determined the date, source, purpose, amount of appropriation, and the place where such water is appurtenant, as follows:

Name of appropriator: Muddy Valley Irrigation Co.

Post-office address: Overton, Nevada

Amount of appropriation: 9.70 cfs

Period of use, from October 1st to May 1st of ~~each~~ the following year

* Date of priority of appropriation: January 1, 1905

Description of land to which water is appurtenant:

See Exhibit "A" attached

This certificate is issued subject to the terms of the permit.

* This certificate changes the point of diversion and place of use of waters heretofore appropriated under Application 1611, Certificate 1199, hence the date of priority of appropriation is the same as that of Certificate 1199.

The right to water hereby determined is limited to the amount which can be beneficially used, not to exceed the amount above specified, and the use is restricted to the place and for the purpose as set forth herein.

IN TESTIMONY WHEREOF, I, ROLAND D. WESTERGARD, State Engineer of Nevada, have hereunto set my hand and the seal of my office, this 19th day of July, A. D. 19 74

Compared dp/ jw

Recorded 7-23-74 Bk. 445 Page 389423

Clark County Records.

State Engineer

1923

SE ROA 44190

Application No.................. Certificate Record No.................. Book.................. Page..................

THE STATE OF NEVADA
CERTIFICATE OF APPROPRIATION OF WATER

WHEREAS, ...has presented to the State Engineer of the State of Nevada Proof of Application of Water to Beneficial Use, from..
....
through..for
....
purposes. The point of diversion of water from the source is as follows:..
....
....
situated in..County, State of Nevada.

NOW KNOW YE, That the State Engineer, under the provisions of NRS 533.425, has determined the date, source, purpose, amount of appropriation, and the place where such water is appurtenant, as follows:

Name of appropriator..
Post-office address..
Amount of appropriation..
Period of use, from..to..of each year
Date of priority of appropriation..

Description of..
....
....
....
....
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....

The right to water hereby determined is limited to the amount which can be beneficially used, not to exceed the amount above specified, and the use is restricted to the place and for the purpose as set forth herein.

IN TESTIMONY WHEREOF, I..State Engineer of Nevada, have hereunto set my hand and the seal of my office, this ....day of..............................., A. D. 19......

....
State Engineer

Compared..
Recorded.................. Bk.............. Page..............
....County Records.

SE ROA 44191

Application 21873 Cert. #8325, Book 26 Page 8325
(Continuation)

EXHIBIT "A"

0.88	acres in	NE¼ SW¼	Section 15,	T. 15 S.,	R. 67 E.,	M.D.B.&M.
30.05	"	SW¼ SW¼	"	"	"	"
18.68	"	SE¼ SW¼	"	"	"	"
11.52	"	NE¼ NE¼	Section 21,	"	"	"
6.31	"	SE¼ NE¼	"	"	"	"
1.58	"	NE¼ SE¼	"	"	"	"
7.88	"	SE¼ SE¼	"	"	"	"
5.79	"	NW¼ NW¼	Section 22,	"	"	"
39.39	"	NE¼ NW¼	"	"	"	"
7.55	"	NW¼ NE¼	"	"	"	"
13.82	"	SW¼ NE¼	"	"	"	"
27.07	"	SE¼ NW¼	"	"	"	"
39.73	"	SW¼ NW¼	"	"	"	"
31.41	"	NW¼ SW¼	"	"	"	"
33.91	"	NE¼ SW¼	"	"	"	"
32.32	"	NW¼ SE¼	"	"	"	"
9.76	"	NE¼ SE¼	"	"	"	"
4.21	"	SE¼ SE¼	"	"	"	"
40.00	"	SW¼ SE¼	"	"	"	"
39.76	"	SE¼ SW¼	"	"	"	"
25.86	"	SW¼ SW¼	"	"	"	"
18.00	"	NW¼ SW¼	Section 26,	"	"	"
1.70	"	NE¼ SW¼	"	"	"	"
6.06	"	SW¼ SW¼	"	"	"	"
0.17	"	SE¼ SW¼	"	"	"	"
35.18	"	NW¼ NW¼	Section 27,	"	"	"
25.42	"	NE¼ NW¼	"	"	"	"
28.00	"	NW¼ NE¼	"	"	"	"
6.60	"	NE¼ NE¼	"	"	"	"
37.12	"	SE¼ NE¼	"	"	"	"
31.26	"	SW¼ NE¼	"	"	"	"
26.52	"	SE¼ NW¼	"	"	"	"
31.82	"	SW¼ NW¼	"	"	"	"
12.42	"	NW¼ SW¼	"	"	"	"
21.09	"	NE¼ SW¼	"	"	"	"
14.22	"	NW¼ SE¼	"	"	"	"
29.84	"	NE¼ SE¼	"	"	"	"
29.09	"	SE¼ SE¼	"	"	"	"
39.70	"	SW¼ SE¼	"	"	"	"
9.82	"	SE¼ SW¼	"	"	"	"
38.34	"	NE¼ NW¼	Section 34,	"	"	"
33.88	"	NW¼ NE¼	"	"	"	"
33.86	"	NE¼ NE¼	"	"	"	"
28.29	"	SE¼ NE¼	"	"	"	"
36.21	"	SW¼ NE¼	"	"	"	"
16.32	"	SE¼ NW¼	"	"	"	"
7.71	"	NE¼ SW¼	"	"	"	"
25.32	"	NW¼ SE¼	"	"	"	"
18.55	"	NE¼ SE¼	"	"	"	"
31.48	"	NW¼ NW¼	Section 35	"	"	"
22.37	"	NE¼ NW¼	"	"	"	"
33.95	"	SE¼ NW¼	"	"	"	"
28.39	"	SW¼ NW¼	"	"	"	"
34.94	"	NW¼ SW¼	"	"	"	"
15.91	"	NE¼ SW¼	"	"	"	"
5.18	"	NW¼ SE¼	"	"	"	"
2.41	"	SE¼ SE¼	"	"	"	"
22.65	"	SW¼ SE¼	"	"	"	"
29.16	"	SE¼ SW¼	"	"	"	"
38.10	"	SW¼ SW¼	"	"	"	"

Application 21873 Cert. #8325, Book 26, Page 8325
(Continutation)

EXHIBIT "A"

2.11	acres in	NW¼ NW¼	Section 1,	T. 16 S.,	R. 67 E.,	M.D.B.&M.
11.32	"	SW¼ NW¼	"	"	"	"
3.28	"	NE¼ SW¼	"	"	"	"
21.21	"	NW¼ SW¼	"	"	"	"
20.26	"	SE¼ SW¼	"	"	"	"
34.04	"	SW¼ SW¼	"	"	"	"
23.26	"	NE¼ NE¼	Section 2,	"	"	"
34.57	"	NW¼ NE¼	"	"	"	"
30.30	"	NE¼ NW¼	"	"	"	"
30.69	"	NW¼ NW¼	"	"	"	"
26.79	"	SE¼ NW¼	"	"	"	"
32.36	"	SW¼ NE¼	"	"	"	"
31.96	"	SE¼ NE¼	"	"	"	"
35.69	"	NE¼ SW¼	"	"	"	"
38.73	"	NW¼ SE¼	"	"	"	"
40.00	"	NE¼ SW¼	"	"	"	"
27.33	"	SW¼ SW¼	"	"	"	"
40.00	"	SE¼ SW¼	"	"	"	"
40.00	"	SW¼ SE¼	"	"	"	"
39.34	"	NE¼ NE¼	Section 3,	"	"	"
17.12	"	NW¼ NW¼	Section 11,	"	"	"
19.88	"	NE¼ NW¼	"	"	"	"
40.00	"	NW¼ NE¼	"	"	"	"
40.00	"	NE¼ NE¼	"	"	"	"
23.55	"	SE¼ NE¼	"	"	"	"
24.39	"	SW¼ NE¼	"	"	"	"
5.26	"	NW¼ SE¼	"	"	"	"
18.54	"	NE¼ SE¼	"	"	"	"
33.25	"	SE¼ SE¼	"	"	"	"
13.25	"	NE¼ NW¼	Section 12,	"	"	"
1.04	"	NW¼ NE¼	"	"	"	"
19.13	"	SW¼ NE¼	"	"	"	"
21.29	"	SE¼ NW¼	"	"	"	"
13.25	"	SW¼ NW¼	"	"	"	"
21.60	"	NE¼ SE¼	"	"	"	"
21.69	"	NW¼ SE¼	"	"	"	"
14.05	"	NE¼ SW¼	"	"	"	"
9.86	"	NW¼ SW¼	"	"	"	"
25.38	"	SW¼ SE¼	"	"	"	"
28.56	"	SE¼ SE¼	"	"	"	"
7.71	"	NW¼ SW¼	Section 7,	"	68	"
5.62	"	SE¼ SW¼	"	"	"	"
25.71	"	SW¼ SW¼	"	"	"	"
5.30	"	NE¼ NE¼	Section 13,	"	67	"
19.01	"	NW¼ NW¼	"	"	"	"
6.02	"	SW¼ NW¼	"	"	"	"
25.36	"	NE¼ SE¼	"	"	"	"
26.00	"	NE¼ SW¼	"	"	"	
36.85	"	SE¼ SE¼	"	"	"	"
7.58	"	NE¼ NE¼	Section 14,	"	"	"
26.89	"	SW¼ SW¼	Section 18,	"	68	"
12.08	"	NW¼ NW¼	Section 19,	"	"	"
16.33	"	NW¼ SW¼	"	"	"	"
9.64	"	NE¼ SW¼	"	"	"	"
13.15	"	SE¼ SE¼	"	"	"	"
13.70	"	SW¼ SE¼	"	"	"	"
21.32	"	SE¼ SW¼	"	"	"	"
15.55	"	SW¼ SW¼	"	"	"	"

Application 21873 Cert.# 8325 Book 26, Page 8325
(Continuation)

Exhibit "A"

27.04	acres in	NE¼ NE¼	Section 24,	T. 16 S.,	R. 67 E.,	M.D.B.&M.
14.21	"	NE¼ NE¼	Section 30,	"	68	"
9.83	"	NW¼ NE¼	"	"	"	"
6.14	"	NE¼ NW¼	"	"	"	"
1.40	"	SE¼ NW¼	"	"	"	"
18.97	"	SW¼ NE¼	"	"	"	"
17.92	"	SE¼ NE¼	"	"	"	"
27.71	"	SE¼ NW¼	Section 29,	"	"	"
29.15	"	SW¼ NW¼	"	"	"	"
18.76	"	NW¼ SW¼	"	"	"	"
11.24	"	NE¼ SW¼	"	"	"	"
2.53	"	NE¼ SE¼	Section 22,	T. 15 S.,	R. 67 E.,	"
5.85	"	SW¼ NW¼	Section 26,	"	"	"
2.25	"	SW¼ NW¼	"	"	"	"
2.66	"	NW¼ SW¼	"	"	"	"
13.54	"	NW¼ SW¼	"	"	"	"
.56	"	NE¼ SW¼	"	"	"	"
16.76	"	SW¼ SW¼	"	"	"	"
6.07	"	SE¼ SW¼	"	"	"	"
13.55	"	NE¼ NE¼	Section 27,	"	"	"
2.92	"	NW¼ SE¼	"	"	"	"
3.04	"	SW¼ NW¼	"	"	"	"
2.25	"	NW¼ SW¼	"	"	"	"
5.62	"	NW¼ SW¼	"	"	"	"
.79	"	SW¼ SW¼	"	"	"	"
23.51	"	SE¼ SW¼	"	"	"	"
6.19	"	SE¼ NW¼	Section 34,	"	"	"
10.86	"	SE¼ NE¼	"	"	"	"
18.62	"	NE¼ SW¼	"	"	"	"
14.62	"	NW¼ SE¼	"	"	"	"
21.77	"	NE¼ SE¼	"	"	"	"
39.93	"	SE¼ SE¼	"	"	"	"
35.99	"	SE¼ SE¼	Section 2,	T. 16 S.	"	"
8.66	"	SW¼ SW¼	"	"	"	"
27.90	"	NW¼ SW¼	"	"	"	"
35.32	"	SW¼ NW¼	"	"	"	"
7.09	"	SW¼ NE¼	Section 11,	"	"	"
15.02	"	SE¼ NE¼	"	"	"	"
21.94	"	NE¼ SE¼	"	"	"	"
14.40	"	NW¼ SE¼	"	"	"	"
37.01	"	NW¼ NW¼	Section 12,	"	"	"
18.62	"	NE¼ NW¼	"	"	"	"
18.05	"	SW¼ NW¼	"	"	"	"
2.25	"	SE¼ NW¼	"	"	"	"
28.12	"	NW¼ SW¼	"	"	"	"
13.50	"	NE¼ SW¼	"	"	"	"
37.23	"	SW¼ SW¼	"	"	"	"
27.56	"	SE¼ SW¼	"	"	"	"
7.65	"	SW¼ NW¼	Section 13	"	"	"
3.26	"	SW¼ NW¼	"	"	"	"
2.81	"	NW¼ SW¼	"	"	"	"
18.67	"	SE¼ NW¼	"	"	"	"
10.12	"	NE¼ SW¼	"	"	"	"
10.07	"	SE¼ SW¼	"	"	"	"
38.24	"	SW¼ SE¼	"	"	"	"
38.81	"	NW¼ SE¼	"	"	"	"
.67	"	NW¼ SE¼	"	"	"	"
8.89	"	SW¼ NE¼	"	"	"	"
12.37	"	NE¼ SE¼	"	"	"	"
3,498.86	Total Acres					

The place of use under this certificate shall not exceed 2784.75 acres within the lands described under the place of use of this certificate.

1.0 INTRODUCTION

1.1 Intentionally Created Surplus (ICS)

The Secretary of Interior (Secretary) issued a Record of Decision for 'Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead' (Guidelines) on December 13, 2007, which established criteria for the development and delivery of Intentionally Created Surplus (ICS). One type of ICS is Tributary Conservation, which allows a Contractor, as defined in the Guidelines, to increase tributary flows into the mainstream of the Colorado River within its state for ICS credits. Conservation of tributary flows entering the mainstream of the Colorado River and available for ICS credit are limited to flows associated with water rights that have been used for a significant period of years and were perfected prior to June 25, 1929, the effective date of the Boulder Canyon Project Act (BCPA).

To generate ICS, the Guidelines require a Contract holder to enter into a Delivery Agreement with the United States of America and a Forbearance Agreement with Lower Basin Contract holders. On December 13, 2007, the Southern Nevada Water Authority (SNWA) and Colorado River Commission of Nevada entered into a Delivery Agreement with the United States of America and a Forbearance Agreement with Lower Basin Contract holders. Exhibit A of the Forbearance Agreement describes the surface-water rights on the Muddy and Virgin Rivers, pre-dating June 25, 1929, which SNWA plans to use to create Tributary Conservation ICS, and how the Muddy River flows reaching Lake Mead will be calculated (Appendix A).

1.2 Plan of Creation (ICS Plan)

The Guidelines, Forbearance Agreement, and Delivery Agreement require a plan for the creation of ICS (ICS Plan). An ICS Plan for Muddy River Tributary Conservation ICS was submitted to Reclamation for CY 2015 on June 30, 2014. SNWA received a letter from Reclamation dated September 25, 2014 approving the ICS Plans for CY 2015.

After the execution of the System Conservation Implementation Agreement (SCIA) on June 4th, 2015, an amended 2015 ICS Plan was submitted Reclamation on June 17, 2015 for the purpose of documenting the planned Pilot System Conservation Program (Pilot Program) water, as discussed in Section 1.3. The amended ICS Plan was approved by Reclamation in a letter dated September 10, 2015 (Appendix B).

This report satisfies the requirements the Guidelines and of Nevada State Engineer Order 1194 which is provided in Appendix C and summarized as follows:

2.0 PROJECT DESCRIPTION

Muddy River water rights that are being utilized to create Tributary Conservation ICS pursuant to the approved ICS Plan and Exhibit A of the Forbearance Agreement are decreed Nevada state water rights with an established history of use prior to 1929. Exhibit A of the Forbearance Agreement specifically allows SNWA to utilize any and all pre-June 25, 1929, Muddy River water rights to create Tributary Conservation ICS regardless of the water rights history of use after 1928.

The Muddy River originates from regional springs in the Muddy River Springs Area in Nevada and flows into the Overton Arm of Lake Mead (Figure 2-1). Muddy River flows are relatively constant, because flows from the springs that form the river are consistent due to their regional source, the carbonate aquifer system of eastern Nevada. The average annual flow of the Muddy River at the United States Geological Survey (USGS) gaging station 09419000 *Muddy River near Glendale, Nevada* (Glendale gage) for Water Years 1950 through 2014 is 30,572 acre-feet per year (afy).

Muddy River water rights were judicially decreed in 1920, and the decree allocated the entire flow of the Muddy River (Appendix D). The Order of Determination, attached to the decree as Exhibit A, explicitly outlines the Place-of-Use (POU) for the water rights and established summer and winter diversion rates. For the most of the decreed rights, the summer season is May 1 to September 30 with a diversion rate of 1 cubic-foot per second (cfs) per 70 acres of land and the winter season is October 1 to April 30 with a diversion rate of 1 cfs per 100 acres of land. These diversion rates equate to an annual rate of 8.54 afy per acre (afy/acre).

Surface water rights on the upper reach of the Muddy River, from the Muddy River Springs to the Glendale gage, are owned and controlled by individual right holders. On the Lower Muddy River, downstream of the Glendale gage, water rights are held by the Muddy Valley Irrigation Company (MVIC) for use by its shareholders.

Muddy River surface-water rights owned and controlled by SNWA are no longer utilized for agriculture and are therefore being conveyed to Lake Mead. The pre-June 25, 1929, water rights conveyed to Lake Mead represent the full right that is and has been historically used for agriculture or could have otherwise been diverted from the Muddy River and fully consumed by SNWA in Nevada.

Muddy River rights conveyed to Lake Mead passed through their historic points of diversion and either flowed through the irrigation company ditches and returned to the mainstream of the Muddy River further downstream or remained in the mainstream of the Muddy River. The full rights owned and leased by SNWA and documented to flow to Lake Mead have been accounted for as Tributary Conservation ICS or as Pilot Program water.

3.0 WATER CONSERVATION ASSOCIATED WITH SNWA MUDDY RIVER RIGHTS

On the Muddy River, there are two distinct reaches above and below USGS gaging station *09419000 Muddy River Near Glendale, NV* (Glendale gage). By controlling water rights on the Muddy River within these two reaches, SNWA was able to successfully conserve Muddy River water in CY 2015 and convey it to Lake Mead for Tributary Conservation ICS credits or for the Pilot Program. The sections below describe the water rights and conservation measures.

3.1 Verification Process of Fallowed Land

Within the agricultural areas, irrigated areas were digitized using the 2006 National Agricultural Imagery Program data. Since 2008, SNWA has funded aerial-photography specifically for the purpose of Tributary Conservation ICS verification. This photography has been strategically scheduled 3-times per year to document agricultural activities during the summer and winter seasons of a given calendar year are documented. The high-resolution, aerial photography has a resolution of 6-inches per pixel and allows for more accurate determinations of fallowed versus active agricultural fields. An example of the high-resolution, aerial photography used to classify and delineate crop areas is presented in Figure 3-1.

The aerial photography combined with field reconnaissance and interviews with irrigation company managers ensured the highest degree of accuracy in determining the actual irrigated acreage along the Muddy River.

Aerial-photography flights were performed in December 2014, July 2015, and December of 2015 to identify lands being flood irrigated or fallowed during the winter and summer irrigation seasons. The summer irrigation season spans May through September. The July photography documents areas that were actually being irrigated during the summer irrigation season, because by July most of the natural vegetation that was not receiving irrigation water had died back.

Muddy River water rights have defined POU maps and many have subsequent Proof-of-Beneficial-Use (PBU) maps, showing the locations where the decreed and permitted water rights were beneficially used within the defined POU. These POU and PBU maps, when compared to recent aerial photography, serve as the baseline for proof of previously irrigated lands, documenting conservation of the water. In some instances, the recent digitized polygons of the current fields do not exactly match the fields on the POU or PBU maps from decades prior. This is due to improved mapping capabilities and changes in land/water right ownership resulting in divided/combined fields. However, since the water rights can be used anywhere within the defined POU, the breakdown of the fields is not as important as the total irrigated acreage within the POU.

Table 3-4
Upper Muddy River ICS Water Rights

Water Right	Data Source	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Total (afy)
	# Days	31	28	31	30	31	30	31	31	30	31	30	31	365
LDS Lease	Permit 6419	8.61	7.78	8.61	8.33	12.30	11.90	12.30	12.30	11.90	8.61	8.33	8.61	119.57
	Permit 25861	70.10	63.31	70.10	67.84	99.61	96.40	99.61	99.61	96.40	70.10	67.84	70.10	971.00
	Permit 26316	51.02	46.09	51.02	49.38	51.02	49.38	51.02	51.02	49.38	51.02	49.38	51.02	600.76
	Permit 26317	2.46	2.22	2.46	2.38	3.50	3.39	3.50	3.50	3.39	2.46	2.38	2.46	34.12
	Permit 26318	23.06	20.83	23.06	22.31	32.96	31.89	32.96	32.96	31.89	23.06	22.31	23.06	320.35
	Used by LDS	(3.24)	(2.93)	(3.24)	(3.14)	(4.63)	(4.48)	(4.63)	(4.63)	(4.48)	(3.24)	(3.14)	(3.24)	(45.00)
	LDS Lease Total	162.01	137.30	162.01	147.10	194.77	188.48	194.77	194.77	188.48	162.01	147.10	162.01	2,001
Cox	Decree	6.15	5.55	6.15	5.95	8.78	8.50	8.78	8.78	8.50	6.15	5.95	6.15	85
Mitchell	Decree	1.84	1.67	1.84	1.79	2.64	2.55	2.64	2.64	2.55	1.84	1.79	1.84	26
Paiute Lease	Table 3-1	209.73	189.43	209.73	289.95	299.61	289.95	299.61	299.61	299.95	209.73	202.96	209.73	3,000
HV Dairy	Table 3-2	74.88	67.63	74.88	72.47	106.97	103.52	106.97	106.97	103.52	74.88	72.47	74.88	1,040
NVE Lease	Table 3-3	438.68	396.23	438.68	424.53	—	—	—	—	—	438.68	424.53	438.68	3,000
Knox and Holmes	Decree	58.41	52.76	58.41	58.53	83.45	80.76	83.45	83.45	80.76	58.41	56.53	58.41	811
Upper Total (af)		941.70	850.57	941.70	998.31	696.22	673.78	696.22	696.22	673.76	941.70	911.33	941.70	9,963

Table 3-5
Mean Daily Flows for USGS Muddy River near Glendale Gage (09419000) (70 cfs Limit)

Day	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Total
1	44	45	47	43	39	45	41	36	35	39	46	45	
2	44	45	50	45	42	44	42	37	36	37	45	44	
3	45	45	48	44	43	45	40	37	35	37	45	44	
4	45	43	48	45	43	44	39	38	35	37	50	44	
5	46	42	48	45	41	43	39	38	35	70	50	44	
6	46	41	46	44	40	42	39	36	35	70	47	44	
7	47	40	47	44	40	42	39	37	36	50	46	43	
8	47	42	47	42	43	42	38	37	35	50	46	43	
9	46	40	47	42	43	43	42	38	36	48	48	43	
10	46	40	47	41	45	43	37	37	35	50	45	44	
11	46	40	47	42	44	43	37	35	35	52	46	45	
12	48	40	48	42	43	42	37	38	35	52	46	45	
13	44	40	48	41	42	44	37	38	35	52	45	44	
14	45	41	50	37	42	43	36	49	35	51	44	45	
15	44	42	50	38	42	44	35	48	37	50	44	43	
16	44	42	50	40	44	42	34	39	39	50	45	43	
17	44	42	50	38	44	42	35	39	37	50	44	43	
18	44	42	50	42	44	42	34	39	35	70	43	44	
19	44	43	50	42	56	42	47	39	35	70	43	44	
20	43	45	50	42	46	41	68	39	35	70	44	44	
21	42	45	50	39	45	40	59	39	35	70	44	44	
22	43	44	50	42	45	40	36	39	36	70	44	45	
23	43	49	50	38	45	39	35	39	36	51	43	45	
24	44	47	50	39	46	41	35	39	36	46	44	44	
25	44	47	50	42	47	40	35	39	37	45	44	45	
26	44	48	49	43	47	41	35	38	37	43	45	44	
27	47	47	48	43	45	42	35	38	37	44	45	45	
28	48	47	48	42	44	41	35	37	38	43	45	45	
29	48	–	48	40	45	40	36	37	38	45	45	45	
30	48	–	47	39	45	39	37	36	39	46	44	45	
31	48	–	44	–	46	–	38	36	–	46	–	45	
Mean	45	43	48	42	44	42	39	38	36	52	45	44	
Count	31	28	31	30	31	30	31	31	30	31	30	31	
Minimum	42	40	44	37	39	39	34	35	35	37	43	43	
Maximum	48	49	50	45	56	45	68	49	39	70	50	45	
Acre-Feet	2,770	2,410	2,970	2,470	2,710	2,500	2,400	2,350	2,140	3,190	2,680	2,720	31,310
Phreatophyte Consumptive Use Glendale to Wells Siding (af)	18	21	37	76	160	202	191	173	141	86	31	13	1,149
SNWA Upper Rights (af)	942	851	942	998	696	674	696	696	674	942	911	942	9,963
AF/Share Basis Volume (af)	1,810	1,538	1,992	1,396	1,854	1,625	1,513	1,481	1,325	2,162	1,737	1,765	20,198

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and (3) SNWA Upper Muddy River rights being conveyed to Lake Mead for Tributary Conservation ICS credit (Table 3-4).

The ET losses between the Glendale gage and Wells Siding were determined to be 1,149 af, as discussed in subsequent sections. To subtract non-divertible flood flows, mean daily flows greater than 70 cfs were identified and replaced with 70 cfs, which is the maximum diversion rate at Wells Siding. Monthly and annual flow statistics were then recalculated without the non-divertible flood flows. In CY 2015, there were a few flood events in October 2015 that resulted in flows exceeding the 70 cfs maximum diversion, which were replaced with a daily flow value of 70 cfs. (Table 3-5).

Conserved Upper Muddy River flows for many of the SNWA water rights were distributed into monthly diversion volumes in Table 3-4. These monthly volumes were then subtracted from the Glendale gage flows on Table 3-5 prior to estimating the amount of water pro-rated to the MVIC shares.

The annual Glendale gage flows for CY 2015 were therefore reduced by 1,149 af for ET and 9,963 af for SNWA's Upper Muddy River rights to derive the volume of divertible flow available to MVIC.

3.3.4 MVIC Acre-Feet per Share Calculations

Table 3-6 summarizes the percent of divertible flows available to each MVIC share class. Using the divertible flows derived for CY 2015 listed in Table 3-5, the acre-foot per share values for preferred and common shares were calculated and listed in Table 3-7.

Table 3-6
MVIC Share Classes and Divertible Flow Percentages

Share Type	Number of Shares	Percent of Summer Flow	Percent of Winter Flow
		(May - September)	(October - April)
Preferred	2,432	100%	75%
Common	5,044	0%	25%

Table 3-7
Acre-Foot per Share Calculation Results

Calendar Year	Jan - Apr and Oct - Dec Flows (af)	May - Sept Flows (af)	100% Summer and 75% Winter Flows (af)	25% Winter Flow (af)	Preferred-af Divided by 2,432 shares (af / share)	Common-af Divided by 5,044 shares (af / share)
2015	12,400	7,797	17,098	3,100	7.0302	0.6146

Table 3-8
SNWA Controlled MVIC Shares in CY 2015

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Water Available to MVIC (AF From Table 3-6)	1,810	1,538	1,992	1,398	1,854	1,625	1,513	1,481	1,325	2,162	1,737	1,765	20,198
Acre-Feet Per Share Per Month													
Common (af/share)	0.0897	0.0763	0.0987	0.0692	0	0	0	0	0	0.1072	0.0861	0.0875	0.6146
Preferred (af/share)	0.5582	0.4745	0.6142	0.4304	0.7624	0.6680	0.6220	0.6090	0.5448	0.6667	0.5358	0.5444	7.0302
Owned by SNWA													
Common Shares	2,839.1267	2,839.1267	2,839.1267	2,839.1267	2,839.1267	2,839.1267	2,839.1267	2,839.1267	2,839.1267	2,839.1267	2,839.1267	2,839.1267	
Preferred Shares	1,009.0847	1,009.0847	1,009.0847	1,009.0847	1,009.0847	1,009.0847	1,009.0847	1,009.0847	1,009.0847	1,009.0847	1,009.0847	1,009.0847	
Leased Back to Seller													
Common Shares	458.9719	458.9719	458.9719	458.9719	458.9719	458.9719	458.9719	458.9719	458.9719	392.7917	392.7917	392.7917	
Preferred Shares	210.7917	210.7917	210.7917	210.7917	210.7917	210.7917	210.9717	210.7917	210.7917	197.7917	197.7917	197.7917	
Leased by SNWA													
Common Shares	351.7500	351.7500	351.7500	351.7500	351.7500	351.7500	351.7500	351.7500	351.7500	351.7500	351.7500	351.7500	
Preferred Shares	167.2830	167.2830	167.2830	167.2830	167.2830	167.2830	167.2830	167.2830	167.2830	167.2830	167.2830	167.2830	
Controlled = (Owned - Leased Back + Leased)													
Common Shares	2,731.9048	2,731.9048	2,731.9048	2,731.9048	2,731.9048	2,731.9048	2,731.9048	2,731.9048	2,731.9048	2,798.0850	2,798.0850	2,798.0850	
Preferred Shares	965.5760	965.5760	965.5760	965.5760	965.5760	965.5760	965.5760	965.5760	965.5760	978.5760	978.5760	978.5760	
Water Controlled (af) = (Shares Controlled x Acre Foot Per Share)													
Common (af)	245.0770	208.3169	269.6767	188.9933	0	0	0	0	0	299.8224	240.9302	244.6059	1,698
Preferred (af)	538.9597	458.1190	593.0578	415.6235	736.1327	645.0444	600.5819	588.0055	526.0177	652.4248	524.2731	532.7068	6,811
Total (af)	784.0367	666.4359	862.7344	604.6168	736.1327	645.0444	600.5819	588.0055	526.0177	952.2472	765.2033	777.3127	8,509

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types and numbers of permeable secondary structures giving rise to exceptionally high transmissivity in the carbonate aquifer to the south and east.

Eureka Quartzite, Pilot Shale, strata that may contain Chainman Shale, and undifferentiated Ely Spring Dolomite, Eureka Quartzite, and / or Pogonip Group have been mapped in carbonate outcrop in the Arrow Canyon Range and Meadow Valley Mountains (Crafford 2007). Likewise, two faults are mapped between KMW-1 and central Coyote Spring Valley (the area of CSVM-6, MX-4, MX-5, and CSVM-1): the Kane Springs Wash Fault near the boundary of Kane Springs and Coyote Spring valleys, and a north-northwest striking normal fault located just east of CSVM-6, MX-4, MX-5, and CSVM-1 (Figure 6). Nonetheless, prior to the 2007 finding, water level trends in CSVM-4 mirrored those in the central Coyote Spring Valley wells, and trends in KMW-1 mirrored those in CSVM-4; the similarity of carbonate water level responses continuing post-2007 through the Order 1169 pumping test (Figures 7, 8a and 8b). Based on the continuity of water level responses across this portion of the carbonate aquifer, any changes in lithology or discrete low permeability structures present in the carbonate aquifer between KMW-1 and central Coyote Spring Valley are not sufficiently impermeable to preclude or significantly minimize the impacts of carbonate pumping in KPW-1 (or KMW-1) on carbonate water levels in Coyote Spring Valley (or the other basins currently recognized as the LWRFS), consequently the Muddy River Springs or Muddy River.

Moreover, to the extent that the completion of KMW-1 (the only carbonate well in Kane Springs Valley) relative to the Kane Spring Wash Fault is unclear, broad conclusions should not be drawn concerning the effects of pumping in Kane Springs Valley based on water level responses, or the response to pumping, in KMW-1 alone. Well KMW-1 is located about 150 to 200 ft northwest of the mapped location of the Kane Springs Wash Fault (Page et al. 2005), but is completed from 955 to 2,013 ft bgs (NDWR 2018b) in an area where the dip of the fault is unknown[28].

Beyond the 2007 Finding

What is known with certainty is that the carbonate aquifer (the full or nearly full sequence of Paleozoic carbonates) extends north to south through Coyote Spring Valley from the Pahranagat Shear Zone to Hidden Valley (and beyond), and west to east from the Gass Peak thrust (if not the crest of the Sheep Range) into LMVW, the MRSA, and California Wash (SNWA 2009b, hydrogeologic framework model; and cross-section B, C, D, and F, Page et al. 2006); and that large amounts of groundwater flow into the north end of Coyote Spring Valley through the carbonates at the Pahranagat Shear Zone (Eakin 1964, Dettinger et al. 1995, and SNWA 2009a), the majority likely between the Gass Peak thrust and a north-striking normal fault that passes through the areas of CE-VF-2 and CSVM-3[29] (Figure 6). Additionally, much of the groundwater

[28] Well KMW-1 located intermediate between cross-sections B and C, Page et al. 2006.

[29] The full sequence of Paleozoic carbonate units preserved over this section of northernmost Coyote Spring Valley, but not east of the north-striking normal fault passing near CE-VF-2 and CSVM-3 and not west of the Gass Peak thrust (cross-section B, Page et al. 2006).

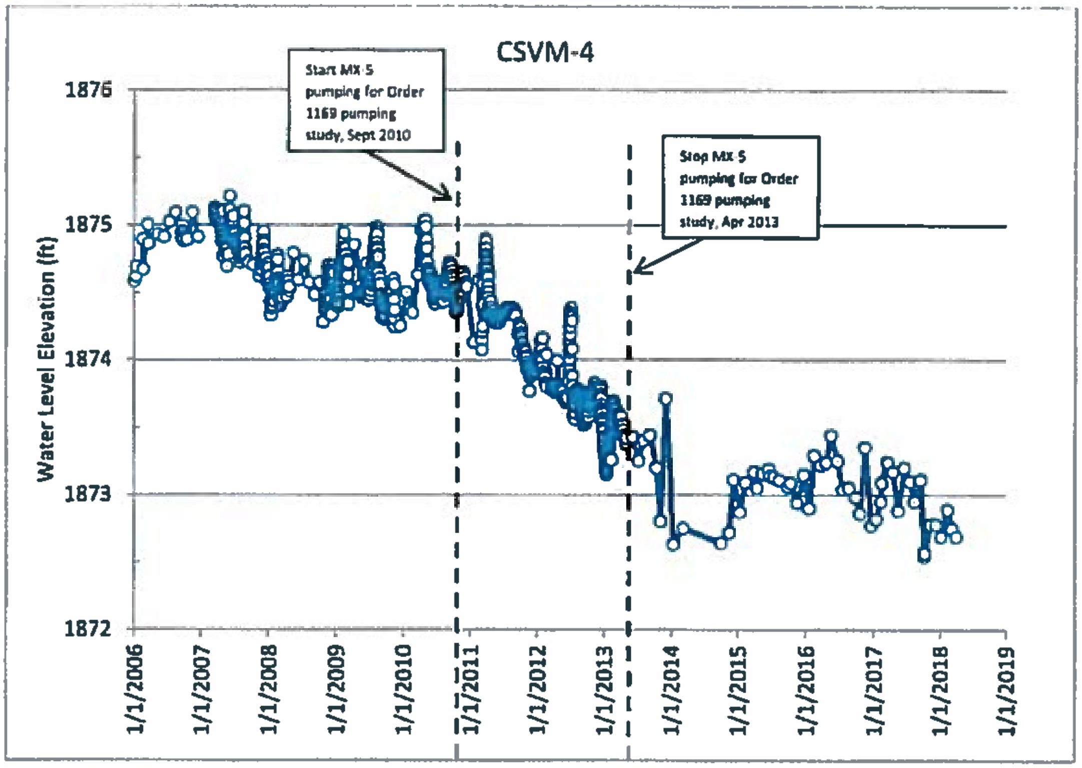


Figure 8a. Change in water level in carbonate monitoring well CSVM-4, northern Coyote Spring Valley, during the Order 1169 pumping test (~1.2 ft), September 2010 to December 2012 (NDWR 2018a).

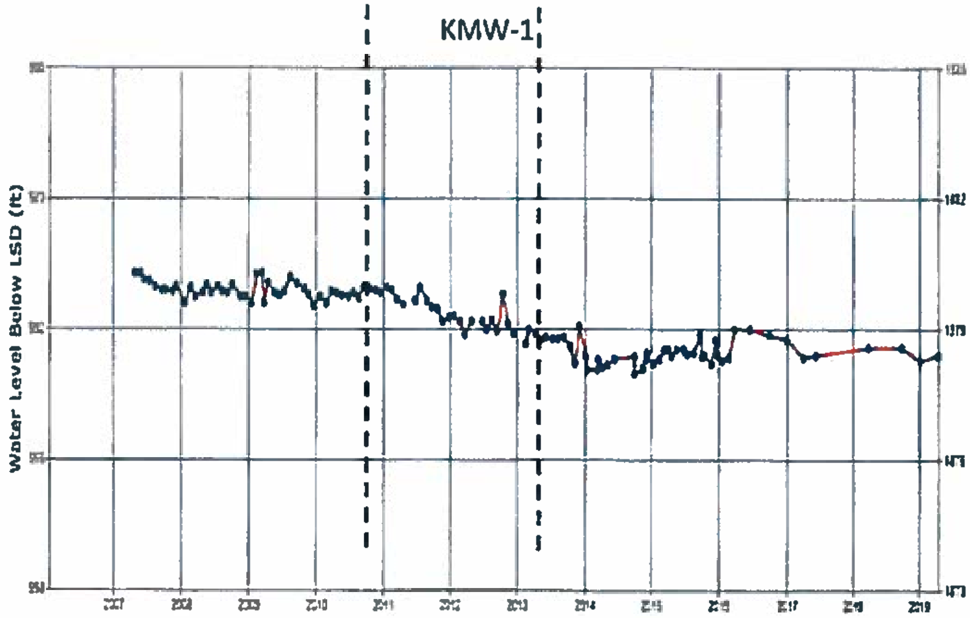


Figure 8b. Change in water level in carbonate monitoring well KMW-1, southern Kane Springs Valley, during the Order 1169 pumping test (~1.1 ft), September 2010 to December 2012 (hydrograph after NDWR 2019c).

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Nevada Fish and Wildlife Office
4701 North Torrey Pines Drive
Las Vegas, Nevada 89130
Ph: (702) 515-5230 ~ Fax: (702) 515-5231

October 29, 2008
File Nos. 84320-2008-F-0007 and
84320-2008-I-0216

Memorandum

To: Field Manager, Ely Field Office, Bureau of Land Management, Ely, Nevada

From: Field Supervisor, Nevada Fish and Wildlife Office, Reno, Nevada

Subject: Request for Formal and Informal Consultation on the Kane Springs Valley Groundwater Development Project in Lincoln County, Nevada

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed Kane Springs Valley Groundwater Development Project and its possible adverse effects on the desert tortoise (*Gopherus agassizii*) (Mojave population), listed as threatened under the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*), and its designated critical habitat, and the Moapa dace (*Moapa coriacea*), listed as endangered under the Act. No critical habitat has been designated for the Moapa dace. Further, the Bureau of Land Management (BLM) requests concurrence that the proposed project *may affect, but is not likely to adversely affect* the southwestern willow flycatcher (*Empidonax traillii extimus*), listed as endangered under the Act. No designated critical habitat for the southwestern willow flycatcher occurs in the project area. The Lincoln County Water District (LCWD) has applied for a BLM right-of-way to construct and operate a system of water facilities on BLM-managed land in southern Lincoln County.

This biological opinion is issued in accordance with section 7 of the Act and based on information provided in BLM's memorandum dated September 27, 2007, to the Service (received on September 28, 2007), and revised biological assessment (BA), dated December 2007 (ARCADIS 2007); Amended Stipulation for Withdrawal of Protests (Stipulated Agreement) dated August 8, 2006; discussions between the Service and BLM; and our files. A complete administrative record of this consultation is on file in the Service's Nevada Fish and Wildlife Office in Las Vegas.

This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to critical habitat.

INFORMAL CONSULTATION

Southwestern willow flycatcher

No habitat is present for the southwestern willow flycatcher within the project area. The closest breeding populations occur at Pahranagat National Wildlife Refuge (NWR) approximately 23 miles northwest and in the Warm Springs Area, approximately 25 miles southeast. Since the springs in the Warms Springs Area are supplied by water from the deep carbonate aquifer, groundwater pumping in the Kane Springs Valley Hydrographic Basin could affect water levels in the Muddy River System. These effects to riparian vegetation will be minimized by actions contained in the Stipulated Agreement among the Service, LCWD and Vidler Water Company, Inc (VWC), which are designed to maintain minimum in-stream flows in the Warm Springs Area of the Muddy River system in order to protect and recover the Moapa dace. (See section below entitled "Proposed Minimization Measures for Moapa Dace"). The project is anticipated to have insignificant effects to the southwestern willow flycatcher since any decreases in groundwater flow to the Muddy River system will be minimized by the Stipulated Agreement.

In consideration of the proposed action, potential effects of the proposed action, and measures proposed by BLM, the Service concurs with BLM's determination that the proposed action *may affect, but is not likely to adversely affect* the southwestern willow flycatcher. This response constitutes informal consultation under regulations promulgated in 50 CFR§402.14, which establishes procedures governing interagency consultation under section 7 of the Act. This informal consultation does not authorize take of any listed species.

CONSULTATION HISTORY

The following chronology documents the consultation process that culminated in the following biological opinion for the desert tortoise and its designated critical habitat and for the Moapa dace:

On May 8, 2006, the Service sent BLM a memorandum containing a species list of endangered, threatened, and candidate species that may occur in or near the proposed Kane Springs Valley Groundwater Development Project (Service File No. 1-5-06-SP-499).

On July 12, 2007, BLM sent the Service a memorandum requesting formal consultation on the Kane Springs Valley Groundwater Development Project for potential adverse effects to the desert tortoise and its designated critical habitat. A BA accompanied the memorandum.

On September 4, 2007, the Service sent BLM a memorandum recommending formal consultation for the Moapa dace and requesting additional information necessary to initiate formal consultation for the desert tortoise (Service File No. 1-5-07-F-558).

On September 27, 2007, BLM sent the Service a memorandum requesting formal consultation on the project for potential adverse effects to the desert tortoise and its designated critical habitat and the Moapa dace. A revised BA accompanied the memorandum.

On October 19, 2007, the Service sent BLM a memorandum that initiated formal consultation on September 28, 2007, since the revised BA contained sufficient information (Service File No. 84320-2008-F-0007).

On December 4, 2007, BLM, the Service, and the project proponent participated in a conference call to discuss several topics including the monitoring wells that are required by the stipulated agreement among LCWD, VWC, and the Service for withdrawal of the Service's protests of water rights applications in Kane Springs Valley. It was decided that the BA would include acreages and potential effects associated with the two new monitoring wells.

On December 6, 2007, ARCADIS, the project consultant, sent the Service a revised BA on behalf of BLM, which included acreages associated with the two new monitoring wells.

On January 28, 2008, the Service sent BLM a memorandum extending the consultation period for this project by 60 days due to a substantial consultation workload.

On June 17, 2008, VWC sent the Service comments on the terms and conditions of the draft biological opinion.

On June 18, 2008, the Service provided BLM a copy of a draft biological opinion via email.

On June 30, 2008, a Memorandum of Understanding (MOU) among LCWD, VWC, and the Service was signed. Pursuant to the MOU, the Service will issue a biological opinion for the project which will include an incidental take statement authorizing such take of Moapa dace as may occur in connection with the pumping and transfer of 1,000 acre-feet of groundwater under Phase I of the Project and implementation of the Monitoring, Management and Mitigation Plan. Upon receiving authorization from the Nevada State Engineer to appropriate more than 1,000 and up to 5,000 acre-feet per year of groundwater from the Kane Springs Valley for use in the Coyote Springs Valley, the Service will reinitiate consultation for the project pursuant to section 7 of the Act.

On July 15, 2008, the Service received a copy of BLM's comments on the draft biological opinion via email.

On July 28, 2008, the Service and BLM met to discuss the draft biological opinion.

On August 18, 2008, BLM sent the Service proposed language for term and condition 4.d. and 5. of the biological opinion via email.

On October 1, 2008, BLM sent the Service updated proposed language for term and condition 4.d. of the biological opinion via email.

On October 1, 2008, the Service and BLM met to discuss deposition of remuneration fees for offsetting desert tortoise habitat loss.

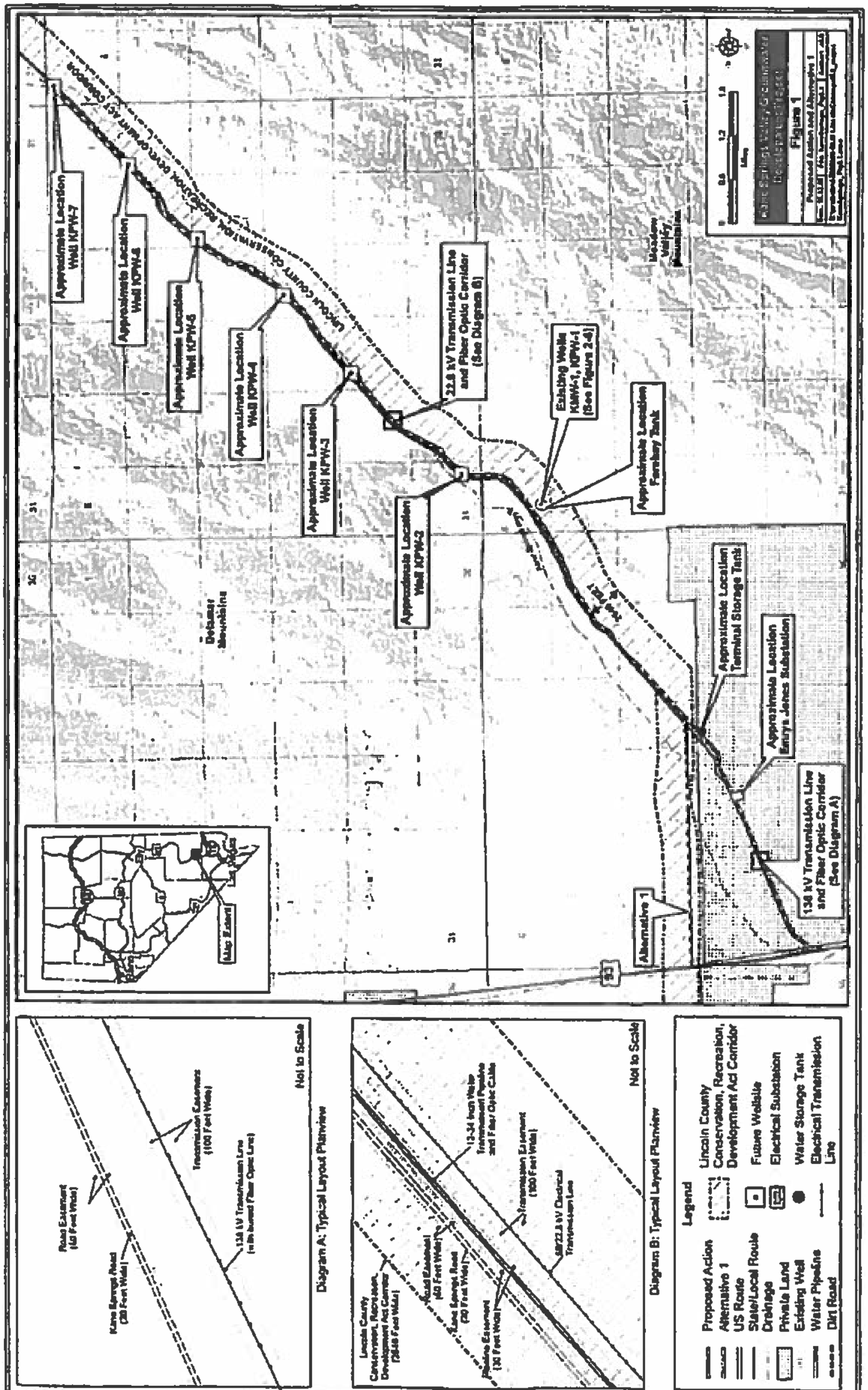
BIOLOGICAL OPINION

A. Description of the Proposed Action

The purpose of the proposed action is to develop a system for tapping groundwater resources in the Kane Springs Valley Hydrographic Basin for municipal water purposes within the Coyote Spring Valley Hydrographic Basin. The project proponents applied to the Nevada State Engineer's Office for 17,375 acre-feet per year (afy), but to date have been granted 1,000 afy under Ruling # 5712. The proposed pipeline would have capacity to transport up to 5,000 afy. Construction and operation of the proposed action would supply a small, but initially substantial portion of the total water requirements for the Coyote Springs Investment (CSI) development projects in southern Lincoln County. The majority of the proposed facilities would be located along or near the Kane Springs Road, within the 2,640-foot wide Lincoln County Conservation, Recreation, and Development Act (LCCRDA) utility corridor on public land, or on private land owned by CSI. The project area extends approximately 16.6 miles along Kane Springs Road from the intersection with US 93 (US 93).

The proposed action consists of several components including, groundwater production wells, monitoring wells, water pipelines, storage tanks, power transmission lines and substations, access roads and a fiber optic line. Figure 1 shows the approximate location of the project components in the lower Kane Springs Valley. LCWD is developing this project in cooperation with Lincoln County Power District (LCPD) Number 1 and Lincoln County Telephone Company. Each utility agency is responsible for the construction, operation, and rehabilitation of disturbed land associated with their utility. Each utility agency may be required to apply for a separate right-of-way with BLM.

Although the BA included the construction of the Emrys Jones Substation and power line west of the Substation, LCPD is constructing these facilities under another project, the Coyote Springs Transmission Line Project. Therefore, these facilities are not considered to be part of the proposed action for this consultation.



Approximate Location Well KPW-7
Approximate Location Well KPW-6
Approximate Location Well KPW-5
Approximate Location Well KPW-4
Approximate Location Well KPW-3
Approximate Location Well KPW-2
22.9 kV Transmission Line and Fiber Optic Corridor (See Diagram B)
Existing Wells KMW-1, KPW-1 (See Figure 2-4)
Approximate Location Forebay Tank
Approximate Location Terminal Storage Tank
138 kV Transmission Line and Fiber Optic Corridor (See Diagram A)
Alternative 1
Map Extent
Not to Scale
Diagram A: Typical Layout Planview
Not to Scale
Diagram B: Typical Layout Planview
Legend
Proposed Action
Alternative 1
US Route
State/Local Route
Drainage
Private Land
Existing Well
Water Pipeline
Dirt Road
Lincoln County Conservation, Recreation, Development Act Corridor
Future Wellsite
Electrical Substation
Water Storage Tank
Electrical Transmission Line
Figure 1

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1. Project Features

a. Wells

Groundwater from the Kane Springs Valley Hydrographic Basin would be supplied to the Coyote Spring Valley area from up to seven groundwater production wells. All production wells would be located within the LCCRDA corridor on public land, spaced approximately 1.3 to 1.8 miles apart. The first well (KPW-1), approved under BLM Serial Number NVN-079630, was drilled in 2005. Each wellhead would be enclosed in a masonry block structure, which would also contain all aboveground piping, shutoff valve, check valve, flow meter, air release valve, and electrical equipment. The size of each fenced well yard would be approximately 150 feet by 150 feet. Production wells would be equipped with an electric pump.

An existing monitoring well, KMW-1, is located adjacent to KPW-1 (Figure 1). The monitoring well was installed in 2005 to assist in assessing the hydrogeology of the Kane Springs Valley Hydrographic Basin. Two new monitoring wells may also be installed per the stipulated agreement for withdrawal of the Service's protests of LCWD and VWC's water rights applications in Kane Springs Valley. The wells would be placed on CSI land and would each have a footprint of less than 1 acre in size. The final location would be coordinated through the Technical Review Team (TRT) established under the stipulated agreement. Should the TRT decide that these monitoring wells are not necessary, funds for the material and construction of the monitoring would be used instead for Moapa dace conservation.

b. Pipelines

There are two types of pipelines associated with the proposed action: the well field pipeline collection system and the main transmission pipeline. Ancillary pipeline components include isolation valves, cathodic protection, control valves, air release/vacuum valves, blow-off valves, access manways, fiber optic splice vaults, and pipe alignment markers.

The well field pipeline collection system would consist of individual branch pipelines from each well to a single main collection pipeline terminating at the forebay storage tank. The total pipeline collection system would extend approximately 9.4 miles. The pipeline, to be constructed of ductile iron, would vary in size (telescope) from 12 inches to 24 inches in diameter, with the largest diameters located closest to the forebay storage tank. The pipeline would be buried to a minimum depth of three feet below grade, or three times scour depth in washes in accordance with engineering requirements. In general, the pipeline would parallel the Kane Springs Road to the south, with a 60-foot wide construction easement and a 30-foot wide permanent easement. If cross-country construction is required, the temporary construction easement would be 75 feet wide, with a permanent easement of 60 feet.

Approximately 3.8 miles of buried 24-inch diameter transmission pipeline would be constructed adjacent to the Kane Springs Road between the forebay storage tank and the terminal storage tank. Appurtenant groundwater facilities (e.g., isolation valves, control valves) would occur, on average, every mile along the alignment. These facilities would be located predominantly below existing grades in traffic-rated, lockable, concrete vaults that would vary in dimension. Typically, these vaults would be located outside of traffic areas and may require small location markers extending several feet above the surface of the ground.

c. Storage Tanks

A 50,000-gallon forebay storage tank would be installed adjacent to the existing production well (KPW-1) and would initially serve as the termination point for the groundwater collection system. This tank would be used to normalize flow pressures in the system and provide storage for secondary lifting to the terminal storage tank, if required. The water level in the forebay storage tank would control the operation of the well field via telemetry. Either wireless telemetry or direct-burial fiber optic telemetry cable located in pipeline trenches would enable communication between the collection system, forebay storage tank, and the terminal storage tank.

A terminal water storage tank would ultimately be located at the southern end of the water transmission pipeline to receive the imported water and to serve as a water distribution source for the northern Coyote Spring Valley area. The storage tank would be constructed with a maximum capacity of 700,000 gallons, subject to final design requirements.

d. Power Distribution

In order to provide reliable electric service to the well fields, LCPD would construct and operate transmission lines and substations. Power facilities built for this project would connect to the Emrys Jones Substation, part of the Coyote Springs Transmission Line Project.

Under the proposed project, LCPD would construct an overhead transmission line with a 69 kV/22.8 kV distribution circuit from the Emrys Jones Substation to the proposed well fields along the Kane Springs Road, parallel to the pipeline. A total of 14 miles of transmission line would be installed. The 69 kV/22.8 kV transmission line would be a single-circuit line supported by wood pole structures. The 69 kV/22.8 kV transmission line would primarily be located on public lands managed by BLM, with a short section near the Emrys Jones Substation located on private property. Each wood pole structure would require a temporary construction easement of 0.07 acre and after construction, each structure would occupy 0.02 acre. The transmission line would have a 100-foot permanent easement.

At each well location, a fenced power substation (approximately 155 feet by 95 feet) would be constructed to serve the well pump motor and ancillary equipment. The substation yards would consist of a 69 kV/22.8 kV to 4.16 kV pad-mounted step-down transformer, primary metering, switch cabinet, capacitor bank, and a station service transformer.

e. Fiber Optic

The Lincoln County Telephone Company is proposing to install fiber optic cables within the proposed project right-of-way. The fiber optic line would be buried in the same trench as the pipeline and adjacent to the 138 kV transmission line on private lands proposed under the Coyote Springs Transmission Line Project. The fiber optic cables would be used for communication to manage the pipeline operation. The fiber optic cables would tie into an existing fiber optic line located on the east side of US 93.

f. Additional Project Components

Approximately 50 acres may be used for temporary extra work spaces. These areas would be spaced approximately 0.5 mile apart and would cover approximately 2 acres. Some larger staging areas may be sited in suitable areas near steeply incised drainages, above and below slopes where construction is expected to be difficult, and at pipe laydown areas. All extra work spaces on Federal lands would be located within the project right-of-way. Staging areas on private lands would be used during construction for storage of materials and equipment, construction office trailers, fuel storage, equipment maintenance, stockpiling and handling of excavated material, and other construction-related activities. Following construction, the staging areas would be restored as described in the Kane Springs Valley Groundwater Development Project Environmental Impact Statement (EIS).

g. Road Access and Transportation

US 93 and the Kane Springs Road would provide primary access into the project area. Spur roads would be constructed from the Kane Springs Road to temporary and permanent facilities sites, such as contractors' yards, well fields, and power pole locations, within the project right-of-way corridor. The number of new spur roads would be held to a minimum, consistent with their intended use (e.g., facility construction, conductor stringing and tensioning). It is estimated that seven new minor access roads would be required to access the proposed well houses. Each of these roads would be approximately 100 feet long and 12 feet wide. Access roads not required after construction would be removed and restored to their approximate original contour and dimensions and made to discourage vehicular traffic. All temporary road surfaces would be ripped or harrowed to establish conditions appropriate for reseeding, drainage, and erosion prevention.

Table 1 lists the estimated temporary and permanent disturbance acreage required for construction and operation of the proposed project. The estimated disturbance acreage is based on preliminary engineering plans and therefore may change slightly.

Table 1 Estimated Surface Disturbance by Land Ownership (at full buildout of the proposed project)		
	Temporary (acres)*	Permanent (acres)*
Federal (BLM)		
Well House and Well Substation	3.2	3.0
KPW-1 Well, Forebay Tank, KMW-1 Well	0.3	1.0
Pipeline Construction right-of-way	148.7	0.0
Terminal Storage Tank	0.0	0.0
Electrical Substation	0.0	0.0
Electrical Transmission Line	14.8	5.0
Electrical Transmission Line Access Roads	0.0	8.0
Fiber Optics Line	0.0	0.0
Subtotal	**167.0**	**17.0**
Private		
Well House and Well Substation	0.0	0.0
KPW-1 Well, Forebay Tank, KMW-1 Well	0.0	0.0
Pipeline Construction right-of-way	0.0	0.0
Terminal Storage Tank	0.7	0.3
Electrical Substation	0.0	0.0
Electrical Transmission Line	2.4	1.1
Electrical Transmission Line Access Roads	0.0	0.7
Fiber Optics Line	14.2	0.0
Two Groundwater Monitoring Wells	4.0	2.0
Subtotal	**21.3**	**4.1**
Total	**188.3**	**21.1**

h. Construction Procedures

Each utility agency would conduct all activities associated with the construction, operation, and rehabilitation of temporarily disturbed areas within the authorized limits of their BLM right-of-way. To supply electrical power to the well fields, it is anticipated that LCPD would be the first utility agency to begin construction after all approvals have been acquired. During construction activities, water would be used to suppress dust in the construction area.

Construction of the electric transmission lines and substation would involve the following general sequence: engineering surveys and staking, clearing and grading, material storage and handling, creation of structure holes or foundations, structure assembly and erection, installation of security fencing around substation, post construction cleanup and reclamation, and construction monitoring. Construction of the overhead lines would be completed in two phases: setting the pole structures and installing the cable. The setting of the pole structures is accomplished with a single multi-purpose truck. The truck has a small crane suitable for lifting and placing poles. A pole trailer is towed behind the crane truck to transport the poles to the installation site. Affixed to the crane is an auger for boring the holes for the pole structures. Soil excavated during construction would be used for backfill and for restoration of disturbed areas. The cable would be installed using two vehicles: a cable truck and a truck with a power lift. The cable would be strung out along the installation route and the man lift would be used to place the cable on the pole structure.

Construction of the groundwater facilities and fiber optic line would involve the following sequence: engineering surveys and staking, topsoil salvage and storage, clearing and grading (including access road construction), trenching and blasting, pipeline stringing/installation, installation of fiber optic line in common pipeline trench, backfilling, hydrostatic testing, re-grading, post-construction cleanup, and reclamation, and construction monitoring. Trenching would consist of excavating the trench using either a trenching machine or track-mounted excavator. In general the bottom of the trench would be five feet wide and up to six feet deep to provide the required cover over the top of the installed pipe. In areas of weathered rock, track-mounted excavators may be preceded by a bulldozer equipped with a single-shank ripper. Limited blasting may be required in areas where shallow or exposed bedrock is present. This project would be constructed utilizing a "Dig and Lay" procedure. In other words, a portion of trench would be dug, the pipe would be laid, welded, and back filled and another segment would begin. There would be minimal (less than 500 feet) open trench at any one time and the backfill would occur almost immediately following pipe installation.

i. Operation and Maintenance

The electrical facilities would be in continuous operation and water facilities would be operated and maintained to ensure safe operation and integrity of the pipeline. Periodic inspection and maintenance of power and water facilities would be required. If a pipeline break were to occur, immediate steps would be taken to isolate the break, the break would be repaired, and the trench backfilled. Areas would be contoured and revegetated after these types of repairs. Emergency maintenance of power lines, such are repairing downed wires and correcting unexpected outages would be performed by LCPD.

j. Project Phases

Construction of the project would occur in three phases, with one to three years between phases. Phases would correspond to demand for water and issuance of permits for additional water rights. Eventually LCWD would like to harvest 5,000 afy from the carbonate aquifer within the Kane Springs Valley Hydrographic Basin but so far has been granted an appropriation of 1,000 afy by the Nevada State Engineer. This appropriation granted four points of diversion, which constitutes the initial production under Phase 1 of the project. If additional appropriations are granted, production from Phase 1 wells could be increased, and Phase 2 and Phase 3 wells could be developed.

- Construction of Phase 1 would occur over a 90- to 180-day period and would begin upon completion of environmental reviews and the acquisition of necessary permits and approvals. Phase 1 water facilities would include the transmission pipeline (main water line) and approximately 9.4 miles of well field collection pipelines for up to four wells (main collection plus laterals to wells), up to four production wells, the storage tanks, and up to two monitoring wells. Power facilities would include 14 miles of 69 kV/22.8 kV overhead power lines and up to four smaller substations to serve each well.

- Construction of Phase 2 would occur over a 30- to 60-day period. Phase 2 water facilities would include one to two production wells and lateral pipelines from these wells to the main collection pipeline (combined length of the two lateral pipelines is expected to be less than 1 mile). Power facilities would include 22.8 kV underground power lines from the main transmission line to the substation(s) and one to two smaller substations to serve the new well(s).
- Phase 3 construction would only occur if production from Phase 1 and Phase 2 were insufficient to meet anticipated demand or if production from previous wells were lower than estimated or designed. Phase 3 facilities and construction times are similar to Phase 2.

2. State Engineer Ruling

On February 2, 2007, the Nevada State Engineer issued Ruling 5712, which granted 1,000 afy of groundwater from the Kane Springs Valley Hydrographic Basin to LCWD and VWC for municipal purposes within the Coyote Spring Valley Hydrographic Basin. Specifically 500 afy was granted under Application 72220 and applications 72218, 72219, and 72221, were granted for a total combined duty of 500 afy.

The State Engineer concluded that to permit the appropriation of water in an amount greater than permitted under this ruling would conflict with existing rights and threaten to prove detrimental to the public interest. After reviewing the existing information, the State Engineer concluded that a small amount of water can be developed in the Kane Springs Valley and not unreasonably impact existing rights in the discharge areas of the White River carbonate-rock aquifer system, which are already fully appropriated. The State Engineer found that no water has been previously appropriated in the Kane Springs Valley Hydrographic Basin and by limiting the quantity of water authorized for appropriation the potential impacts to existing waster rights in down-gradient hydrographic basins would be minimized.

3. Proposed Minimization Measures for Desert Tortoise (Mojave population)

a. The applicant will implement an Environmental Training Program. Prior to beginning work, all contractor personnel assigned to the field for construction-related activity will attend a mandatory one-time Worker Environmental Training Program presented by the project developer's Environmental Compliance Team. The presentation will review topsoil salvage, access restrictions, general site restrictions, and other environmental requirements regarding the project. Participants will sign a statement declaring that they understand and will abide by any guidelines set forth in the material presented.

b. All areas around structures will be backfilled, compacted, and returned as close as possible to the original condition and grade.

c. Signs will be placed along the access roads to discourage off-highway vehicle use of adjacent areas.

d. Clearance surveys will be performed prior to any construction activities within the right-of-ways. Any tortoises located will be handled and relocated by a qualified tortoise biologist in accordance with Service-approved protocol (Desert Tortoise Council 1994, revised 1999). Burrows containing tortoises or nests will be excavated by hand, with hand tools, to allow removal of the tortoise or eggs. Desert tortoises moved during the tortoise inactive season or those in hibernation, regardless of date, must be placed into an adequate burrow; if one is not available, one will be constructed in accordance with Desert Tortoise Council (1994, revised 1999) criteria. During mild temperature periods in the spring and early fall, tortoises removed from the site will not necessarily be placed in a burrow. Tortoises and burrows will only be relocated to federally managed lands. If the responsible Federal agency is not BLM, verbal permission, followed by written concurrence, will be obtained from BLM and the Service before relocating the tortoise or eggs to lands not managed by BLM.

e. Construction monitoring will employ a field contact representative, authorized biologist(s), and qualified biologist(s) during construction activities except in those areas with high disturbance. The Service employs a specific set of guidelines for such monitoring.

f. Tortoises requiring moving will only be handled by the authorized and qualified tortoise biologist or other trained personnel approved by the Service and the Nevada Department of Wildlife (NDOW).

g. A 25 mile per hour (mph) project access road speed limit will be enforced for all project vehicles and personnel.

h. The area limits of project construction and survey activities would be predetermined based on the temporary and permanent disturbance areas noted on the final design engineering drawings to minimize environmental effects arising from the project, with construction activities and traffic restricted to and confined within those limits.

i. Littering is not allowed. Project personnel would not deposit or leave any food or waste in the project area, and no biodegradable or non-biodegradable debris would remain in the right-of-way following completion of construction.

j. No wildlife, including rattlesnakes, may be harmed except to protect life and limb.

k. Project personnel are not allowed to bring pets to any project area in order to minimize harassment or killing of wildlife and to prevent the introduction of destructive animal diseases to native wildlife populations.

l. Wildlife species may not be collected for pets or any other reason.

m. Project supplies or equipment where wildlife could hide will be inspected prior to moving or working on them, to reduce the potential for injury to wildlife. Supplies or equipment that cannot be inspected or from which wildlife cannot escape or be removed, will be covered or otherwise made secure from wildlife intrusion or entrapment at the end of each work day.

n. All steep-walled trenches or excavations used during construction will be inspected twice daily (early morning and evening) to protect against wildlife entrapment.

o. All new access roads constructed as part of the project that are not required as permanent access for future project maintenance and operation would be permanently closed to minimize impacts from increased public access.

p. To minimize perching opportunities for raptors near habitats supporting sensitive prey species, structures incorporating a design to discourage raptor perching will be selected.

q. Only the minimum amount of vegetation necessary for the construction of structures and facilities will be removed. Topsoil will be conserved during excavation and reused as cover on disturbed areas to facilitate re-growth of vegetation.

r. Construction holes left open overnight will be covered. Covers will be secured in place nightly, prior to workers leaving the site, and will be strong enough to prevent livestock or wildlife from falling through and into a hole.

s. Holes and/or trenches will be inspected prior to filling to ensure absence of mammals and reptiles.

t. Where necessary, a biological resource monitor shall be present during the construction to ensure resources are protected in the construction area.

u. Excavations will be sloped on one end to provide an escape route for small mammals and reptiles.

v. A revegetation plan will be developed and implemented for the project which describes procedures the LCWD and its contractors would use to conduct revegetation of the disturbed areas. The Plan describes seedbed preparation; seed mixtures; seeding, salvaging, and transplanting methods; revegetation schedule; post-construction monitoring; evaluation of revegetation success; remediation; and reporting.

w. A noxious weed management plan will be developed and implemented for the project which includes site-specific measures that LCWD and its contractors would implement to control noxious weeds including, but not limited to, the use of cleaned, weed-free equipment, pressure washing of all vehicles and equipment prior to arrival at the work site, and the use of certified weed-free straw/hay bales to control erosion. A key element of the noxious weed management plan is to identify and treat existing weed infestations prior to construction.

x. A fire mitigation plan will be developed and implemented for the project which identifies measures to be taken during construction, operation, and maintenance of the project facilities to prevent and suppress fires. The purpose is to establish standards and practices to minimize the risk of fire or, in the event of fire, to implement immediate suppression procedures.

4. Proposed Minimization Measures for Moapa Dace

On August 8, 2006, the Service entered into a stipulated agreement with LCWD and VWC for water rights applications in the Kane Springs Valley Hydrographic Basin, then under review by the Nevada State Engineer's Office. The Service agreed to withdraw its protests for the granting of these water rights in exchange for the parties agreeing to implement the Monitoring, Management, and Mitigation Plan which would help protect senior Federal water rights in the Muddy River Springs/Warm Springs Area from unreasonable adverse impacts from groundwater pumping. The common goal of the parties is to manage the development of the LCWD and VWC water rights in their entirety from the Kane Springs Valley Hydrographic Basin, without resulting in any losses to senior water rights or unreasonable adverse impacts to Federal water resources.

The Monitoring, Management, and Mitigation Plan lists monitoring requirements in relation to the production wells, two new monitoring wells, elevation control and springflow, water quality, data quality, and reporting. The management requirements include action criteria to help to maintain minimum in-stream flows in the Warm Springs Area in order to protect and recover the Moapa dace. The parties agreed to the following, summarized from the Plan:

a. The Average Flow Level shall be determined by flow measurements at Warm Springs West flume. See the Plan for the definition of Average Flow Level.

b. If the Average Flow Level decreases to an amount within the Trigger Range of 3.2 cubic feet per second (cfs) or less, the parties agree to meet as soon as practically possible to discuss and interpret all available data and plan for mitigation measures in the event that flows continue to decline.

c. If the Average Flow Level is within the Trigger Range of 3.15 cfs or less but greater than 3.0 cfs, LWCD and VWC agree to reduce pumping from all wells in Kane Springs Valley by 50 percent or to a pumping level not greater than 2,500 afy, whichever results in the lesser amount of pumping, until the Average Flow Level exceeds 3.15 cfs. The subsequent State Engineer ruling limited pumping to 1,000 afy. Accordingly, under this scenario, LCWD and VWC would be required to reduce pumping by 50 percent.

d. If the Average Flow Level is within the Trigger Range of 3.0 cfs or less, LWCD and VWC agree to cease pumping from all wells in Kane Springs Valley until the Average Flow Level exceeds 3.0 cfs. However, if LWCD and VWC, together with CSI, effectuate a reduction in the quantity of water, CSI would have otherwise been entitled to pump in a given year from wells within the Coyote Spring Valley, then LWCD and VWC shall have the right to pump a like quantity of water from wells within Kane Springs Valley in that year.

The management requirements also include the establishment of a TRT with two representatives each from LCWD/VWC and the Service. The objectives of the TRT include reviewing existing data, making recommendations concerning the monitoring efforts required by this Plan, and determining whether other criteria, such as water levels in the monitoring wells, are a better indicator of potential effects of the pumping wells on the springs in the Muddy River Springs/ Warm Springs Area. As part of their commitment to the recovery of the Moapa Dace, LCWD and VWC will commit annual funds for a period of five years following the granting of the water rights applications, for the restoration of Moapa dace habitat outside the boundaries of the Moapa Valley National Wildlife Refuge (NWR).

B. Definition of the Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action, including interrelated and interdependent actions, and not merely the immediate area involved in the action (50 CFR § 402.02). Subsequent analyses of the environmental baseline, effects of the action, cumulative effects, and levels of incidental take are based upon the action area as determined by the Service.

For the desert tortoise and its designated critical habitat, impacts will be tied to the project area and a zone-of-influence extending 0.5 miles (2,400 feet) beyond the project area to cover potential effects to desert tortoises that could move into construction areas or onto access roads.

For the Moapa dace, which depends on thermal springs in the Warm Springs Area for survival, the action area includes the Kane Springs Valley Hydrographic Basin and the hydrographic basins down gradient of this basin in the White River Groundwater Flow System that are hydrologically connected to the Muddy River ecosystem. These hydrographic basins are the Coyote Spring Valley (Basin 210) and Muddy River Springs Area (Basin 219). The Service acquired the Moapa Valley NWR to secure habitat and assist the recovery efforts for the endangered Moapa dace, a species restricted to the Warm Springs Area and the mainstem of the upper Muddy River. Springs in this area are considered regional discharge points for the carbonate aquifer of the White River Flow System.

C. Status of the Species- Rangewide

1. Desert Tortoise (Mojave population) and Designated Critical Habitat

The current rangewide status of the desert tortoise and its critical habitat consists of information on its listing history, species account, recovery plan, recovery units, distribution, reproduction, and numbers, and critical habitat units and their constituent elements. This information is provided on the Service's website at: http://www.fws.gov/nevada. If unavailable, contact the Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230 and provide File No. 84320-2008-F-0007.

2. Moapa Dace

See the description in the Intra-Service Programmatic Biological Opinion for the Proposed Muddy River Memorandum of Agreement Regarding the Groundwater Withdrawal of 16,100 afy From the Regional Carbonate Aquifer in the Coyote Spring Valley and California Wash Basins and Establishment of Conservation Measures for the Moapa Dace, Clark County, Nevada (Service 2006c) (File No. 1-5-05-FW-536). Updated information on the Moapa dace is provided below.

Warm Springs Natural Area

In September 2007, Southern Nevada Water Authority (SNWA) purchased 1,179 acres of private property that encompasses several springs in the Muddy River headwaters area, including the former Warm Springs Ranch. The property includes 3.8 miles of the mainstream Muddy River. The Warms Springs Natural Area is to be managed as a nature preserve for protection of Moapa dace; and restoration and management of the areas as an ecological reserve.

Current Distribution and Abundance

Moapa dace surveys have been conducted annually throughout the upper Muddy River system. Dace surveys conducted semi regularly between 1994 and 2006 indicate Moapa dace numbers range between 1,296 and 3,825 individuals. The 2007 survey data indicate that there were approximately 1,172 fish in the population that occurred throughout 5.6 miles of habitat in the upper Muddy River system. Approximately 97 percent of the total population occurred within one major tributary that included 1.78 miles of spring complexes that emanate from the Pedersen, Plummer, and Apcar spring complexes on the Moapa Valley NWR and their tributaries (upstream of the gabion barrier). Approximately 48 percent of the population was located on the Moapa Valley NWR and 48 percent occupied the Refuge Stream supplied by the Pederson-Plummer springs. The highest densities of Moapa dace occurred on the Moapa Valley NWR's Plummer and Pedersen units.

In 2008, there was an approximately 60 percent decrease in the number of Moapa dace, from 1,172 fish in 2007 to 460 in 2008. Most of this decline is due to large changes in the numbers of dace in the Pederson, Plummer, and Refuge Stream areas which supported more than 92 percent of the population in 2007. The cause of the population decline is currently unknown, although beavers have recently changed stream characteristics in the Refuge Stream and vegetation management occurred along the Pederson Unit. In addition, habitat restoration projects have been implemented over the past few years in the Pederson and Plummer units of the Moapa Valley NWR, restoring the streams to a more natural state to augment Moapa dace habitat and populations.

D. Environmental Baseline

1. Status of the Listed Species/Critical Habitat in the Action Area

a. *Desert Tortoise (Mojave Population) - Status within the Action Area*

The action area occurs in the Mojave Desert Scrub Biome (Turner 1982), along the Kane Springs Road located in the valley between the Meadow Valley Mountains to the south and the Delamar Mountains to the north. The project area crosses Kane Springs Wash, which flows southwest to its confluence with the Pahranagat Wash in the northern part of the Coyote Spring Valley, in several locations. The vegetation in the action area consists of creosote bush scrub and desert wash scrub along Kane Springs and Pahranagat washes. Elevations in the action area range from approximately 2,600 to 3,300 feet.

Between October 16 and 18, 2006, Greystone-ARCADIS biologists conducted desert tortoise presence-absence surveys in the project area for BLM (ARCADIS 2007). Evenly spaced along the project area were 18, 1.5 mile long by 10 yard wide triangular strip transects. Transects were surveyed for live or dead desert tortoise, and any tortoise sign including burrows, scat, tracks, and water scrapes. The total corrected sign method was used to estimate tortoise densities. Estimated tortoise densities ranged from 10 to 0 tortoises per square mile. No live tortoises were found and most of the tortoise sign was comprised of burrows and water scrapes. The highest tortoise densities were 10 per square mile at 3 transects, and 7 per square mile at 3 transects. The remainder of the transects had densities of 5 per square mile or less. No desert tortoise sign were found in the two transects that overlapped with a wildfire perimeter from 2005 at the northeast end of the project area. Over the project area, tortoise densities average 4 desert tortoises per square mile. Densities in the project area are therefore estimated to be very low.

Recent surveys have been conducted in the Coyote Spring Valley as part of the rangewide population monitoring program. Survey data from 2005 line-distance sampling in the Coyote Spring Valley, which includes transects in the CSI private and lease lands located in the Mormon Mesa Critical Habitat Unit (CHU), estimate the tortoise densities in the valley to be 8.3 tortoises per square mile (Service unpublished data). Over the first five years of line-distance sampling monitoring, tortoises were least abundant in the Northwest Mojave Recovery Unit (2 to 8 tortoises per square mile) as compared to other recovery units (Service 2006b). Tortoise densities in the Coyote Spring Valley are therefore among the highest in the recovery unit. These results are preliminary and additional analysis is needed, incorporating 2006 and 2007 survey results. Desert tortoise clearance surveys were conducted in 2006-2007 in the southern part of the Coyote Spring Valley. One hundred percent clearance surveys were conducted on 5,302 acres of CSI private lands in Clark County as of January 2008. Based on the total number of tortoises cleared during surveys (108 adults and juveniles), we estimate a density of around 13 tortoises per square mile on the CSI private lands in Clark County.

Older desert tortoise survey data exists for the action area including BLM strip triangle surveys and the Coyote Springs Permanent Study Plot (PSP). Prior to 1991, BLM surveyed for tortoises using the strip triangle method, recording all tortoise sign within approximately 5 meters (15 feet) of the transect and estimating species density based on methods described by Karl (1981) for southern Nevada. Densities within one half mile of Kane Springs Road ranged from high to very low. Densities averaged medium (45 - 90 tortoises per square mile) and low (10 - 45 tortoises per square mile) over the project area. Densities on the northeast part of the project area were very low (0 - 10 tortoises per square mile). It appears that densities have declined somewhat since 1991.

The closest 1-square-mile PSP to the project area is the Coyote Spring plot, which is located 1.9 miles east of US 93 and 1.9 miles north of Kane Springs Road. This plot was established in 1986 and resurveyed in 1992 and 1995. EnviroPlus Consulting (1995) characterized this site as having moderately high tortoise numbers, with a size distribution typical of that observed on other PSPs and a significantly skewed sex ratio with female tortoises comprising two-thirds of the observed sub-adult and adult population (however, this effect was not significant for tortoises >208 mm mid-carapace length). Over the three survey periods, total estimated population size on the plot ranged from 96 ± 31 to 116 ± 29 (Esque1986, Converse Environmental Consultants Southwest, Inc. 1992, EnviroPlus Consulting 1995). This is considerably higher than densities in the action area. The annual adult mortality rate for the Coyote Spring plot in 1995 was estimated at 4 percent, which is higher than the 2-3 percent rate that the Service believes necessary to sustain desert tortoise populations (Service 1994). However, the tortoise population at the Coyote Spring PSP was apparently stable over the 10 years that the surveys spanned (EnviroPlus Consulting 1995).

Tortoises with symptoms of cutaneous dyskeratosis and URTD were observed during plot surveys; however, comparisons across survey periods are unreliable due to differences in diagnosis/evaluation criteria used to evaluate health status. In 1995, approximately one-third of tortoises had trauma-related injuries, likely caused by a predator. Overall, mortality by predation was characterized as present, but not at a high rate. Human impacts on tortoise populations in this area were considered low and inconsequential (EnviroPlus Consulting 1995). The PSP is located in the northern part of the Coyote Spring Valley and BLM strip triangle survey data corroborates that this area north of the Kane Springs Road and east of US 93 has higher tortoise densities than the surrounding areas with several very high density (greater than 140 tortoises per square mile) and high density (90 -140 tortoises per square mile) survey triangles.

b. ***Desert Tortoise Critical Habitat - Status within the Action Area and the Mormon Mesa CHU***

The project area is located mostly within the 427,900 acre Mormon Mesa CHU of the Northeastern Mojave Recovery Unit for the desert tortoise. The primary vegetation community within the Mormon Mesa CHU is creosotebush-white bursage desert scrub, which in Nevada is found in broad valleys, lower bajadas, plains and low hills of the Mojave Desert. Shrub cover is sparse to moderately dense, consisting primarily of creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) with a variety of different shrubs and cacti as co-dominants or understory species. Where poorly-drained soils with high salt and clay content are found on valley bottom floors, pockets of salt desert scrub community may be present, typified by one or more *Atriplex* species.

The CHU boundaries were based on proposed desert wildlife management areas (DWMAs) in the Draft Desert Tortoise Recovery Plan. The land management agencies have subsequently designated areas of critical environmental concern (ACECs) in each DWMA, where they are managing the land as reserves. In general, land management activities that may negatively affect the desert tortoise and its habitat such as domestic livestock grazing, grazing by wild burros and horses, commercial harvest of desert flora, and off-road vehicle use are mostly restricted or not allowed in these areas, as per Recovery Plan recommendations. The Mormon Mesa CHU contains the following ACECs: Kane Springs, Coyote Springs, and Mormon Mesa. The project area is in the Kane Springs ACEC.

CSI owns 29,055 acres of lands in Coyote Spring Valley, in Clark and Lincoln counties, Nevada, all of which is designated critical habitat for the desert tortoise. In addition CSI has a lease for approximately 13,767 acres of BLM-administered land in Coyote Spring Valley for 99 years. In Clark County, CSI is currently constructing a residential and golf community with associated commercial development on 6,881 acres of private land. Construction will occur over 25 years, with an eventual build out of 29,000 residential units, approximately 72,500 residents, and a visitor capacity equal to 14,500 residents (based on full-time equivalency). In Lincoln County, CSI proposes to develop 21,454 acres of private land over a 40 year period. It is estimated that there would be up to 111,000 residential units, resulting in an increase of population of 275,300 residents in Lincoln County. CSI plans to create a natural reserve on 13,767 acres of BLM leased land (approximately 7,548 acres in Lincoln County and 6,219 acres in Clark County).

EnviroPlus Consulting (1995) characterized the Coyote Spring PSP as having low historical and present-day human impact: Old Highway 93 was rarely used and had large shrubs growing through cracks in the pavement; little trash was observed on the plot; no power lines were present; no cattle or burros were observed; and while a few old two-track roads were discernible for short distances, none appeared to be recently made. Furthermore, this area was characterized as having somewhat variable but adequate tortoise habitat, with abundant forage and good soil for burrowing (EnviroPlus Consulting 1995).

The Mormon Mesa CHU is highly fragmented with an extensive network of primarily unimproved and two-track roads. The Desert Tortoise Recovery Plan (companion document for proposed DWMAs, Service 1994), describes this area as having the highest density of roads and trails (1.3 linear miles per square mile) of any desert tortoise *crucial* habitat in southern Nevada based on a 1984 status report [crucial habitat was defined by BLM in the California Desert Plan (1980) as "...Portions of the habitats of sensitive species that if destroyed or adversely modified could result in their being listed as threatened or endangered pursuant to section 4 of the Act or in some category implying endangerment by a State agency or legislature."]. US 93 runs along the western edge and bisects the southwestern tip of the unit, providing a substantial barrier between the unit and protected tortoise habitat in the Desert NWR to the west. State Route (SR) 168 also runs through the western part of the CHU, and I-15 traverses the southeastern edge of the unit. Other well-established roads include the Kane Springs Road and the Carp-Elgin Road which bisects the unit. Powerlines, pipelines, and access roads dissect much of the area.

The 2005 wildfire season in southern Nevada was severe due in large part to the high bio-mass of flammable non-native annual grasses after above-average moisture conditions the previous winter. Approximately eight acres in the northeast part of the project area burned in 2005 in the Meadow Valley Fire, which burned approximately 148,000 acres overall, including a small amount of the Mormon Mesa CHU. In total, over 56 fires of various sizes in southern Nevada, southwestern Utah, and northern Arizona burned roughly 964,806 acres in the Northeastern Mojave Recovery Unit in 2005 including 15,559 acres (4 percent) within the Mormon Mesa CHU. The wildfire hazard in the Mormon Mesa CHU remains significant although fire activity in 2006 and 2007 was lower due to dryer conditions over the winter and spring. Monitoring of the 2005 fires in critical habitat being conducted by the U.S. Geological Survey (USGS) shows that proportionally less tortoise activity occurred in burned areas (treatment plots and control plots) compared to unburned reference plots.

The Mormon Mesa CHU is primarily in Federal ownership, administered by BLM. In addition to CSI's private lands, there are several small privately-held parcels along the Meadow Valley Wash that are within or adjacent to the CHU. Other privately-held lands or Federal land slated for disposal adjacent or near the Mormon Mesa CHU have the potential for future development. Land near the extreme southwestern tip of the Mormon Mesa CHU and northeast of Las Vegas is also in private ownership. Future development of these private lands, as well as possible future disposals of Federal land to allow for expansion of existing cities will create additional challenges for the Service and Federal lands managers in terms of management of the Mormon Mesa DWMA/ACEC, and conservation and recovery of desert tortoises in the Mormon Mesa CHU.

c. ***Moapa Dace - Status within the Action Area***

The action area encompasses the entire range of the Moapa dace. Population numbers were discussed in detail in the section entitled "Status of the Species Rangewide, C. Moapa Dace;" thus, no further details are provided here. The relationship of the dace's habitat to groundwater is discussed in more detail below.

2. *Factors Affecting the Listed Species/Critical Habitat in the Action Area*

The action area is located primarily within the Kane Springs Valley, Coyote Spring Valley and Muddy River Springs Area hydrographic basins. These basins are part of the White River Groundwater Flow System, a regional groundwater flow system located in southern Nevada (Eakin 1966, Harrill *et al.* 1988, Prudic *et al.* 1993). The flow system consists of numerous local basin fill aquifers underlain by a large regional carbonate aquifer that transmits groundwater from basin to basin, beneath topographic divides. Groundwater inflow or recharge to the regional carbonate aquifer is primarily through precipitation. The terminal discharge of the White River Groundwater Flow System is most likely the Warm Springs in the Upper Moapa Valley, an area consisting of about twenty regional springs, with numerous seeps and wetlands. Since the Moapa dace is dependent upon these springs for survival it is important to discuss the hydrology of this area in more detail.

The source water supporting spring discharge in the Warm Springs Area is from the regional carbonate groundwater (62 percent) and from local recharge based on precipitation in the surrounding mountain ranges (BLM 2008). The production wells in the Kane Springs Valley that would be pumped under the proposed action are located about 20 miles northwest of the Warm Springs Area. The high permeability and transmissivity of the carbonate aquifer underlying the Kane Springs Valley and down-gradient Coyote Spring Valley could connect the proposed action to springs in the Warm Springs Area. Long-term effects from groundwater extraction could be propagated over great distances. Barriers to flow, such as faults or rock units with low permeability, also affect the extent of drawdown. There may be a break in the regional hydraulic gradient at the location of the Kane Springs Wash fault zone; however until additional long-term pumping data are obtained, the true relationship cannot be fully evaluated (BLM 2008).

a. *Existing Groundwater Rights and State Engineer Rulings in the Action Area:*

Groundwater wells within the Kane Springs Valley and Coyote Spring Valley Hydrographic Basins are associated with municipal, mining, industrial, commercial and irrigation use. Permitted diversion rates for existing wells vary from 145 to 7,242 afy. Within the Kane Springs Valley Hydrographic Basin, permitted water rights are limited to the LCWD/VWC applications recently approved by the State Engineer under Ruling 5712. The LCWD has an additional four groundwater applications pending before the Nevada State Engineer. Currently, in the Kane Springs Valley Hydrographic Basin permitted groundwater rights are 1,000 afy (BLM 2008).

In the Coyote Spring Valley Hydrographic Basin, groundwater rights filed with the Nevada State Engineer include 15 industrial use permits owned by SNWA, 4 municipal use permits owned by CSI, 1 industrial use permit owned by Nevada Power Company, and 4 permits owned by Bedrock Limited, LLC associated with sand and gravel mining operations. Bedrock Limited, LLC also has one vested application for irrigation use. Currently, in the Coyote Spring Valley Hydrographic Basin permitted groundwater rights are 16,304 afy (BLM 2008). There are 34 pending applications by Las Vegas Valley Water District (LVWD); CSI; Dry Lake Water, LLC;

and Bedrock Limited, LLC in the Coyote Spring Valley Hydrographic Basin. A list of surface water and groundwater rights in the Kane Springs Valley and Coyote Spring Valley hydrographic basins is provided in Appendix D of the Kane Springs Valley Groundwater Development EIS (BLM 2008).

There are three Nevada State Engineer rulings that affect the withdrawal of groundwater in the action area. In these rulings the Nevada State Engineer has required "staged development," an incremental approach for phasing in development of the carbonate aquifer with adequate monitoring in cooperation with other parties in order to assist in assessing effects. This approach was adopted by the Nevada State Engineer "...in order to predict, through the use of a calibrated model, the effects of continued or increased development with a higher degree of confidence." Ruling 5712, granting 1,000 afy of groundwater from the Kane Springs Valley to LCWD and VWC was summarized in the section entitled "Description of the Proposed Action." The other two rulings are summarized below.

In Order 1169 issued in 2002, the Nevada State Engineer held in abeyance applications for new groundwater rights in the Coyote Spring Valley, Black Mountains Area, Garnet Valley, Hidden Valley, Upper Moapa Valley, and Lower Moapa Valley groundwater basins until a pump test is completed. All major water right holders in these basins (SNWA, LVVWD, Moapa Valley Water District [MVWD], CSI, and Nevada Power Company) were required to conduct a regional groundwater study, including the pumping of at least 50 percent of the permitted water rights within the Coyote Spring Valley hydrographic basin for a period of at least two consecutive years. Order 1169 is designed to evaluate how groundwater pumping activities in Coyote Spring Valley will impact water rights and the environment within the Warm Springs Area, including the Muddy River ecosystem. Data obtained from the study will be used to evaluate groundwater development activities within the regional carbonate groundwater system.

To date, there has been limited pumping of the permitted groundwater rights in Coyote Spring Valley. In 2005, CSI drilled and pump tested two wells in Coyote Spring Valley under Nevada Division of Water Resources permit numbers 70429 and 70430. Currently, CSI is monitoring and pumping water as needed for their development activities in Clark County.

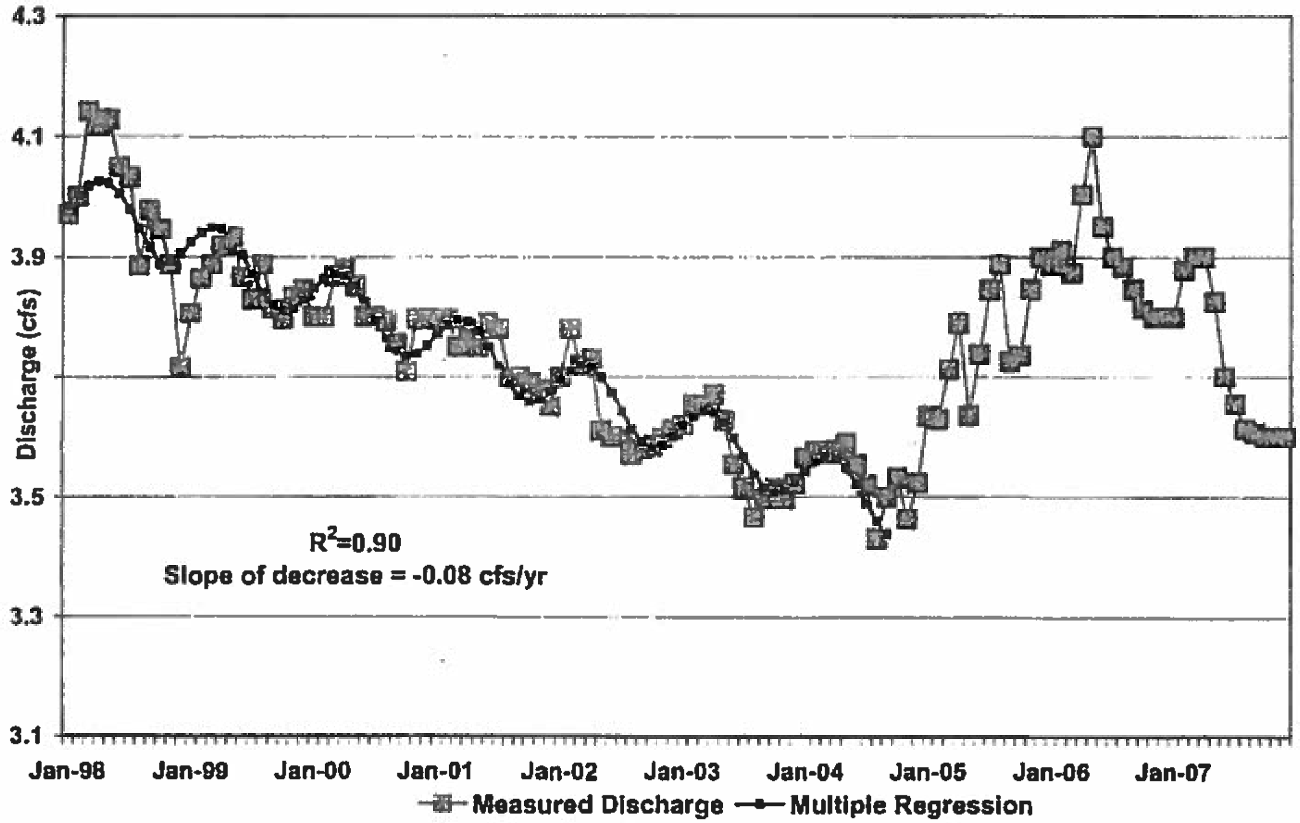
In Ruling 4243 in the Muddy River Springs Area Hydrographic Basin, the Nevada State Engineer granted permits to MVWD for 5,800 afy from Arrow Canyon Well, but with pumping phased in over a 10-year period while monitoring surface water flows and groundwater levels in order to assess potential effects to wells and springs. Annual volume pumped is limited to annual demand, up to the maximum permitted. Annual pumping has consistently been less than the amount allowed in the ruling.

As of 2002, the Nevada State Engineer had granted a total of approximately 14,800 afy of groundwater permits for the alluvial and carbonate aquifer in the Muddy River Springs Area Hydrographic Basin (Service 2006c). Included in these are MVWD permits for the Arrow Canyon Well totaling 7,240 afy (1,440 afy prior to Ruling 4243 plus 5,800 afy from Ruling 4243) from the carbonate aquifer. To date, the actual pumping from the Arrow Canyon Well has been far less than the permitted volume. Approximately 2,400 afy has been pumped on average since 1998.

Concurrent with groundwater pumping between 1998 and 2004, groundwater levels and spring discharge in the Warm Springs Area consistently declined (Service 2006c). Over the same period, the total spring discharge from the Pedersen Unit, as measured at Warm Springs West, decreased from 4.00 cfs to 3.55 cfs (Service 2006c) (Figure 2). The discussion in Mayer (2004) shows that the observed decreases in spring discharge are consistent with expected decreases based on the two-foot decline in groundwater levels observed in the carbonate monitoring wells in the Warm Springs Area. The extremely wet winter of 2005 appears to have recharged the springs with monthly discharge peaking at 4.1 cfs in May of 2006, and decreasing since that time (Mayer 2008). This is expected to be a transient response but the timing and level of a return to equilibrium conditions is not known for certain. Discharge has currently declined to 3.6 cfs (USGS 2008).

The exact timing of the groundwater level decline is important because if the actual decline precedes in time any action or event suspected of causing the decline (such as increased pumping or drought), then this is strong evidence that there are other factors causing the decline. The Service (2006c) analyzed the timing of the decline as it was concerned about the rate and magnitude of the 1998 to 2004 decrease. The start of the decline coincides with MVWD's increased pumping from the carbonate aquifer. In order to address the possibility that drought caused the groundwater level declines, the Service (2006c) compiled precipitation records from a number of stations in the southeastern Nevada area. Their analysis showed that the decline from 1998 to 2004 was not likely to be drought-related. These declines observed between 1998 and 2004 have occurred not only locally in the Warm Springs Area, but have also occurred in monitoring wells 12 miles upgradient in Coyote Spring Valley and 15 miles south in monitoring

Figure 3: Warm Springs West, Moapa Valley NWR - USGS Average Monthly Discharge, Apr 1998 to Dec 2007



wells in the California Wash Basin, based on USGS monitoring well data and monitoring well data shared with the Service in July 2004 (Service 2006c).

On July 14, 2005, a Memorandum of Agreement (MOA) was signed by the SNWA, MVWD, CSI, Moapa Band of Paiutes (Tribe), and the Service, regarding groundwater withdrawal of 16,100 afy from the regional carbonate aquifer in Coyote Spring Valley and California Wash Basins, and establishment of conservation measures for the Moapa dace. The MOA outlined specific conservation actions that each party would complete in order to minimize potential impacts to the Moapa dace should water levels decline in the Muddy River system as a result of the cumulative withdrawal of 16,100 afy of groundwater from two basins within the regional carbonate aquifer system.

To minimize effects to the Moapa dace, conservation actions were identified in the MOA. In order to be considered a benefit to the species, the proposed conservation measures will be initiated or fully implemented prior to the proposed groundwater withdrawal of 16,100 afy. Since development of these water rights requires the construction of facilities, as identified above, there would be a two to five year timeframe in which to implement many of these actions prior to the pumping of the full amount of water. CSI would utilize a small portion of their water right in Coyote Spring Valley prior to full implementation of all of the conservation measures. The action items identified in the MOA include development of a Recovery Implementation Program, restoration, ecological studies, construction of fish barriers, eradication of non-native fish, and dedication of water rights. Minimum in-stream flow levels were established in the MOA that trigger various conservation actions should those predetermined levels be reached. The flow levels will be measured at the Warm Springs West Flume located on the Moapa Valley NWR.

b. Section 7 Consultations Completed for Activities and Projects in the Action Area

1. **File Nos. 1-5-99-F-450 and 84320-2008-F-0078:** On March 3, 2000, the Service issued a programmatic biological opinion (File No. 1-5-99-F-450) to BLM's Ely District Office for implementation of actions in the Caliente Management Framework Plan Amendment (CMFPA). The planning area consisted of public lands in White Pine, Lincoln, and a portion of Nye counties in east-central Nevada. Cumulatively, 25,521 acres of desert tortoise habitat were projected to be affected by the proposed activities within the planning area over a 10-year period.

   On September 9, 2008, the Service issued a programmatic biological opinion (File No. 84320-2008-F-0078) to BLM for the Ely District Resource Management Plan (Ely RMP). This programmatic biological opinion superseded the March 3, 2000, programmatic biological opinion for the CMFPA. Programs in the 2008 programmatic biological opinion included: vegetation management; weed management; wild horse management; lands, realty, and renewable energy projects; travel and off-highway vehicle management;

recreation; livestock grazing management; geological and mineral extraction; and fire management.

Implementation of multiple-use activities (excluding vegetation and weed management) were projected to result in the disturbance of 22,624 acres of desert tortoise critical habitat and 37,311 acres of desert tortoise habitat. During the 10-year term of the programmatic biological opinion, the Service authorized the take of no more than 47 desert tortoises and estimated that 972 tortoises would be taken by non-lethal means (i.e. harassment).

2. **File Nos. 1-5-94-F-334, 335, 336, and 035:** On May 15, 1995, the Service issued a non-jeopardy biological opinion to BLM for the issuance of a right-of-way to install four proposed fiber-optic lines in Clark and Lincoln counties, Nevada. Four applicants comprising the Fiber Toll Joint Venture Project requested a 7.6-m-wide (25-foot-wide) right-of-way for construction of four buried fiber-optic lines. Segments of these lines would parallel SR 168 for approximately 23 miles, and for 43 miles along US 93 (File Nos. 1-5-94-F-334 and 336). Approximately 98 and 65 acres of long- and short-term habitat disturbance, respectively, was attributed to the two segments adjacent to US 93 and SR 168 described above, a majority of which runs through the action area for the CSI project. This included approximately 53 acres of long-term disturbance and 35 acres of short-term disturbance to designated critical habitat (Mormon Mesa CHU) for the desert tortoise. The Service anticipated that up to 34 tortoises would be incidentally taken, 8 through mortality and 26 through injury or harassment.

3. **File No. 1-5-98-F-053, as amended:** On June 18, 1998, the Service issued a programmatic biological opinion to BLM for implementation of the Las Vegas Resource Management Plan (RMP). The project area for this consultation covers all lands managed by BLM's Las Vegas Field Office, including desert tortoise critical habitat, desert tortoise ACECs, and BLM-withdrawn land. The Las Vegas Field Office designated approximately 648 square miles of tortoise habitat as desert tortoise ACEC in the Northeastern Mojave Recovery Unit, and approximately 514 square miles of tortoise habitat as desert tortoise ACEC in the East Mojave Recovery Unit, through the final RMP. As identified in the RMP, BLM manages 743,209 acres of desert tortoise habitat within four tortoise ACECs for desert tortoise recovery. To accomplish desert tortoise recovery in the Northeastern and Eastern Mojave Recovery Units, the Las Vegas Field Office implements appropriate management actions in desert tortoise ACECs.

4. **File No. 1-5-98-FW-177:** On November 2, 1998, the Service issued a non-jeopardy biological opinion to the Nevada Fish and Wildlife Office for the implementation of eradication of non-native fish activities and installation of fish barriers in the Apcar Stream in the Warm Springs Area of the Muddy River. The Service concluded that the project was not likely to jeopardize the continued existence of the Moapa dace.

Incidental take was authorized and Reasonable and Prudent Measures were identified to minimize take to the species.

5. **File No. 1-5-99-F-411:** On December 8, 1999, the Service issued a non-jeopardy biological opinion to BLM for issuance of a right-of-way permit for the Nevada segment of the Las Vegas to Salt Lake City Long-haul Fiber-Optic Project. This consultation evaluated impacts to the desert tortoise and designated critical habitat from the construction, operation, and maintenance of a buried fiber-optic cable and related structures over an 180-mile linear stretch from the Utah-Nevada border to its terminus north of Nellis Air Force Base in Las Vegas. The section of the fiber-optic cable that runs through the Mormon Mesa CHU and CSI lands was located in NDOT's right-of-way east of US 93. The final area of disturbance was calculated at approximately 270 acres, including 158 acres of permanent impacts. The Service estimated that 4 desert tortoises may be incidentally injured or killed and 200 tortoises could potentially be affected by project activities.

6. **File No. 1-5-01-F-463:** On December 26, 2001, the Service issued a non-jeopardy biological opinion to the Bureau of Indian Affairs for approval of a lease for lands on the Reservation for construction and operation of the Moapa Paiute Energy Center. The proposed project would disturb up to 7 percent of the total available spawning habitat for the Moapa dace. As of the date of this biological opinion, the proposed project has not moved forward and the Service is not aware of any plans in the near future to construct the project.

7. **File No. 1-5-02-FW-463:** On March 13, 2002, the Service issued a non-jeopardy biological opinion to the Desert NWR Complex, Las Vegas, Nevada for the implementation of riparian and aquatic habitat restoration activities in the Pedersen Unit of the Moapa Valley NWR. The Service concluded that the incidental take of less than 10 percent of the 180-200 individuals (18-20 individuals) that may be present in the project area, would not likely jeopardize the continued existence of the Moapa dace. Reasonable and Prudent Measures were identified and implemented to minimize take of the species.

8. **File No. 84320-2008-F-0066 and 1-5-94-F-28R:** On December 20, 2007, the Service issued a biological opinion to BLM-Las Vegas for their proposal to amend an existing right-of-way for construction, operation, and maintenance of a single-circuit, overhead 500 kV transmission line (Southwest Intertie Project). The southern portion of the project begins at the Harry Allen Substation in Clark County, Nevada, crossing through the planning area, and ending approximately 34 miles north of Ely in White Pine County, Nevada. The project would disturb 231 acres of non-critical and 365 acres of critical desert tortoise habitat.

9. **File No. 1-5-05-FW-536:** On January 30, 2006, the Service issued a non-jeopardy intra-Service programmatic biological opinion for the Proposed Muddy River MOA, regarding the groundwater withdrawal by multiple parties of 16,100 afy from the regional carbonate aquifer in the Coyote Spring Valley and California Wash Basins. Given that there will be groundwater withdrawn from the same regional carbonate aquifer concurrently by different users and at different locations, it was difficult to assign loss to a specific action. The most accurate way to establish incidental take is at the landscape-level, which was analyzed in the Programmatic Biological Opinion. In that parent document, the cumulative withdrawal of 16,100 afy from all parties associated with the MOA predicted a loss of approximately 22 percent riffle and 16 percent pool habitat (as measured at the Warm Springs West gage downstream from the Pedersen Unit) when the flows reach 2.78 cfs. This amount included habitat losses potentially occurring under both the CSI development and SNWA pipeline. Three tiered biological opinions have been issued under this programmatic opinion:

   a. **File No. 1-5-05-FW-536 Tier 1:** On March 2, 2006, the Service issued a non-jeopardy tiered biological opinion to the Corps for the issuance of a Section 404 permit under the Clean Water Act of 1972, as amended, for the CSI residential development project. The Service concluded the proposed residential development is an interdependent activity with the Corps' action and will result in the permanent loss of 6,881 acres of desert tortoise habitat and take of no more than 645 desert tortoises. The proposed action falls within the scope and coverage of the 10(a)(1)(B) permit issued to Clark County for its multiple species habitat conservation plan (MSHCP), and exemption for the anticipated take of the desert tortoise is provided via the incidental take statement for the MSHCP. The Service estimated that the proposed action will result in the incidental take of Moapa dace associated with the loss of 6 percent of riffle habitat and 5 percent of pool habitat, in the Pedersen Unit. Incidental take was authorized, and reasonable and prudent measures were identified to minimize take of the species.

   b. **File No. 1-5-05-FW-536 Tier 2:** On May 9, 2007, the Service issued a non-jeopardy tiered biological opinion to BLM for a right-of-way to the SNWA to construct a water conveyance pipeline. SNWA's appropriated water right of 9,000 afy from Coyote Spring Valley would be pumped in order to participate in the Nevada State Engineer Study (Order 1169), and to provide water to the Moapa Valley area for residential and commercial purposes. The right-of-way would allow construction of approximately 16 miles of 24-inch diameter pipeline to transport water from three existing groundwater pumping wells in the southern end of the Coyote Spring Valley to an existing storage tank and pipeline. The Service estimated that 12 percent of riffle habitat and 9 percent of pool habitat will be lost due to the withdrawal of 9,000 afy associated with the SNWA action; however there were other factors which complicated the establishment of incidental take at this level for the proposed action.

c. **File No. 1-5-05-FW-536 Tier 3:** On August 6, 2007, the Service issued a non-jeopardy tiered biological opinion to the U.S. Department of Housing and Urban Development for construction of a water pipeline from an existing well on the Moapa River Indian Reservation to the Moapa Valley of Fire Travel Plaza. The use of 7 of the 16,100 afy for the proposed Travel Plaza will independently have no significant impact on the Muddy River Springs area discharge and subsequently the Moapa dace, but was authorized under the Programmatic Biological Opinion.

On October 22, 2008, the Service issued a non-jeopardy intra-service biological opinion for the Coyote Springs Investment Planned Development Project Multiple-Species Habitat Conservation Plan (MSHCP) (File No. 84320-2008-F-0113). The Service subsequently issued a 40-year incidental take permit to CSI under the authority of section 10(a)(1)(B) of the Act. The Permit covers take of desert tortoise on up to 21,454 acres of private lands in Lincoln County, and management of 13,767 acres of lease lands in Clark and Lincoln counties as the Coyote Springs Investment Conservation Lands. Groundwater withdrawal is not a Covered Activity in the CSI MSHCP. Groundwater withdrawals and their effects to the Moapa dace are subject to evaluation under separate biological opinions for several groundwater development projects, and any appropriate incidental take would be authorized through those biological opinions when issued, or under section 10 (a)(1)(B) if these actions did not involve a Federal agency.

E. Effects of the Proposed Action on the Listed Species/Critical Habitat

Effects of the action refer to the direct and indirect effects of the proposed action on the listed species, together with the effects of other activities that are interrelated and interdependent with that action. Direct effects encompass the immediate, often obvious effect of the proposed action on the listed species or its habitat. Indirect effects are caused by or will result from the proposed action and are later in time, but still reasonably certain to occur. In contrast to direct effects, indirect effects can often be more subtle, and may affect listed species populations and habitat quality over an extended period of time, long after project activities have been completed. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

1. Effects to the Desert Tortoise (Mojave Population)

Linear construction projects can negatively affect desert tortoise populations. Studies suggest that differences in the extent of the threat are related to the scale of the project, the ability of crews to avoid disturbing burrows, and timing of construction to avoid peak activity periods of tortoises (Boarman 2002). In addition to the discrete disturbance points formed by towers and lines, maintenance roads and repeated operations can (1) introduce continuous sources of disturbance and (2) provide potential sites for invasion of exotic species. Rights-of-way can cause habitat destruction and alteration where vegetation is minimal, possibly increasing mortality, directly or indirectly (Boarman 2002).

Direct impacts to the desert tortoise would be the permanent and temporary loss of habitat utilized by tortoises for foraging, breeding, and cover. Approximately 21 acres will be permanently lost by the construction of well houses and well power substations, water storage tanks, access roads, ancillary pipeline facilities, and power poles. Approximately 188 acres will be temporarily lost by the construction of the pipelines, power lines, fiber optic line, temporary access roads, and temporary workspaces such as pipe and power line laydown areas, power line pulling sites, staging areas, and construction easements. Many of these activities will involve blading and excavation of the area. These areas will be rehabilitated as described in the Revegetation Plan in the Plan of Development; however, it will likely take a long time (potentially more than 10 years) before these areas can provide foraging and cover sites for the desert tortoise.

Other areas that have heavy machinery moving over them will have crushed vegetation and compacted soil. LCWD and BLM propose to salvage topsoil during excavation and to reuse the topsoil later as cover on disturbed areas to facilitate re-growth of vegetation. LCWD and BLM will also flag the work areas so that unauthorized habitat removal does not occur.

Any tortoise within the construction area during work activities would be highly vulnerable. Desert tortoises may be killed or injured by project vehicles and equipment in the project area. Construction equipment and vehicles could crush tortoises or collapse burrows both occupied and unoccupied if not located during clearance surveys. Project vehicles and equipment that stray away from designated access roads and areas may crush desert tortoises aboveground or in their burrows. Tortoises may take refuge underneath project vehicles and equipment and be killed or injured when the equipment or vehicle is moved. Blasting during construction could collapse burrows and injure tortoises. Tortoises that wander into the project area could also fall into holes or trenches from which they are unable to escape. The following measures proposed by LCWD and BLM should reduce these potential effects to desert tortoises: 1) conduct tortoise clearance surveys within the project area; 2) enforce a 25 mph speed limit on project access roads; 3) cease project activities that may endanger a tortoise until it is moved out of harm's way by an authorized desert tortoise biologist; 4) present a worker education program; 5) cover construction holes left open overnight and check trenches twice daily to check for entrapment of wildlife; and 6) restrict vehicles and equipment to the work area boundaries and designated access roads.

Tortoises moved during clearance surveys and tortoises that are physically moved out of harm's way to prevent mortality or injury could be inadvertently harmed if not handled properly. Urine and large amounts of urates are frequently voided during handling and may represent a severe water loss, particularly to juveniles (Luckenbach 1982). Overheating can occur if tortoises are not placed in the shade when ambient temperatures equal or exceed temperature maximums for the species (Desert Tortoise Council 1994, revised 1999). Tortoise eggs moved during clearance surveys could also be harmed if not handled properly. The following measures proposed by LCWD and BLM should reduce these potential effects to desert tortoises: 1) implementing a worker education program; 2) utilizing Service-approved protocols for handling desert tortoises and tortoise eggs; and 3) ensuring that only authorized individuals handle tortoises.

The resulting indirect impacts to the desert tortoise may include the risk of death, injury, or lower reproductive potential through increased predation and degradation and fragmentation of the habitat surrounding the project area. There is a potential for an increase in the number of predatory and scavenger species due to the presence of humans and improper disposal of trash. Workers associated with the proposed project may provide food in the form of trash and litter; or water, which attracts important tortoise predators such as the common raven, kit fox, and coyote (BLM 1990, Boarman and Berry 1995). Natural predation in undisturbed, healthy ecosystems is generally not an issue of concern. However, predation rates may be altered when natural habitats are disturbed or modified (BLM 1990). Ravens likely would be attracted to human activities and buildings for perch sites and food sources, increasing the potential for predation on juvenile desert tortoise in adjacent habitats. LCWD and BLM will implement a litter-control program and a worker education program to avoid or minimize these potential effects.

The project may degrade habitat in the surrounding landscape by introducing non-native weeds or plants into the project area, which later spread in to the surrounding desert, increasing fuel loads for wildfires and competing with native forbs and shrubs. Land clearing activities in the project area may lead to increased soil erosion especially on steeper slopes. The following measures proposed by LCWD and BLM should help reduce these potential effects to desert tortoise habitat: 1) implementation of a Stormwater and Pollution Prevention Plan; 2) implementation of a Revegetation Plan; and 3) implementation of a Noxious Weed Management Plan.

Following construction, the public may use project access roads which may result in adverse effects to tortoise populations. Humans use the desert for off-road exploration, casual shooting and target practice, personal or commercial collection of animals and plants, searches and digging for minerals and gems, geocaching (GPS guided stash hunts), and even the production of illegal drugs. Desert tortoise shells found in the Mojave Desert with bullet holes were examined forensically with the finding that the tortoises were alive when they were shot (Berry 1986), suggesting that illegal shooting of tortoises could occur. Project personnel could illegally collect tortoises for pets or bring dogs to the project area. Measures proposed by LCWD and BLM to 1) clear project areas of tortoises, 2) prohibit pets from the project area, 3) impose a speed limit, and (4) close unnecessary roads following construction and control public access, should minimize the potential effects to the tortoise described above.

2. Effects to Critical Habitat for the Desert Tortoise (Mojave Population)

Direct impacts to desert tortoise critical habitat would be the permanent and temporary loss of areas that contain the PCEs of desert tortoise critical habitat. Approximately 18 acres will be permanently lost by the construction of well houses and well power substations, water storage tanks, access roads, ancillary pipeline facilities, and power poles. Approximately 155 acres will be temporarily lost by the construction of the pipelines, power lines, fiber optic line, temporary access roads, and temporary workspaces such as pipe and power line laydown areas, power line pulling sites, staging areas, and construction easements. Many of these activities that temporarily impact areas will involve blading and excavation of the area which would remove all of the PCEs of critical habitat. These areas will be recontoured and rehabilitated as described in the Revegetation Plan; however, it will likely take a long time before these areas can provide a sufficient quantity and quality of forage species (PCE 2) and sufficient vegetation to provide shelter from temperature extremes and predators (PCE 5). Other areas that have heavy machinery moving over them, will impact PCE 3 (suitable substrates for burrowing, nesting, and overwintering), PCE 4 (burrow, caliche caves, and other shelter sites), and PCE 5. These areas will also likely take a long time to recover and may also need some revegetation or soil de-compaction treatments. LCWD proposes to salvage topsoil during excavation and to reuse the topsoil later as cover on disturbed areas to facilitate re-growth of vegetation. As per the Revegetation Plan only native species will be used and cacti and yucca will be salvaged when possible.

Indirect impacts to the desert tortoise critical habitat may include fragmentation of the habitat surrounding the project area which will degrade PCE 1 (space to support viable populations and to provide for movement, dispersal, and gene flow). Since the project is linear, it has a greater potential to fragment habitat, although it does follow the existing Kane Springs Road. The project is in the LCCRDA corridor which is 0.5 miles wide. This project is the first to use this designated utility corridor so it may have greater impacts than future projects, although the proposed development on CSI lands in Lincoln County will be a greater barrier to tortoise movement.

Indirect impacts also include the introduction or spread of non-native plants in the project area and into the surrounding landscape which may impact PCE 2 and PCE 5. If red brome increases in the project area or surrounding landscape, this could increase the fuel load which increases the chance of large scale fires. Red brome can often out-compete native species because red brome extracts soil water and nutrients more rapidly than similar native annuals (DeFalco *et al.* 2003) and also reduces the growth of mature native perennials (DeFalco *et al.* 2007b). The project could also introduce new non-native plants into the area which could impact PCE 2 and PCE 5 in the future. LCWD and BLM should help reduce these potential effects to critical habitat by the implementation of a Noxious Weed Management Plan and the implementation of a Fire Management Plan. The Noxious Weed Management Plan includes the following measures: survey of area prior to land clearing, cleaning of vehicles and equipments, treating weed infestations, post-construction monitoring and employee education.

Project activities could also increase soil erosion. Increased soil erosion could negatively impact PCE 2, PCE 4, and PCE 5. LCWD and BLM should help reduce these potential effects to critical habitat by the implementation of a Stormwater and Pollution Prevention Plan.

3. Effects to the Moapa Dace

The Moapa dace will not be directly affected by the physical construction of the proposed groundwater wells, pipelines, and power facilities; however, groundwater pumping will likely indirectly affect the headwater spring discharges of the Muddy River, and therefore, the Moapa dace. The magnitude and timing of impacts from pumping in Kane Springs Valley are uncertain. Differences in boundary conditions relating to the areal extent of the aquifer, location of the pumping, transmissivity, and permeability, all influence the magnitude and timing of pumping impacts. Also, if the proposed pumping lowers carbonate water levels in the Warm Springs Area further, not all springs will be affected equally. The decrease in spring discharge will be proportional to the decrease in head elevation at each spring. Higher elevation springs have a lower head difference initially and are therefore more susceptible to decreases in groundwater levels. Therefore, the higher elevation springs will be affected proportionately more for a given decline in groundwater levels. The highest elevation springs occur on the Pedersen Unit of the Moapa Valley NWR, an area which also comprises some of the most important spawning habitat for Moapa dace in the system.

As discussed in the programmatic biological opinion for the Muddy River MOA (Service 2006c), existing data suggests that current groundwater pumping of the Arrow Canyon Well is causing a decline in the regional carbonate aquifer levels locally and in the Coyote Spring Valley, and a decrease in spring discharge in the Warm Springs Area (Mayer 2004). The average pumping rate at the Arrow Canyon Well since 1998 has been 3.3 cfs or 2,400 afy. Pumping rates will increase with commencement of the pump test, and may further increase pending the outcome of the pump test and associated monitoring. The proposed action includes pumping of an additional 1,000 afy from the same regional carbonate aquifer. The pumping will be located along the same flow path that supplies the Warm Springs Area and is within the low-gradient, high-transmissivity zone that connects Kane Springs Valley, Coyote Spring Valley and the Warm Springs Area.

Under the terms of the stipulated agreement, if the Average Flow Level reaches 3.15 cfs or less but greater than 3.0 cfs at the Warm Springs West gage, LWCD and VWC agree to reduce pumping from all wells in Kane Springs Valley by 50 percent. This would mean pumping at these flow levels would be reduced to 500 afy. If the Average Flow Level reaches 3.0 cfs or less, LWCD and VWC agree to cease pumping from all wells in Kane Springs Valley until the Average Flow Level exceeds 3.0 cfs. The exact magnitude and timing of the impacts from pumping groundwater from the carbonate aquifer in Kane Springs Valley are unknown at this time, as are the effects of reduced or cessation of groundwater pumping or whether there will be some equilibration of the aquifer to the proposed pumping.

In the programmatic biological opinion for the MOA, the Service (2006c) used the potential effects on spring discharge at the Warm Springs West gage to predict potential effects to Moapa dace habitat. The results indicated that both spring discharge and dace habitat are reduced with declines in groundwater levels. Flows and habitat loss were projected as a function of incremental declines in groundwater levels (Service 2006c). If flows were reduced to 3.02 cfs at the Warm Springs West gage this would be a 25 percent reduction of flows from the 1998 conditions which would reduce riffle habitat by 17 percent and pool habitat by 13 percent in the Petersen Unit. Because pumping for the Kane Springs project will occur concurrently with the potential pumping of 16,100 afy in the carbonate aquifer of White River Flow System, only a very small amount of this possible reduction would be attributable to pumping in Kane Springs Valley. Given the amount of 1,000 afy authorized by the State Engineer, effects from this project will be difficult to tease apart from effects of pumping 16,100 afy as described in the programmatic biological opinion for the MOA. However, monitoring of the Kane Springs wells concurrent with other monitoring under the MOA will lend greater understanding to the overall effects.

The primary effect to the Moapa dace of diminished flows within the spring channels will be a decrease in the hydraulic conditions that create the diversity of habitat. A decrease in velocity and depth within riffles would result in a decrease of invertebrate and phytoplankton (food) production. Drift stations in pools are maintained by the scouring effect of turbulent flow. Scour will decrease in pools as water velocity and depth at the upstream end of the pool decreases. Perhaps the most prominent impact that would occur, as a result of decreased discharge and subsequent depth, is the reduction of overall volume of water that will be available to the species within the channel. Scoppettone *et al.* (1992) demonstrated that Moapa dace size is scaled to water volume. Thus, larger water volumes provide the habitat necessary for increased food production and subsequently larger fish, therefore greater fecundity. Hence, more numerous, larger eggs provide a better opportunity for the long-term survival of the species.

Additional factors that would influence channel and hydraulic characteristics within the stream channels following a decline in spring discharge include, but are not limited to, changes in sediment transportation rates, and the alteration of riffle and pool maintenance that is accomplished at the present rate of discharge in each spring channel. Additionally, vegetative encroachment and subsequent channel obstruction may also occur as the wetted cross sectional area of the channel decreases, and new surfaces become exposed for vegetation growth. Decreases in these parameters will likely have an adverse impact on the overall diversity and quantity of hydraulic habitat.

The Pedersen Unit of the Moapa Valley NWR is one of the six spring complexes that the Moapa dace depends on for successful reproduction. It includes the highest elevation spring, presumed most susceptible to groundwater level declines. The analysis presented in the programmatic biological opinion for the MOA (Service 2006c) estimated that at 3.02 cfs, there is a 25 percent loss in flow on the Pedersen Unit from 1998 conditions. This loss is estimated to reduce available riffle habitat by 17 percent and pool habitat by 13 percent within the Pedersen Unit. In addition to the loss of habitat, decreased flows would also result in a loss of temperature that would extend downstream, thereby reducing the thermal load in the system and thus the amount of available habitat at the appropriate spawning temperature. The additional 1,000 afy of groundwater pumping under the Kane Springs Groundwater Development Project would potentially increase overall habitat loss and temperature declines, however, trigger levels identified in the Monitoring, Management and Mitigation Plan (starting at 3.2 cfs or less) are a higher threshold than those established under the MOA. Accordingly, adverse effects on Moapa dace habitat should be prevented.

Conservation Measures Identified to Minimize Effects of the Proposed Action

Guaranteed Groundwater Pumping Reductions (Trigger ranges): LCWD and VWC have agreed to reduce groundwater pumping by half in the Kane Springs Valley should stream flows reach 3.15 cfs or less but greater than 3.0 cfs at the Warm Springs West gage. The groundwater pumping will be stopped in the Kane Springs Valley should stream flows reach 3.0 cfs or less at the Warm Springs West gage. This conservation measure will result in a reduction in the rate of decline of water levels and spring discharge. Further reduction in the rate of decline will depend on the effect of remaining groundwater pumping by other parties in the Coyote Spring Valley, California Wash, and the Warm Springs Area.

Restore Moapa Dace Habitat Outside of the Moapa Valley NWR Boundary: LCWD and VWC agreed to provide funds annually for five years to be used for habitat restoration outside of the Moapa Valley NWR boundary to promote recovery of the Moapa dace. This funding will be applied towards various on-going or proposed activities that would improve and secure habitat that is currently not being utilized due to degraded conditions (i.e. illegal diversions or non-native species presence). The funding will provide a mechanism to restore habitat to a level that would provide a higher quality of habitat for the species. These habitat improvements would contribute to the long-term survival of the species by increasing the food production potential, providing additional habitat types that would be available for the various life stages and providing an environment that is devoid of predatory non-native fishes.

F. Cumulative Effects

Cumulative effects are those effects of future non-Federal (State, local government, or private) activities that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

1. Desert Tortoise (Mojave Population)

The action area is on both Federal and private lands. The Service determined that future actions in the action area would likely require section 7 consultation or fall under purview of an HCP (section 10 of the Act). Thus, no future non-Federal activities are reasonably certain to occur in the action area; thus, there are no cumulative effects to the desert tortoise as a result of the proposed action. Private lands in the action area include CSI property. These activities are proposed to be covered under the Coyote Springs Investment MSHCP and associated incidental take permit, which are currently under development.

2. Critical Habitat for the Desert Tortoise (Mojave Population)

The Mormon Mesa Critical Habitat unit occurs mostly on Federal lands with CSI private land along US 93 and private property along Meadow Valley Wash. The Service determined that future actions in the action area would likely require section 7 consultation or fall under purview of an HCP (section 10 of the Act). No future non-Federal activities are reasonably certain to occur in the action area; thus, there are no cumulative effects to designated critical habitat as a result of the proposed action. Activities on CSI lands in Clark County are covered under the approved Clark County MSHCP and associated incidental take permit, and the activities in Lincoln County are proposed to be covered under the CSI MSHCP and associated incidental take permit, which are currently under development. The Southeastern Lincoln County Habitat Conservation Plan and associated incidental take permit, which are currently under development, will cover activities on private land along Meadow Valley Wash.

3. Moapa Dace

Future demand for groundwater will continue to threaten spring flows and surface water important for aquatic species such as the Moapa dace. In the Warm Springs Area, MVWD's existing permit would allow more groundwater to be pumped from the Arrow Canyon Well in the future. The maximum permitted pumping rate at the Arrow Canyon Well is 7,200 afy, as compared with the annual average of 2,400 afy pumped currently. Depending on the outcome of the pump study mandated in the State Engineer Order 1169 and subsequent ruling by the State Engineer, additional groundwater could potentially be pumped in Coyote Spring Valley. The maximum volume that could be removed from the Coyote Spring Valley and Muddy River Springs Area basins under existing permits is 31,100 afy. This represents more than a tenfold increase from current withdrawals in the system. In addition to the existing permitted water rights, there are pending applications for a far greater volume of groundwater above and beyond the permitted amount in the Coyote Spring Valley, Muddy River Springs Area, and Kane Springs Valley hydrographic basins.

G. Conclusion

1. Desert Tortoise (Mojave Population)

After reviewing the current status of the desert tortoise, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the project, as proposed and analyzed, is not likely to jeopardize the continued existence of the threatened desert tortoise (Mojave population). This conclusion for the desert tortoise is based on the following:

a. The proposed project will not result in a level of take of desert tortoise that would significantly affect the rangewide number, distribution, or reproduction of the species; tortoises that are taken as a result of the project are anticipated to remain in the wild with no long-term effects except for two desert tortoise estimated to be killed or injured by project activities.

b. The desert tortoise densities in the project area are considered low and measures have been proposed by LCWD and BLM to minimize the effects of the proposed action on the desert tortoise.

2. Critical Habitat for Desert Tortoise (Mojave Population)

The Service has reviewed the current rangewide status of designated critical habitat for the desert tortoise (Mojave population), the environmental baseline, the effects of the project, and the cumulative effects. Based on this review, it is the Service's biological opinion that these actions are not likely to destroy or adversely modify designated critical habitat for the desert tortoise (Mojave population). The project actions will not diminish the capability of the area to serve its role for recovery by continuing to provide the PCEs of critical habitat. The basis for this conclusion is summarized as follows:

a. The amount of critical habitat permanently and temporarily disturbed by the project is 173 acres, approximately 0.05 percent of the Mormon Mesa CHU.

b. Measures have been proposed by LCWD and BLM to minimize the effects of the proposed action on critical habitat for the desert tortoise.

3. Moapa Dace

After reviewing the current status of and environmental baseline for the Moapa dace, the effects of the project, and the cumulative effects, it is the Service's biological opinion that the action, as proposed and analyzed, is not likely to jeopardize the continued existence of the endangered Moapa dace. The project could contribute to groundwater level declines and spring flow reductions; however, implementation of the project's conservation actions will minimize these impacts.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act, as amended, prohibits take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering (50 CFR § 17.3). "Harass" is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR § 17.3). Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the

Federal agency or applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The terms and conditions may include: (1) restating measures proposed by BLM; (2) modifying the measures proposed by BLM; or (3) specifying additional measures considered necessary by the Service. Where these terms and conditions vary from or contradict the minimization measures proposed under the Description of the Proposed Action, specifications in these terms and conditions shall apply. The measures described below are nondiscretionary and must be implemented by BLM so that they become binding conditions of any project, contract, grant, or permit issued by BLM or other jurisdictional Federal agencies as appropriate, in order for the exemption in section 7(o)(2) to apply. The Service's evaluation of the effects of the proposed actions includes consideration of the measures developed by BLM, and repeated in the section entitled "Description of the Proposed Action" of this biological opinion, to minimize the adverse effects of the proposed action on the desert tortoise. Any subsequent changes in the minimization measures proposed by BLM may constitute a modification of the proposed action and may warrant reinitiation of formal consultation, as specified at 50 CFR § 402.16. These reasonable and prudent measures are intended to clarify or supplement the protective measures that were proposed by BLM as part of the proposed action.

BLM, or other jurisdictional Federal agencies as appropriate, have a continuing duty to regulate the activity that is covered by this incidental take statement. If BLM, or other jurisdictional Federal agencies as appropriate, fail to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to permits or grant documents, and/or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

A. Amount of Take

Desert Tortoise (Mojave Population)

Based on the analysis of effects provided above, measures proposed by BLM, and anticipated project duration the Service anticipates that the following take could occur as a result of the proposed action:

1. No more than two adults and an unknown number of hatchling and juvenile desert tortoises would be incidentally killed or injured as a result of the proposed project. Should any desert tortoise be killed or injured in association with the proposed action, all activity in the vicinity of the incident shall cease and the project proponent shall contact the Service within 24 hours to assess the circumstances and discuss if additional protective measures are necessary.

2. All desert tortoises located during clearance surveys or located in harm's way in work areas may be harassed by capture and removal from the project area. Based on survey data, timing of the proposed project, and description of the project area, the Service estimates that no more than 33 desert tortoises may be taken (other than killed or injured) by non-lethal means as a result of project activities.

3. An unknown number of desert tortoise nests with eggs may be excavated and relocated. The Service determined that no desert tortoise nests with eggs are anticipated to be destroyed as a result of project activities.

4. An unknown number of desert tortoises may be preyed upon by ravens or other subsidized desert tortoise predators drawn to trash in the project area; however, the Service estimates that the potential increase in ravens will be minimized by litter-control measures proposed by BLM.

Moapa Dace

The Service anticipates that incidental take of Moapa dace through harm (i.e., habitat modification or degradation that results in death or injury) will occur, but the actual death or injury of fish will be difficult to detect for the following reasons: the species has a small body size and finding a dead or impaired specimen is unlikely in a flowing stream environment. On the other hand, significant habitat modification or degradation that could result in take of Moapa dace will be detectable and measurable. Therefore, we are expressing take of Moapa dace in terms of habitat loss resulting from changes in habitat characteristics, such as water temperature or chemistry and water flows. Although the extent of effects to the species as a result of the proposed action is not yet known, future and on-going biological and hydrological studies will assist us in determining how flow reductions and thermal load losses will affect Moapa dace habitat, food availability, reproduction, and fecundity.

Perhaps the most significant impact to Moapa dace habitat that could result from implementation of the proposed action, as a result of decreased discharge and subsequent wetted area, is the reduction of overall volume of water that would be available to the species within the channel. The amount of groundwater pumping permitted under the Kane Springs Groundwater Development Project (1,000 afy) is substantially smaller than the amount of pumping that could potentially co-occur under Order 1169 (16,100 afy). A small but unquantifiable amount of take in the form of habitat loss would occur in the Pedersen Unit if flows reached 3.0 cfs at the Warm Spring West gage. Should flows at the Warm Springs West gage decline below 3.0 cfs, the amount of incidental take for this project would be exceeded for the Moapa dace.

B. Effect of Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the desert tortoise or Moapa dace. These determinations are based in part on the implementation of conservation measures detailed in the BA for this project.

C. Reasonable and Prudent Measures with Terms and Conditions

The Service believes that the following reasonable and prudent measures (RMPs) are necessary and appropriate to minimize take of desert tortoise or Moapa dace.

RPM 1: *BLM, LCWD, VWC, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of measures to minimize injury or mortality of desert tortoises due to surface-disturbing activities and operation of project vehicles or equipment:*

Terms and Conditions:

1.a. An authorized desert tortoise biologist shall be onsite at all locations where ground-disturbing activities are occurring within desert tortoise habitat. The authorized biologist will be responsible for approving, evaluating, and supervising monitors to assist in implementing the desert tortoise measures of this biological opinion. Potential biologists shall complete the Qualifications Form (Attachment A) and submit it to the Service for review and approval as appropriate. Allow 30 days for Service review and response.

1.b. Prior to initiation of construction, an authorized biologist or approved monitor shall present a desert tortoise awareness program to all personnel who will be onsite, including but not limited to contractors, contractors' employees, supervisors, inspectors, and subcontractors. This program will contain information concerning the biology and distribution of the desert tortoise and other sensitive species, their legal status and occurrence in the project area; the definition of "take" and associated penalties; the terms and conditions of this biological opinion; the means by which employees can help facilitate this process; responsibilities of workers, approved monitors, and biologists; and reporting procedures to be implemented in case of desert tortoise encounters or non-compliance with this biological opinion. The name of every individual trained will be recorded on a sign-in sheet. Each trained individual will be given evidence indicating they have received this training and will keep that evidence with them at all times when they are in the project area.

1.c. Immediately prior to surface-disturbing activities or traveling off of main access roads on the right-of-way, the authorized biologist shall survey for desert tortoises and their burrows using techniques providing 100-percent coverage of the right-of-way and an additional area approximately 90 feet from both sides of the right-of-way. Transects will be no greater than 30 feet apart. All potential desert tortoise burrows will be examined to determine occupancy of each burrow by desert tortoises and handled in accordance with Term and Condition 1.d. – 1.f and 2.a – 2.c. below.

1.d. All potential desert tortoise burrows located within the project area that are at risk for damage shall be excavated by hand by an authorized biologist, tortoises removed, and burrows collapsed or blocked to prevent occupation by desert tortoises.

1.e. Desert tortoises located in the project area, but outside of an area to be disturbed by ground disturbing activities, sheltering in a burrow during a period of reduced activity (*e.g.*, winter), may be temporarily penned. Tortoises shall not be penned in areas of moderate or heavy public use. Penning shall be accomplished by installing a circular fence, approximately 20 feet in diameter to enclose the tortoise/burrow. The pen should be constructed with durable materials (*i.e.*, 16 gauge or heavier) suitable to resist desert environments. Fence material should consist of ½-inch hardware cloth or 1-inch horizontal by 2-inch vertical, galvanized welded wire. Pen material should be 24 inches in width. Steel T-posts or rebar (3 to 4 feet) should be placed every 5 to 6 feet to support the pen material. The pen material should extend 18 to 24 inches aboveground. The bottom of the enclosure will be buried several inches; soil mounded along the base; and other measures should be taken to ensure zero ground clearance. Care shall be taken to minimize visibility of the pen by the public. An authorized biologist, approved monitor, or designated worker shall check the pen daily.

1.f. Desert tortoises and eggs found within construction sites shall be removed by an authorized biologist in accordance with the most current protocols identified by BLM and the Service. Desert tortoises will be moved solely for the purpose of moving them out of harm's way. Desert tortoises shall be relocated up to 1,500 feet into adjacent undisturbed habitat on protected public land in accordance with Service-approved handling protocol (Desert Tortoise Council 1994, revised 1999). The disposition of all tortoises handled shall be documented in accordance with 6.b. below.

1.g. All fuel, transmission or brake fluid leaks, or other hazardous materials shall not be drained onto the ground or into streams or drainage areas. All petroleum products and other potentially hazardous materials shall be removed to a disposal facility authorized to accept such materials. Waste leaks, spills or releases shall be reported immediately to BLM. BLM or the project proponent shall be responsible for spill material removal and disposal to an approved off-site landfill.

Servicing of construction equipment will take place only at a designated area. All fuel or hazardous waste leaks, spills, or releases will be stopped or repaired immediately and cleaned up at the time of occurrence. Service and maintenance vehicles will carry a bucket and pads to absorb leaks or spills.

1.h. Vehicles shall not exceed 25 mph on access roads. Authorized desert tortoise biologists and/or approved monitors will ensure compliance with speed limits during construction.

1.i. Project personnel shall exercise caution when commuting to the project area and obey speed limits to minimize any chance for the inadvertent injury or mortality of species encountered on roads leading to and from the project site. All desert tortoise observations, including mortalities, shall be reported directly to an authorized biologist and the Service.

1.j. Any vehicle or equipment on the right-of-way within desert tortoise habitat shall be checked underneath for tortoises before moving. This includes all construction equipment and the area under vehicles should be checked any time a vehicle is left unattended, as well as in the morning before any construction activity begins. If a desert tortoise is observed, an authorized biologist will be contacted.

1.k. Project activity areas shall be clearly marked or flagged at the outer boundaries before the onset of construction. All activities shall be confined to designated areas. The authorized biologist and approved monitors shall ensure that no habitat is disturbed outside designated areas as a result of the project, including ensuring that all vehicles and equipment remain on the right-of-way or areas devoid of native vegetation.

1.l. To prevent mortality, injury, and harassment of desert tortoises and damage to their burrows and coversites, no pets shall be permitted in any project construction area.

1.m. All desert tortoises observed within the project area or access road shall be reported immediately to the authorized biologist. The authorized biologist shall halt activities as necessary to avoid harm to a desert tortoise. Project activities that may endanger a desert tortoise shall cease until the desert tortoise moves out of harm's way or is moved out of harm's way by an authorized biologist.

1.n. Only water or an alternative substance approved by BLM shall be used as a dust suppressant. Water application shall avoid pooling of water on roadways. Pools of water may act as an attractant to desert tortoises.

1.o. In the event that blasting is required, a 200-foot-radius area around the blasting site shall be surveyed by an authorized biologist for desert tortoises prior to blasting, using 100-percent-coverage survey techniques. All tortoises located above ground or in pallets within this 200-foot radius of the blasting site shall be moved 500 feet from the blasting site. Additionally, tortoises in burrows within 75 feet of the blasting will be placed into an artificial or unoccupied burrow 500 feet from the blasting site. This will prevent tortoises that leave their burrow upon translocation from returning to the blasting site. Tortoises in burrows at a distance of 75 to 200 feet from the blasting site will be left in their burrows. Burrow locations will be flagged and recorded using a GPS unit and burrows would be stuffed with newspapers. Immediately after blasting, newspaper and flagging will be removed. Blasting would only occur in the brief time period after an area has been cleared by an authorized biologist, but before any relocated tortoises could return to the site.

1.p. If possible, overnight parking and storage of equipment and materials shall be located in previously-disturbed areas or areas to be disturbed that have been cleared by an authorized tortoise biologist. If not possible, areas for overnight parking and storage of equipment shall be designated by the authorized biologist.

1.q. Within desert tortoise habitat, any construction pipe, culvert, or similar structure with a diameter greater than 3 inches stored less than 8 inches above ground on the construction site for one or more nights shall be inspected for tortoises before the material is moved, buried, or capped. As an alternative, all such structures may be capped before being stored on the construction site.

1.r. Flagging and wire shall be removed from the project area at the end of project to ensure debris is not consumed by desert tortoises.

1.s. All project activities in desert tortoise habitat shall be conducted from dawn until dusk.

1.t. Any excavated holes left open overnight shall be covered, and/or tortoise-proof fencing (Attachment B) shall be installed to prevent the possibility of tortoises falling into the open holes.

1.u. Open pipeline trenches shall be fenced with temporary tortoise-proof fencing or inspected by an authorized biologist or approved monitor periodically throughout and at the end of the day, and immediately prior to backfilling, and tortoise escape ramps (of at least 3:1 slope) shall be installed at least every quarter mile. Any tortoise that is found in a trench or excavation shall be promptly removed by an authorized biologist in accordance with Service-approved protocol or alternative method approved by the Service if the biologist is not allowed to enter the trench for safety reasons.

1.v. In areas to be encircled by a security fence, such as well yards and well substations, the fence shall be installed at least one foot below the surface of the ground or install permanent desert tortoise fencing around the area, to ensure that tortoises do not get trapped inside. See Attachment B for the Service's recommendations on tortoise exclusion fencing, dated September 2005. Fences should be checked during regular maintenance of the facilities to ensure zero ground clearance.

1.w. Any tortoise injured as a result of the proposed project shall immediately be transported to a qualified veterinarian and reported to the Service's Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230.

RPM 2: *BLM, LCWD, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of the following measures to ensure that tortoises are not injured as a result of capture and handling:*

Terms and Conditions:

2.a. All appropriate NDOW permits or letters of authorization shall be acquired prior to handling desert tortoises and their parts, and prior to initiation of any activity that may require handling tortoises.

2.b. Tortoises and nests shall be handled and relocated by an authorized tortoise biologist in accordance with the Service-approved protocol (Desert Tortoise Council 1994, revised 1999). If the Service or Desert Tortoise Council releases a revised protocol for handling of desert tortoises before initiation of project activities, the revised protocol shall be implemented for the project area. A pair of new, disposable latex gloves shall be used for each tortoise that must be handled. After use, the gloves will be properly disposed. Burrows containing tortoises or nests shall be excavated by hand, with hand tools, to allow removal of the tortoise or eggs. Desert tortoises moved during the tortoises less active season or those in hibernation, regardless of date, must be placed into an adequate burrow; if one is not available, one shall be constructed in accordance with Desert Tortoise Council (1994, revised 1999) criteria. Desert tortoises that are located aboveground and need to be moved from the project area shall be placed in the shade of a shrub. All desert tortoises removed from burrows shall be placed in an unoccupied burrow of approximately the same size and orientation as the one from which it was removed.

2.c. Special precautions shall be taken to ensure that desert tortoises are not harmed as a result of their capture and movement during extreme temperatures (i.e., air temperatures below 55° F or above 95° F). Under such adverse conditions, tortoises captured will be monitored continually by an authorized biologist or approved monitor until the tortoise exhibits normal behavior. If a desert tortoise shows signs of heat stress, procedures will be implemented as identified in the Service-approved protocol (Desert Tortoise Council 1994, revised 1999). The disposition of all tortoises handled shall be documented in accordance with 6.b. below.

RPM 3: *BLM, LCWD, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of the following measures to minimize predation on desert tortoises by predators drawn to the project area:*

Terms and Conditions:

Trash and food items shall be disposed properly in predator-proof containers with resealing lids. During construction activities, trash containers will be emptied and waste will be removed from the project area daily. Trash removal reduces the attractiveness of the area to opportunistic predators such as desert kit fox, coyotes, and common ravens.

RPM 4: *BLM, LCWD, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of the following measures to minimize loss and long-term degradation and fragmentation of desert tortoise habitat, such as soil compaction, erosion, crushed vegetation, and introduction of weeds or contaminants as a result of construction activities:*

Terms and Conditions:

4.a Off-road travel outside construction zones shall be prohibited.

4.b. The designated utilities shall follow the Noxious Weed Management Plan which includes the following: washing vehicles and equipment prior to mobilizing to the project area, providing onsite personnel with BLM weed identification information, reseeding the project area with a BLM-approved certified weed-free seed mix, and controlling noxious weeds should they be introduced as a result of the proposed action.

4.c. After completion of the project, the designated utilities shall follow the Revegetation Plan to restore all temporarily-disturbed areas to functioning desert tortoise habitat, using native seeds or plants.

4.d. BLM shall ensure payment of remuneration fees by the project proponents, the designated utilities, for compensation of the loss of desert tortoise habitat as a result of the proposed project. BLM shall require a receipt of payment from each designated utility prior to issuing the Notice to Proceed.

The right-of-way applicant is required to submit a Final Plan of Development to the BLM, which must be approved by BLM prior to issuance of the Notice to Proceed. It is likely that the amount of disturbance will change with the final engineering design; therefore, BLM will reevaluate the project disturbance and adjust the total compensation fee accordingly. A copy of the Final Plan of Development and a breakdown of the final compensation fee will be provided to the Service. The applicant will be made aware that, depending on final engineering designs, the final compensation fee may be lower than the estimated value provided in this document.

Currently, the basic compensation rate for disturbance to desert tortoise habitat is $753 per acre. For disturbance to desert tortoise critical habitat a multiplier is used to increase the cost per acre as described in Hastey *et al.* (1991). For each project, this multiplier for critical habitat is based on assignment of ratings to the following five factors:

- Category of Habitat (value of the land to tortoise populations)
- Term of Effect (short term vs. long term)
- Existing Disturbance on Site
- Growth Inducement (growth inducing effects of the proposed action)
- Effect of Adjacent Lands (whether adjacent lands will be affected)

The proposed project will disturb 209 acres of desert tortoise habitat on lands in Lincoln County. The total compensation fee for this project is $808,722. Attachment C shows a breakdown of these calculations. Fees for disturbances on Federal land will be deposited into the Lincoln County Section 7 Account, while fees for disturbance on private land will be deposited into the CSI MSHCP Section 10 Trust Fund. The payee will fill out the attached fee payment forms (Attachment D) and include these with the payments.

Each year these fees will be indexed for inflation based on the Bureau of Labor Statistics Consumer Price Index for All Urban Consumers (CPI-U). Information on the CPI-U can be found on the internet at: http://stats.bls.gov/news.release/cpi.nr0.htm. The next rate adjustment will occur on March 1, 2009.

Fees deposited in the Lincoln County Section 7 account will be managed consist with an MOA to be developed between BLM and the Service. The development of a MOA will be initiated within 30 days of the ROD.

Section 7 fees collected under this biological opinion may be used in coordination with the mitigation program of the CSI MSHCP, to implement conservation and recovery measures within the Mormon Mesa critical habitat unit.

RPM 5: *BLM, LCWD, VWC, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of the following measures to mininize impacts to Moapa dace that may result from groundwater pumping associated with the project in the Kane Springs Valley:*

Terms and Conditions:

BLM shall assure that all provisions of the proposed actions including the Monitoring, Management and Mitigation Plan of the Stipulated Agreement are fully implemented.

RPM 6: *BLM, LCWD, and other jurisdictional Federal agencies as appropriate, shall ensure implementation of the following measures to comply with the reasonable and prudent measures, terms and conditions, reporting requirements, and reinitiation requirements contained in this biological opinion:*

Terms and Conditions:

6.a. LCWD shall designate a field contact representative. The field representative will be responsible for overseeing compliance with protective stipulations for the desert tortoise and coordinating directly with BLM and the Service. The field contact representative shall have the authority to halt activities or construction equipment that may be in violation of the stipulations. A copy of the terms and conditions of this biological opinion shall be provided to the field contact representative, biologists, and monitors for the project.

6.b. The authorized biologist shall record each observation of desert tortoise handled. Information will include the following: location, date and time of observation; whether tortoise was handled, general health and whether it voided its bladder; location tortoise was moved from and location moved to; and unique physical characteristics of each tortoise. A final report will be submitted to the Service's Nevada Fish and Wildlife Office in Las Vegas within 90 days of completion of the project.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take or loss of habitat identified is exceeded, such incidental take and habitat loss represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The designated utilities must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

D. Reporting Requirements

Upon locating a dead or injured endangered or threatened species within the action area, notification must be made to the Service's Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230. Care should be taken in handling sick or injured endangered or threatened species to ensure effective treatment and be taken for handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by the Service to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed. All deaths, injuries, and illnesses of endangered or threatened species, whether associated with project activities or not, will be summarized in an annual report.

Desert Tortoise (Mojave Population)

The following actions should be taken for injured or dead tortoises if directed by the Service:

1. Injured desert tortoises shall be delivered to any qualified veterinarian for appropriate treatment or disposal.

2. Dead desert tortoises suitable for preparation as museum specimens shall be frozen immediately and provided to an institution holding appropriate Federal and State permits per their instructions.

3. Should no institutions want the desert tortoise specimens, or if it is determined that they are too damaged (crushed, spoiled, etc.) for preparation as a museum specimen, then they may be buried away from the project area or cremated, upon authorization by the Service.

4. The designated utilities shall bear the cost of any required treatment of injured desert tortoises, euthanasia of sick desert tortoises, or cremation of dead desert tortoises.

5. Should sick or injured desert tortoises be treated by a veterinarian and survive, they may be transferred as directed by the Service.

Moapa Dace

The following action should be taken for injured or dead Moapa dace if directed by the Service: Dead Moapa dace suitable for preparation as museum specimens shall be frozen immediately and provided to the Service's Nevada Fish and Wildlife Office in Las Vegas.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service provides no conservation recommendations at this time.

REINITIATION

This concludes formal consultation on the actions outlined in your requested dated September 27, 2007. As required by 50 CFR § 402.16, reinitiation of formal consultation is required where the discretionary Federal agency involvement or control over an action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. In particular, if the State Engineer grants additional water rights beyond the currently permitted 1,000 afy for the Kane Springs Groundwater Development Project, then formal consultation should be reinitiated.

The incidental take statement provided with this Biological Opinion authorizes take of the Moapa dace as may occur in connection with the pumping and transfer of 1,000 afy of groundwater under Phase I of the Project, and implementation of the Monitoring, Management, and Mitigation Plan established under the amended stipulated agreement for the Kane Springs Valley Hydrographic Basin. In June 2008, the LCWD, VWC, and the Service executed a Memorandum of Understanding to ensure additional consultation on this project should additional water rights be appropriated to LCWD and VWC in the Kane Springs Valley Hydrographic Basin (Attachment E). Specifically, the Memorandum requires that the Service reinitiate Section 7 consultation, and, if required, LCWD and VWC will apply for an incidental take permit under Section 10(a)(1)(B) of the Act to cover any take that may occur due to the pumping and transfer of such additional groundwater.

If we can be of further assistance regarding this consultation, please contact me at (775) 861-6300, or Janet Bair in the Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230.

Sincerely,

Robert D. Williams
Field Supervisor

Attachments

cc:
Lincoln County Treasurer, Pioche, Nevada
Supervisory Biologist - Habitat, Nevada Department of Wildlife, Las Vegas, Nevada
Field Manager, Caliente Field Office, Bureau of Land Management, Caliente, Nevada
Nevada Groundwater Projects Office, Nevada State Office, Bureau of Land Management, Reno, Nevada
T&E Species Coordinator, Nevada State Office, Bureau of Land Management, Reno, Nevada

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ATTACHMENT A

GENERAL DESERT TORTOISE QUALIFICATIONS STATEMENT

This form should be used to provide your qualifications to agency officials if you wish to undertake the duties of an authorized biologist with regard to desert tortoises during construction or other projects authorized under Sections 7 (Biological Opinions) or 10(a)(1)(B) (i.e. Habitat Conservation Plans) of the Endangered Species Act.

(If you seek approval to attach/remove/insert any devices or equipment to/into desert tortoises, withdraw blood, or conduct other procedures on desert tortoises, a recovery permit or similar authorization may be required. Application for a recovery permit requires completion of Form 3-200-55, which can be downloaded at http://www.fws.gov/forms/3-200-55.pdf.)

1. Contact Information:

Name	
Address	
City, State, Zip Code	
Phone Number(s)	
Email Address	

2. Date:

3. Areas in which authorization is requested (check all that apply):

☐ San Bernardino, Kern, and Los Angeles Counties, California (Ventura office)
☐ Riverside and Imperial Counties, California (Carlsbad office)
☐ Nevada ☐ Utah ☐ Arizona

4. Please provide information on the project:

USFWS Biological Opinion or HCP Permit No.		**Date:**
Project Name		
Federal Agency		
Proponent or Contractor		

ATTACHMENT A

5. If you hold, or have held, any relevant state or federal wildlife permits provide the following:

Species	Dates	State (specify) or Federal Permit Number	Authorized Activities

6. **Education:** Provide up to three schools, listing most recent first:

Institution	Dates attended	Major/Minor	Degree received

7. **Desert Tortoise Training.**

Name/Type of Training	Dates (From/To)	Location	Instructor/Sponsor
1. Classes			
2. Field Training			
3. Translocation			
4.			

8. **Experience** – Include only those positions relevant to the requested work with desert tortoises. Distinguish between Mojave desert tortoise and other experience. Include only your experience, not information for the project you worked on (e.g., if 100 tortoises were handled on a project and you handled 5 of those tortoises, include only those 5. List most recent experience first. Handling a Mojave desert tortoise must be authorized by a Biological Opinion or other permit and reported to the USFWS. Information provided in this section will be used by the USFWS to track the numbers of tortoises affected by previous projects (baseline). **Be sure to include a project supervisor or other contact that can verify your skills and experience in relation to your job performance.** Attach additional sheets as necessary.

ATTACHMENT A

Experience by project and activity:

Project Name, Job Title, Dates	Project Contact name, phone no., & Email address	Conduct Clearance Surveys (Hrs/Days)	Excavate DT burrows (No.)	Locate DT No. < 100mm ≥100mm	Relocate DTs (No.)	Excavate, and relocate DT nests (No.)
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

ATTACHMENT A

Experience by project and activity (continued): Each project number should correspond with the project listed on the previous page

Project Number (Corresponds to previous page)		Construct Artificial Burrows (No.)	Monitor project equipment and activities (Hrs/Days)	Oversee project compliance (Hrs/Days)	Supervise field staff (Hrs/Days)	DT fence installation and inspection (Hrs/Days)	Present DT Awareness Training (No.)
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

ATTACHMENT A

Summary of experience:

Total time spent for all desert tortoise-related field activities (referenced above):
Specify total number of hours
OR total number of 8-hour days: ____________________

Total number of miles/kilometers walked conducting survey transects:

Total number of wild, free-ranging desert tortoises you personally handled:

<100 mm: _______

≥100 mm: _______

I certify that the information submitted in this form is complete and accurate to the best of my knowledge and belief.
I understand that any false statement herein may subject me to the criminal penalties of 18 U.S.C. Ch.47, Sec. 1001.

Signed: ______________________________ **Date:** ____________________

ATTACHMENT B

RECOMMENDED SPECIFICATIONS FOR DESERT TORTOISE EXCLUSION FENCING

September 2005

These specifications were developed to standardize fence materials and construction procedures to confine tortoises or exclude them from harmful situations, primarily roads and highways. Prior to commencing any field work, all field workers should comply with all stipulations and measures developed by the jurisdictional land manager and the U.S. Fish and Wildlife Service for conducting such activities in desert tortoise habitat, which will include, at a minimum, completing a desert tortoise education program.

FENCE CONSTRUCTION

Materials

Fences should be constructed with durable materials (*i.e.*, 16 gauge or heavier) suitable to resist desert environments, alkaline and acidic soils, wind, and erosion. Fence material should consist of 1-inch horizontal by 2-inch vertical, galvanized welded wire, 36 inches in width. Other materials include: Hog rings, steel T-posts, and smooth or barbed livestock wire. Hog rings should be used to attach the fence material to existing strand fence. Steel T-posts (5 to 6-foot) are used for new fence construction. If fence is constructed within the range of bighorn sheep, 6-foot T-posts should be used (see New Fence Construction below). Standard smooth livestock wire fencing should be used for new fence construction, on which tortoise-proof fencing would be attached.

Retrofitting Existing Livestock Fence

Option 1 (see enclosed drawing). Fence material should be buried a minimum of 12 inches below the ground surface, leaving 22-24 inches above ground. A trench should be dug or a cut made with a blade on heavy equipment to allow 12 inches of fence to be buried below the natural level of the ground. The top end of the tortoise fence should be secured to the livestock wire with hog rings at 12 to 18-inch intervals. Distances between T-posts should not exceed 10 feet, unless the tortoise fence is being attached to an existing right-of-way fence that has larger interspaces between posts. The fence must be perpendicular to the ground surface, or slightly angled away from the road, towards the side encountered by tortoises. After the fence has been installed and secured to the top wire and T-posts, excavated soil will be replaced and compacted to minimize soil erosion.

Option 2 (see enclosed drawing). In situations where burying the fence is not practical because of rocky or undigable substrate, the fence material should be bent at a 90° angle to produce a lower section approximately 14 inches wide which will be placed parallel to, and in direct contact with, the ground surface; the remaining 22-inch wide upper section should be placed vertically against the existing fence, perpendicular to the ground and attached to the existing fence with hog rings at 12 to18-inch intervals. The lower section in contact with the ground should be placed within the enclosure in the direction of potential tortoise encounters and level with the ground surface. Soil and cobble (approximately 2 to 4 inches in diameter; can use larger rocks where soil is shallow) should be placed on top of the lower section of fence material on the ground covering it with up to 4 inches of material, leaving a minimum of 18 inches of open space between the cobble surface and the top of the tortoise-proof fence. Care should be taken to ensure that the fence material parallel to the ground surface is adequately covered and is flush with the ground surface.

New Fence Construction
Options 1 or 2 should be followed except in areas that require special construction and engineering such as wash-out sections (see below). T-posts should be driven approximately 24 inches below the ground surface spaced approximately 10 feet apart. Livestock wire should be stretched between the T-posts, 18 to 24 inches above the ground to match the top edge of the fence material; desert tortoise-proof fencing should be attached to this wire with hog rings placed at 12 to 18-inch intervals. Smooth (barb-less) livestock wire should be used except where grazing occurs.

If fence is constructed within the range of bighorn sheep, two smooth-strand wires are required at the top of the T-post, approximately 4 inches apart, to make the wire(s) more visible to sheep. A 20 to 24-inch gap must exist between the top of the fence material and the lowest smooth-strand wire at the top of the T-post. The lower of the top two smooth-strand wires must be at least 43 inches above the ground surface.

(72-inch T-posts: 24 inches below ground + 18 inches of tortoise fence above ground + 20 to 24-inch gap to lower top wire + 4 inches to upper top wire = 66 to 70 inches).

INSPECTION OF DESERT TORTOISE BARRIERS

The risk level for a desert tortoise encountering a breach in the fence is greatest in the spring and fall, particularly around the time of precipitation including the period during which precipitation occurs and at least several days afterward. All desert tortoise fences and cattleguards should be inspected on a regular basis sufficient to maintain an effective barrier to tortoise movement. Inspections should be documented in writing and include any observations of entrapped animals; repairs needed including bent T-posts, leaning or non-perpendicular fencing, cuts, breaks, and gaps; cattleguards without escape paths for tortoises or needed maintenance; tortoises and tortoise burrows including carcasses; and recommendations for supplies and equipment needed to complete repairs and maintenance.

All fence and cattleguard inventories should be inspected at least twice per year. However, during the first 2 to 3 years all inspections will be conducted quarterly at a minimum, to identify and document breaches, and problem areas such as wash-outs, vandalism, and cattleguards that fill-in with soil or gravel. GPS coordinates and mileages from existing highway markers should be recorded in order to pinpoint problem locations and build a database of problem locations that may require more frequent checking. Following 2 to 3 years of initial inspection, subsequent inspections should focus on known problem areas which will be inspected more frequently than twice per year. In addition to semi-annual inspections, problem areas prone to wash-outs should be inspected following precipitation that produces potentially fence-damaging water flow. A database of problem areas will be established whereby checking fences in such areas can be done efficiently.

REPAIR AND MAINTENANCE OF DESERT TORTOISE BARRIERS

Repairs of fence wash-outs: (1) realign the fence out of the wash if possible to avoid the problem area, or (2) re-construct tortoise-proof fencing using techniques that will ensure that an effective desert tortoise barrier is established that will not require frequent repairs and maintenance. Gaps and breaks will require either: (a) repairs to the existing fence in place, with similar diameter and composition of original material, (b) replacement of the damaged section to the nearest T-post, with new fence material that original fence standards, (c) burying fence, and/or (d) restoring zero ground clearance by filling in gaps or holes under the fence and replacing cobble over fence constructed under Option 2. Tortoise-proof fencing should be constructed and maintained at cattleguards to ensure that a desert tortoise barrier exists at all times.

All fence damage should be repaired in a timely manner to ensure that tortoises do not travel through damaged sections. Similarly, cattleguards will be cleaned out of deposited material underneath them in a timely manner. In addition to periodic inspections, debris should be removed that accumulates along the fence. All cattleguards that serve as tortoise barriers should be installed and maintained to ensure that any tortoise that falls underneath has a path of escape without crossing the intended barrier.

Attachment C

Calculation of Desert Tortoise Remuneration Fees

Table 1. Project specific multiplier for calculating remuneration fees for critical habitat.

COMPENSATION FACTOR*	DESCRIPTION	RATING
Category of Habitat	The habitat has been rated as Category I, which is the most valuable and protected (i.e. critical habitat).	3.0
Term of Effect	The term of effect has been rated as long term (> 10 years)	1.0
Existing Disturbance on Site	The existing disturbance has been rated as little or no existing habitat disturbance	1.0
Growth Inducement	The proposed action has been rated as having growth inducing effects	0.5
Effect of Adjacent Lands	The proposed action has been rated as having a direct or indirect deleterious impacts	0.5
TOTAL RATING FOR COMPENSATION FACTORS = MULTIPLIER		6.0
MULTIPLIER X CURRENT COST/ACRE (6 x $753)**		$4,518/acre

Table 2. Calculation of remuneration fees for the Kane Springs Valley Groundwater Development Project.

ACRES	COST PER ACRE**	COST
Compensation for disturbance not within designated critical habitat on Federal land:		
36 acres	$753/acre	$27,108
Compensation for disturbance within designated critical habitat:		
148 acres Federal land	$4,518/acre	$668,664
25 acres private land	$4,518/acre	$112,950
TOTAL COST		$808,722

*Compensation Factors are rated based on the *Compensation for the Desert Tortoise; A Report Prepared for the Desert Tortoise Management Oversight Group* (Hastey *et al.*, 1991).
** Each year these fees will be indexed for inflation based on the Bureau of Labor Statistics Consumer Price Index for All Urban Consumers (CPI-U). Information on the CPI-U can be found on the internet at: http://stats.bls.gov/news.release/cpi.nr0.htm. The next rate adjustment will occur on March 1, 2009.

Attachment D

LINCOLN COUNTY SECTION 7
LAND DISTURBANCE FEE
PAYMENT FORM
Entire form is to be completed by project proponent

Biological Opinion File Number: 84320-2008-F-0007

Biological Opinion issued by: Nevada Fish and Wildlife Office, Las Vegas, Nevada

Species: Desert tortoise (*Gopherus agassizii*) (Mojave population)

Project: Kane Springs Valley Groundwater Development Project

Number of acres anticipated to be disturbed: 184 acres on Federal land (148 acres critical habitat, 36 acres non-critical habitat)

Fee rate (per acre): $4,518 for critical habitat, $753 for non-critical habitat ______

Total payment required: $ ______________________

Amount of payment received: ____________________

Date of receipt: ____________________

Check or money order number: ________________

Project proponent: __________________________

Telephone number:

Authorizing agencies: Bureau of Land Management, Ely, Nevada

Make checks payable to: Lincoln County Treasurer

Deliver check to:
Lincoln County Habitat Conservation Section 7 Account
Lincoln County Treasurer
Attn: Ms. Cathy Hiatt
P.O. Box 416
Pioche, Nevada 89043
(775) 962-5805

If you have questions, you may call the Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230.

Attachment D (continued)

CSI MSHCP SECTION 10 TRUST FUND
LAND DISTURBANCE FEE
PAYMENT FORM
Entire form is to be completed by project proponent

Biological Opinion File Number: 84320-2008-F-0007

Biological Opinion issued by: Nevada Fish and Wildlife Office, Las Vegas, Nevada

Species: Desert tortoise (*Gopherus agassizii*) (Mojave population)

Project: Kane Springs Valley Groundwater Development Project

Number of acres anticipated to be disturbed: 25 acres of critical habitat on private land

Fee rate (per acre): $4,518 for critical habitat

Total payment required: $__________

Amount of payment received: __________

Date of receipt: __________

Check or money order number: __________

Project proponent: __________

Telephone number:

Authorizing agencies: Bureau of Land Management, Ely, Nevada

Make checks payable to: Coyote Springs Investment, LLC/CSI MSHCP Section 10 Trust Fund

Deliver check to:
CSI MSHCP Section 10 Trust Fund
Coyote Springs Investment, LLC
Attn: Mr. James England
3100 State Route 168
Coyote Springs, Nevada 89037

If you have questions, you may call the Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230.

ATTACHMENT E

Memorandum of Understanding Between
Lincoln County Water District, Vidler Water Company, Inc.
and Nevada Fish and Wildlife Office, US Fish and Wildlife Service

The Nevada Fish and Wildlife Office of the US Fish and Wildlife Service (SERVICE), Lincoln County Water District (LCWD) and Vidler Water Company, Inc. (VIDLER) have entered into this memorandum of understanding (MOU) with reference to the following facts and circumstances:

1) The SERVICE is responsible for administering and implementing the Endangered Species Act of 1973, as amended, (ESA) (16 U.S.C. §§ 1531 – 1544), including conducting consultation pursuant to Sections 7 and 10 of the ESA and as described in its implementing regulations (50 CFR Part 402).

2) LCWD and VIDLER propose to complete the Kane Springs Valley Groundwater Development Project (Project), which involves the pumping and transfer of up to 5,000 acre-feet of groundwater from the Kane Springs Valley Hydrographic Basin for use in the Coyote Spring Valley Hydrographic Basin in Lincoln County, Nevada. The Project will be completed in three phases. Phase I of the Project involves the pumping and transfer of 1,000 acre-feet per year of groundwater.

3) LCWD and VIDLER applied to the Nevada State Engineer for authorization to appropriate up to 5,000 acre-feet per year of groundwater from Kane Springs Valley for use in Coyote Spring Valley, and the SERVICE filed protests to the applications.

4) The SERVICE, LCWD and VIDLER entered into an Amended Stipulation for Withdrawal of Protests under which the SERVICE, LCWD and VIDLER agreed to implement a Monitoring, Management and Mitigation Plan and the SERVICE agreed to withdraw its protests to the applications.

5) The purpose of the Monitoring, Management and Mitigation Plan is to obtain accurate and reliable information regarding the aquifer's response to pumping and the impact of pumping on water-related resources within the regional carbonate-rock aquifer and overlying basin-fill aquifer systems so that the Project can be managed to avoid adverse impacts to the Moapa Dace or its habitat.

6) The Nevada State Engineer has authorized LCWD and VIDLER to appropriate 1,000 acre-feet of groundwater from Kane Springs Valley for use in Coyote Spring Valley and may in the future authorize LCWD and VIDLER to appropriate up to 5,000 acre-feet of groundwater from Kane Springs Valley for use in Coyote Spring Valley.

7) The Bureau of Land Management is expected to issue a Record of Decision granting a right-of-way for the Project.

8) The SERVICE is expected to issue a biological opinion concluding that the Project "may affect, is likely to adversely affect" the Moapa dace or its habitat.

9) The extent of any impact to the Moapa dace or its habitat is uncertain and cannot be known until pumping begins and reliable data is collected under the Monitoring, Management and Mitigation Plan.

10) The sole purpose of this MOU is to ensure ongoing cooperation and consultation between LCWD, VIDLER and the SERVICE, the timely, economical and successful completion of the Project and the protection of the Moapa Dace and its habitat.

11) By entering into this MOU, the SERVICE is taking "action" as defined in 50 CFR §402.02.

12) By entering into this MOU, the SERVICE, LCWD, and VIDLER seek to create a federal nexus to enable the SERVICE to reinitiate consultation under Section 7 of the ESA concerning impacts to the Moapa dace that may occur if the Nevada State Engineer authorizes LCWD and VIDLER to appropriate more than 1,000 acre-feet of groundwater from the Kane Springs Valley Hydrographic Basin.

Now, therefore, in consideration of the mutual promises contained in this MOU, LCWD, VIDLER and the SERVICE agree as follows:

A. The SERVICE will issue a biological opinion for the Project. The biological opinion will include an incidental take statement authorizing such take of the Moapa dace as may occur in connection with the pumping and transfer of 1,000 acre-feet of groundwater under Phase 1 of the Project and implementation of the Monitoring, Management and Mitigation Plan.

B. Upon receiving authorization from the Nevada State Engineer to appropriate more than 1,000 and up to 5,000 acre-feet per year of groundwater from the Kane Springs Valley for use in Coyote Springs Valley, the SERVICE will reinitiate consultation for the Project pursuant to Section 7 of the ESA; and if necessary, LCWD and VIDLER will apply for an incidental take permit under Section 10(a)(1)(B) of the ESA to cover any take of the Moapa dace that may occur due to the pumping and transfer of such additional groundwater.

US Fish and Wildlife Service
Nevada Fish and Wildlife Office

Robert Williams
Field Supervisor

6/30/08
Date

Lincoln County Water District

By George T. Rowe
Title: Chairman LCWD

6/16/08
Date

Vidler Water Company, Inc.

By Dorothy A. Timian
Title: President

6/26/08
Date

Kane Springs Valley

- Water levels responded to Order 1169 pumping

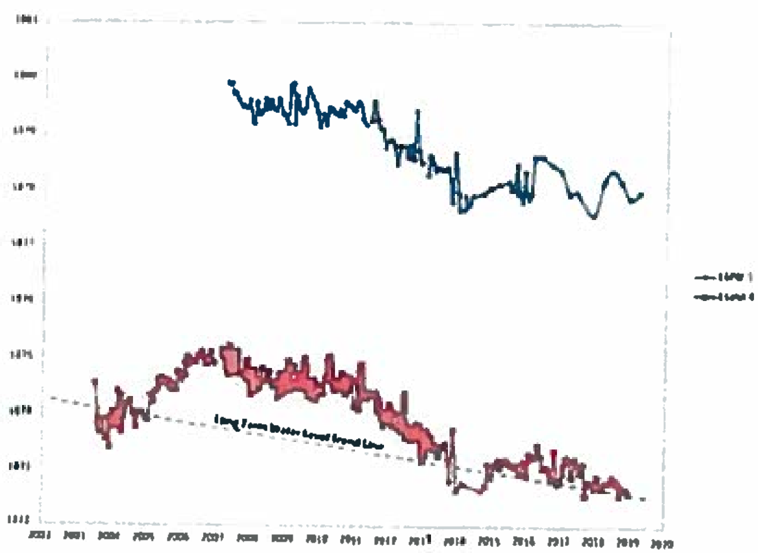
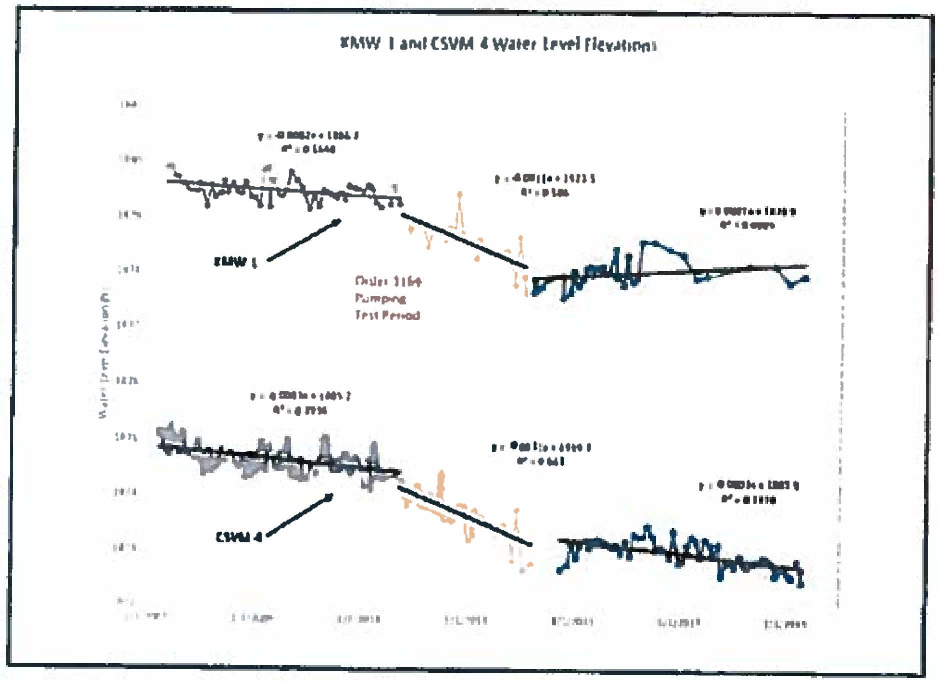


FIGURE 3-9, COMBINED HYDROGRAPHS OF WELLS KMW-1 AND CSVM-4

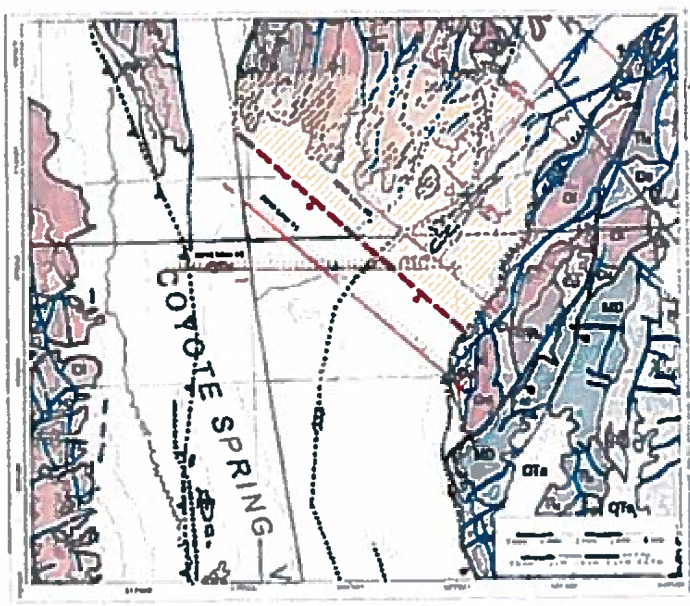
Ex. LC-V_001



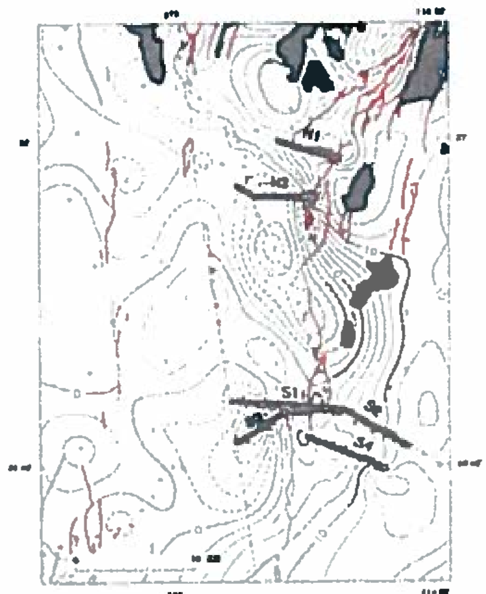
NPS Ex. No. 3

Kane Springs Valley (continued)

- Faults are present in northern Coyote Spring Valley and Kane Springs Valley that may reduce permeability



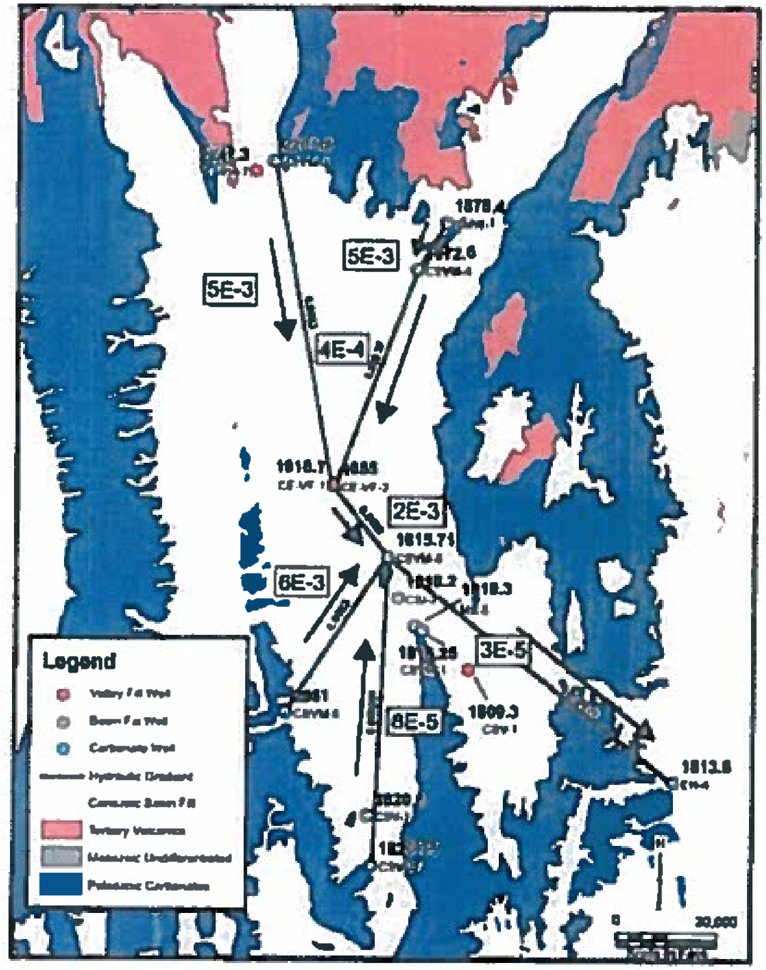
LC-V_001



NPS Ex. No. 3

Kane Springs Valley (continued)

- Hydraulic gradients are higher in the northernmost part of Coyote Spring Valley
- But not enough to create a significant barrier, based on observed pumping responses in KMW-1 and CSVM-4

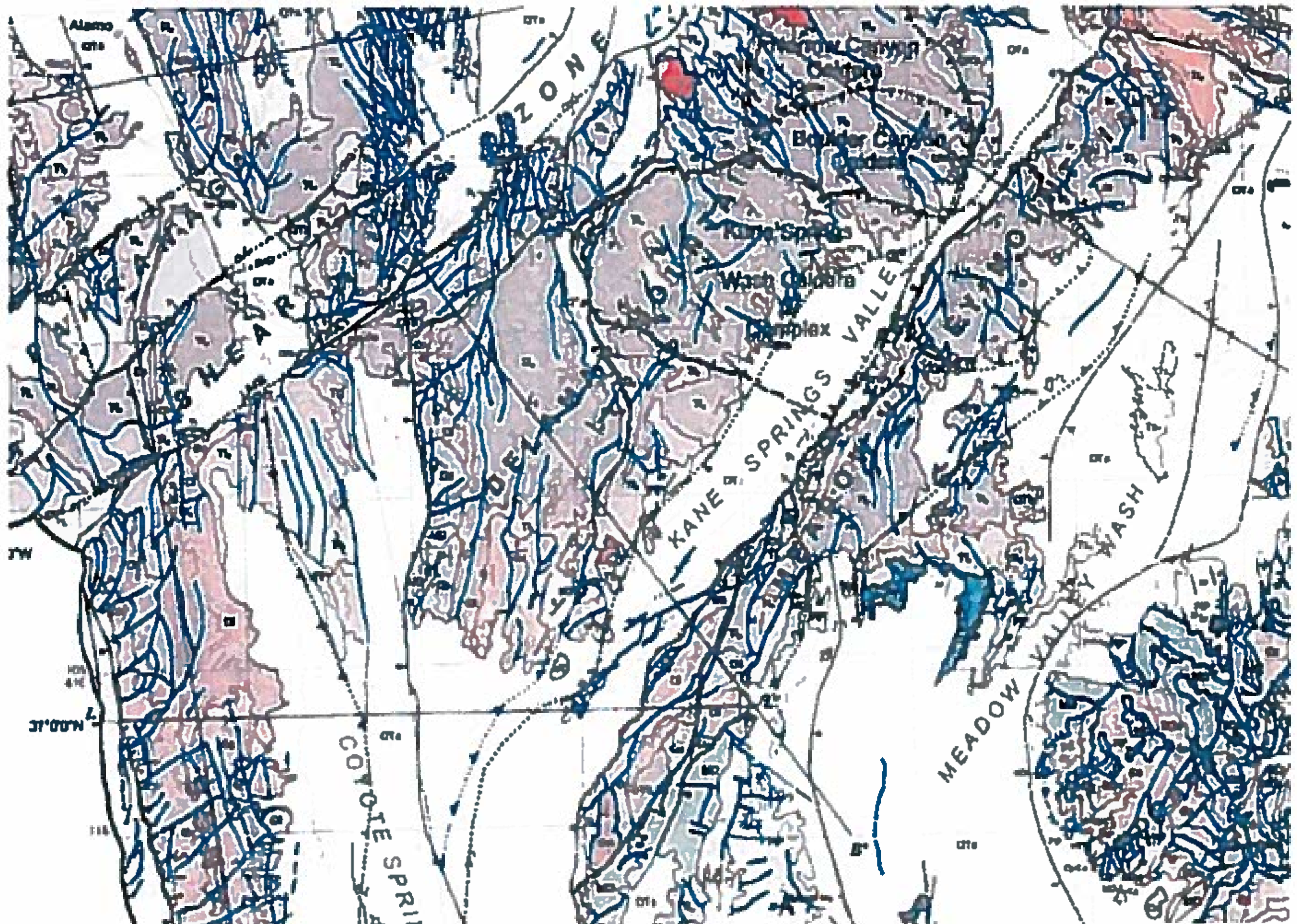


NPS Ex. No. 3

Figure 2
Horizontal Hydraulic Gradients Between Selected Well Points,
Coyote Springs Valley and Vicinity
6/18/2019

25

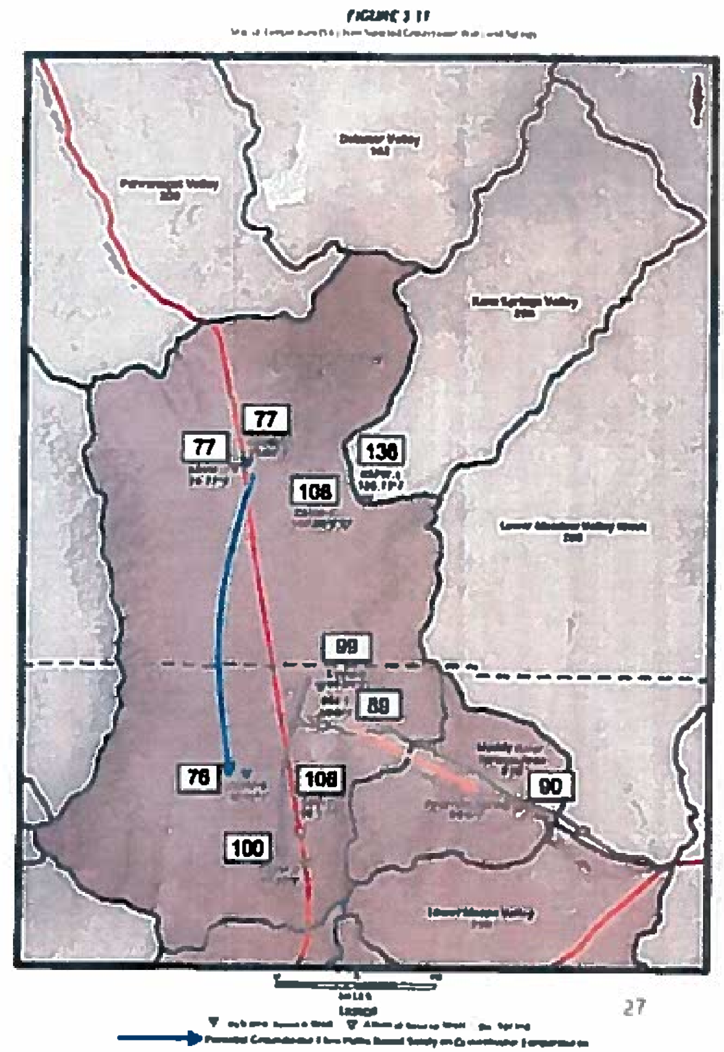
Geology near Kane Springs Valley



SNWA_EX_022

Kane Springs Valley (continued)

- KSV is tributary to CSV
  - Temperature tracer
    - Higher temperatures are present along the eastern side of CSV
    - The highest measured temperature is in KSPW-1, probably because of the proximity of calderas immediately north of the northeastern end of KSV
    - Because of the lateral heat transport from KSV, using water temperature and estimated vertical geothermal gradients to calculate depth of flow and spring plumbing is invalid
  - Water levels in KSV
    - ~3200 ft at head of valley
    - ~1880 ft at SW end of valley



LC-V_001

rainfall, recharge, evapotranspiration, and other conditions come together and correlate to pumping impacts that may occur at various locations within the LWRFS. Taken together with new evidence such as the Unnamed Normal Fault parallel to and west of the plunging Arrow Canyon Range in the center of CSV, identifying the separation and compartmentalization of pumping impacts on the west side of CSV from impacts on the east side of CSV is important to the State Engineer's analysis of what can be sustainably pumped and from what locations in CSV, as well as from other regions within the LWRFS.

B. *Kane Springs should continue to be excluded from the LWRFS*.

Reports submitted to the State Engineer include detailed scientific analysis and explanation regarding structural faults and other matters describing the reasons that KSV should continue to be excluded from the LWRFS.

For instance, and as described in the Vidler Report,[7] the high groundwater gradient between CSVM-4 and KMW-1 is due to the presence of a series of parallel faults. These parallel faults are a barrier against any impacts from MX-5 reaching KMW-1 and the KSV as a result of the hydraulic head that would be required to flow against the steep hydraulic gradient that exists north-to-south across those parallel faults. These parallel faults are a barrier to impacts but not to flow. The parallel faults impede the quantity of flow from north-to-south but do not prevent flow altogether due to the hydraulic gradient present. The boundary of the LWRFS unit should not be modified to include KSV due to, among other things, a lack of pumping impact between KSV and the southern CSV and the MRSA.

CSI and Vidler Water Company each retained Zonge International to conduct geophysical testing which further supports the exclusion of the KSV from the LWRFS.[8] Zonge's report supports the limited transmissivity and flow from KSV to lower CSV and the MRSA.

CSI disagrees with MVWD that the KSV should be included in the LWRFS. MVWD postulates that because KSV is a part of the interconnected system of carbonate rock aquifers that

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[7] IO 1303 Report issued by Vidler Water Company "Vidler" and Lincoln County Water District ("LCWD") and dated July 3, 2019 (the "Vidler Report").

[8] *See*, IO 1303 Report issued by CSI and dated July 3, 2019 ("CSI Report"), and Vidler Report.

BROWNSTEIN HYATT FARBER SCHRECK, LLP
100 North City Parkway
Suite 1600
Las Vegas, NV 89106
702.382.2101

make up the overall White River Flow System, KSV should be included.[9] MVWD also relies on observation of a 6-inch decline in water levels at KMW-1 during the Order 1169 test.[10] During Vidler's testimony this was shown to be unreliable data and CSI agrees with the explanation.

2. *The information obtained from the Order 1169 aquifer test, subsequent to the aquifer test, and Muddy River headwater spring flow as it relates to aquifer recovery since the completion of the aquifer test.*

A. *CSI's active participation in CSV basin matters.*

CSI has diligently participated in proceedings relating to the physical characteristics of and water availability within the Coyote Spring Basin, such as the Order 1169 test, including the proceedings' expansion to include designation of the LWRFS, matters leading up to IO 1303, and IO 1303 reports and the Hearing.

B. *CSI commissions new scientific study.*

As a result of the IO 1303 charge to provide new information and interpretation of Order 1169 test and subsequent pump records, CSI commissioned a study of the geophysical characteristics of the LWRFS within the CSV. Both CSI and Vidler engaged Zonge to conduct CSAMT geophysical surveys, to enhance their understanding of the faulting within the CSV and KSV region of the LWRFS that had previously been identified in the Rowley Report.[11]

While many others have postulated as to how Order 1169 test data might infer the physical characteristics and communication among the separate basins composing the LWRFS, CSI and Vidler were the only parties that invested in additional study of these issues. The data obtained through the Zonge 2019 CSAMT surveys provides objective scientific evidence required for an accurate interpretation of Order 1169 test data and groundwater level information gathered since the conclusion of the Test. Specifically, the CSAMT surveys corroborate the existence of

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[9] IO 1303 Report dated July 1, 2019 submitted by Moapa Valley Water District and Glorieta GeoScience Inc. ("MVVWD Report").
[10] MVWD Report, page 1.
[11] CSI Hearing Exhibit #14. Rowley, P.D., Dixon, G.L., Mankinen, E.A., Pari, K.T., McPhee D.K., et al., 2017. Geology and geophysics of Spring, Cave, Dry Lake, and Delamar valleys, White Pine and Lincoln Counties and adjacent areas, Nevada and Utah: The geologic framework of regional groundwater flow systems. Nevada Bureau of Mines and Geology Report 56.

All of the new and existing data provide a better understanding of the groundwater flow system in KSV. [LC-V 001, July 3, 2019 Report Submittal at 2-1].

A. <u>No Response in CSVM-1 and KMV-1 Groundwater Elevation Data To Order 1169 Pumping</u>

The groundwater elevations in monitor wells CSVM-4 and KMW-1 were not responsive to the Order 1169 Aquifer Test, but were responsive to local climatic events. [LC-V 001, July 3, 2019 Report Submittal at 3-3 and 3-4]. There was no response in well CSVM-4 to the cessation in MX-5 pumping during the Order 1169 Aquifer Test - - not once but twice. [9-30-19 Tr. 1298:2-5, 1298:7-8 (Umstot Testimony); LC-V Umstot Demonstrative Exhibit Slide 7]. The MX-5 well went through two periods of time where it stopped pumping. [9-30-19 Tr. 1298:4-5 (Umstot Testimony)]. Further, "...if you compare the pumping signal to the hydrographs, you don't see any response to when MX-5 well stopped pumping." [9-30-19 Tr. 1298:2-4 (Umstot Testimony)]. There was no recovery signal seen and the water levels in well CSVM-4 continued to rise after the completion of the MX-5 pumping test. [9-30-19 Tr. 1298:9-17 (Umstot Testimony); LC-V Umstot Demonstrative Exhibit Slide 7]. Dr. Johnson testified "...that mid-test recovery is what is diagnostic and it's absent here." referring to wells in the southern [LWRFS] flow field. [9-26-19 Tr. 743:5-15 (Johnson Testimony)]. Dr. Johnson also stated that "...there's no mid-test recovery from that 2012, 5-month shutdown." referring to both monitor wells KMW-1 and CSVM-4. [9-26-19 Tr. 743:16-19 (Johnson Testimony)].

Referring to the hydrograph for monitor well CSVM-4: "But it's very clear during the period of recovery that you don't have a response to the MX-5 [cessation of pumping]. So I think that's very diagnostic that this well is not connected to pumping of the MX-5 location." [9-30-19 Tr. 1298:20-24 (Umstot Testimony)]. For the monitor well located at the mouth of KSV, KMW-1 "You don't see any recovery responses in KMW-1.... But you can definitely see because a lack of recovery signal that the MX-5 is not connected to the KMW-1 well location." [0-30-19 Tr. 1299:11, 1299:13-15 (Umstot Testimony)]. Furthermore, regarding the seasonal pumping patterns, Mr. Umstot testified "You don't see that seasonal pattern from the carbonate wells pumping before the MX-5 test began." [9-30-19 Tr. 1301:1-3 (Umstot Testimony)].

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

In comparison, there is a difference in response in the water levels in several other wells after the MX-5 well was shut off at the end of the Order 1169 Aquifer Test, meaning that these wells show a recovery response or an identifiable rise in water levels at the end of the MX-5 test. [9-30-19 Tr. 1300:5-22 (Umstot Testimony); LC-V Umstot Demonstrative Exhibit Slides 11, 12, and 13]. Several wells in the vicinity of MX-5, the pumping well, showed a recovery response by rising water levels in response to the end of the Order 1169 Aquifer Test. Other wells further to the north in CSV showed no response to pumping in the "...vicinity of CE-VF-1 or CE-VF-2 and areas to the north." [9-30-19 Tr. 1301:24-1302:10 (Umstot Testimony); LC-V Umstot Demonstrative Exhibit Slide 15].

In summary Mr. Umstot concluded "...there's too much error in the data to be able to discern drawdown response from the MX-5 test [represented by water level data from well MX-4] and to determine that there's a hydraulic connection to the southern carbonate pumping in the LWRFS to the location of KMW-1 to CSVM-4 and that climate conditions would explain the general trends, the downward trends, that you do see in the groundwater elevations. So, I don't see any evidence, hydraulic connection, to southern LWRFS." [9-30-19 Tr. 1318:7-15 (Umstot Testimony)].

ALLISON MacKENZIE, LTD.
402 North Division Street, P.O. Box 646, Carson City, NV 89702
Telephone: (775) 687-0202 Fax: (775) 882-7918
E-Mail Address: law@allisonmackenzie.com

B. Climate Affects And Impact On Groundwater Elevations In The LWRFS

During the Order 1169 Aquifer Test, southern Nevada was experiencing drought conditions as documented by the National Oceanic and Atmospheric Administration (NOAA), publisher of the Palmer drought data. [9-30-19 Tr. 1293:6-13 (Umstot Testimony)]. Based on this data "There was a general increase in drought conditions that would be expected to cause the decline in groundwater elevation [s in wells in CSV].[1] So, if you look at the...one-year period, before the MX-5 pumping began, there were drought conditions about 42 percent of the time. And if you look at the period when the 1169 aquifer test took place and the additional time the MX-5 pumped beyond that into April 2013, drought occurred 82 percent of the time. So you had drought conditions occurring twice as often during the test as you had occurring in the year just before the test started." [9-30-19 Tr. 1295:5-16 (Umstot Testimony); LC-V Umstot Demonstrative Exhibit Slide 4]. This was also noted by the City of North Las Vegas "...[the] Climate Drought Severity Index for climate zone three, which is to the north, the northern part of the

[1] The text in brackets within quoted testimony represents explanatory text that was added to make the testimony clearer or to insert a word that was either left out or misspelled by the court reporter.

United States Department of the Interior

OFFICE OF THE SOLICITOR
Pacific Southwest Region
San Francisco Field Office
333 Bush Street, Suite 775
San Francisco, CA 94104

IN REPLY REFER TO:

December 2, 2019

Tim Wilson, P.E., Acting State Engineer
Nevada Division of Water Resources
901 S. Stewart Street, Suite 2002
Carson City, Nevada 89701-5250

Subject: Closing Statements in Response to Interim Order 1303

Dear Mr. Wilson:

On behalf of the National Park Service (NPS), and at the invitation extended by Ms. Micheline Fairbank on the last day of the Interim Order 1303 administrative hearing, I am submitting the NPS' closing statements in response to Interim Order 1303. The closing statements provided are intended as a summation of the main "take home" issues and findings important to the NPS. We hope this summary is useful as your staff prepares to evaluate the considerable information that has been presented and formulate a final order related to the conjunctive management of surface water and groundwater resources in the Lower White River Flow System (LWRFS) administrative unit.

The NPS appreciates the opportunity to provide these closing statements to your office and to work with you and the other interested stakeholders to determine how best to manage these public resources. If you or your staff have any questions or need further information, please contact me (415-296-3381) at your convenience.

Sincerely,

Karen Glasgow
Field Solicitor
San Francisco Field Office
Office of the Solicitor
Department of the Interior

CLOSING STATEMENTS
INTERIM ORDER 1303 HEARING TESTIMONY

Prepared by the National Park Service in cooperation with Tetra Tech, Inc.

The National Park Service (NPS) appreciates the opportunity to participate in the Interim Order 1303 hearing process and to provide the Nevada State Engineer (NSE) and staff with some closing statements for final consideration. The closing statements provided below are intended to leave the NSE with a summation of the main "take home" issues and findings important to the NPS, as the NSE prepares to evaluate the considerable information that has been presented and formulate a final order related to the conjunctive management of surface water and groundwater resources in the Lower White River Flow System (LWRFS) administrative unit.

Inclusion of the Black Mountains Area within the LWRFS Geographic Boundary.

The NPS is the only stakeholder holder who has requested that all of the Black Mountains Area basin be included in the geographic boundary of the LWRFS administrative unit being considered by the NSE. Based on the information contained in the NPS reports that were submitted to the NSE, as well as testimony presented by Dr. Richard Waddell at the hearing, the NPS believes that there is sufficient scientific evidence to conclude that a considerable portion of the flow issuing from Rogers Spring, Blue Point Spring and several other springs in the same vicinity is derived from carbonate-rock aquifer groundwater moving to the east-southeast beneath Garnet Valley, California Wash and the Black Mountains Area. This evidence includes:

- *Favorable geologic conditions exist allowing for carbonate groundwater flow beneath the Muddy Mountains.* Although the Muddy Mountain thrust fault superposes permeable Paleozoic carbonate rocks in the upper plate over less permeable Mesozoic rocks in the lower plate, the overprinting of the thrust fault by Cenozoic faults in certain areas provides linkage between rocks in the upper and lower plates, thereby allowing for some groundwater flow across the thrust fault in both the upper and lower plates. One area where this linkage likely has been created by Cenozoic faulting is the upper plate area extending from the west side of the Muddy Mountains to the Rogers Spring and Blue Point Spring area on the east side of the Muddy Mountains, which is overprinted by the Arrowhead Fault and other smaller faults.
- *Spring chemistry and isotopic composition can be explained by water mixing and rock-water reactions along the pathways.* The groundwater discharging from Rogers Spring and Blue Point Spring has a stable isotopic signature that suggests a substantial contribution from the carbonate aquifer. Geochemical modeling indicates that the stable isotopic composition of these springs requires the mixing of the lighter isotopic carbonate aquifer groundwater with heavier isotopic local recharge water. The higher content of dissolved solids and major ions at Rogers Spring and Blue Point Spring likely is attributable to dissolution of evaporite minerals as groundwater flows through the Mesozoic rocks, Tertiary volcanic rocks, and/or Tertiary basin-fill sediments present in the Muddy Mountains.

- *Favorable hydraulic head conditions allow for carbonate groundwater flow beneath the Muddy Mountains.* Recent potentiometric surface mapping of the upper carbonate-rock aquifer in southern Nevada indicates an east-southeast flow direction through Garnet Valley, California Wash and the Black Mountains Area toward the NPS' springs. This recent groundwater level data also indicates the presence of a significant head differential (100 to 190 feet) that is sufficient to sustain groundwater flow beneath the Muddy Mountains area.

We would like to address an observation that was made by Mr. Jon Benedict of the NSE's staff during cross examination of Dr. Waddell that groundwater temperatures in several of the carbonate aquifer wells in Garnet Valley are cooler than the water temperatures measured at Rogers Spring and Blue Point Spring (approximately 30° to 31° C), suggesting that the Garnet Valley-California Wash pathway may not be the source of water to these springs. At that time, Dr. Waddell did not have readily available temperature data to be able to make an informed reply. Subsequent examination of temperature data, which is contained in Table 1 of Appendix A of the NPS' July 3, 2019 data report, indicates that there are at least two (2) existing wells (RW-1 and G.P. Apex) in Garnet Valley, and three (3) other periphery wells in western California Wash (ECP-1 & ECP-2) and western Black Mountains Area (EBM-4), respectively, with measured groundwater temperatures similar to these two springs. Therefore, this pathway cannot be discounted as a primary source of water to Rogers Spring and Blue Point Spring, based solely on small temperature differences in a few wells.

Another factor that should be considered in explaining water temperature differences between these springs and some of the groundwater wells in Garnet Valley and California Wash relates to the potential warming of the groundwater from a nearby Tertiary volcanic center located on the north shore of Lake Mead, south of the Rogers Spring area. Similar to the volcanic caldera complexes in Kane Springs Valley that are believed to provide a remnant heat source to warm the groundwater temperature (57° C) observed in well KMW-1, these Tertiary volcanic rocks may be providing a remnant heat source to groundwater flowing toward Rogers Spring and Blue Point Spring, thus warming water temperatures before discharging at the surface. This instance of remnant heating is believed to be similar to the case of Tertiary volcanic centers located further south in the Black Canyon area below Hoover Dam, which are likely responsible for several hot springs in the canyon, where water temperatures ranging from 36° to 56° C have been measured.

Some of the other participating stakeholders (SNWA and NV Energy) provided supporting statements in their reports and/or testimony that some amount of carbonate groundwater in the LWRFS bypasses the Muddy River Springs Area (MRSA) and flows toward Lake Mead. Although these parties did not endorse the incorporation of the rest of the Black Mountains Area into the LWRFS, NV Energy's expert (Mr. Richard Felling) raised important questions that were never answered about how the partial exclusion of a hydrographic area (such as the Black Mountains Area) from the LWRFS would be managed by the NSE. Specifically, would the unincorporated (weakly connected) portion of a hydrographic basin become a new (or reconstructed) basin with a revised perennial yield?

In conclusion, there is a hydraulic connection between Rogers Spring and Blue Point Spring, and the carbonate aquifer beneath California Wash and Garnet Valley, and thus with the carbonate aquifer in up-gradient areas. The NPS recognizes these spring areas are weakly connected to up-gradient portions of the LWRFS due to the lower permeability of the intervening geology in the Muddy Mountains area. Even though this hydraulic connection is weaker than other areas of the LWRFS, the NPS believes it is necessary to incorporate the rest of the Black Mountains Area basin into the boundary of the LWRFS for purposes of protecting the NPS' state appropriative and Federal reserved water rights at these springs. It is worth reiterating that the NPS has a state appropriative water right at Rogers Spring with a priority date of February 16, 1937, which is senior to all other groundwater rights in the currently defined LWRFS, with the exception of the rights held by Bedroc Limited, LLC in Coyote Spring Valley. By excluding the rest of the Black Mountains Area from the LWRFS, the NPS is concerned that if our springs are adversely affected by up-gradient junior groundwater users in the LWRFS basins, the NPS' ability to claim injury will be substantially reduced if the NSE does not recognize this hydraulic connectedness.

In order to increase the potential success of future conjunctive water resources management , the NPS recommends that the NSE include all existing hydrographic areas within the final LWRFS administrative unit where a hydraulic interconnection (strong to weak) between surface water and groundwater can be reasonably demonstrated within any portion of the hydrographic areas being considered. This approach will allow appropriate management decisions to be made for designated sub-regions with differences in hydraulic connectedness that are contained within the final LWRFS boundary, thereby eliminating the need to create new hydrographic areas from the remnants of areas that were not fully incorporated into the final LWRFS administrative unit. As more information becomes available on the different degrees of hydraulic connectedness (or lack thereof) within a given hydrographic area, these designated sub-region boundaries can be modified, and appropriate management conditions and approaches can be applied to these different sub-regions accordingly.

Inclusion of Kane Springs Valley within the LWRFS Geographic Boundary.

It is noteworthy that in the data reports and rebuttal reports submitted to the NSE, Kane Springs Valley was recommended most often for inclusion into the LWRFS, with recommendations provided by the NPS, U.S Fish & Wildlife Service (USFWS), Moapa Valley Water District (MVWD), the Center for Biological Diversity (CBD), the Southern Nevada Water Authority (SNWA) and Nevada Cogeneration Associates (NCA). In all cases, the prime reason stated for including this basin within the LWRFS was the hydrologic connection between this basin and Coyote Spring Valley, which was established by the distinct and unambiguous pumping response that is seen in the hydrographs for wells CSVM-4 and KMW-1 during the Order 1169 pumping test period.

Although Lincoln County/Vidler collected useful geophysical data to define subsurface geologic structures such as the high resistivity carbonate block near the mouth of Kane Springs Valley, their contention that this block acts as a significant impediment to groundwater flow in this region should not be accepted at face value alone without additional corroborating evidence. The geophysical method that was used detects changes in the electrical conductivity of rocks, but it does not provide a measure of the hydrologic properties of the rocks. Therefore, it should not be assumed that high resistivity values necessarily equate to intra-fault blocks having low permeability without adequate aquifer testing and evaluation of hydraulic gradients across the fault blocks to substantiate the resistivity data. The NPS believes the attenuated Order 1169 pumping test response expressed in the hydrographs for wells CSVM-4 and KMW-1 proves that this carbonate block and associated faults do not significantly impede groundwater flow in this area. Although the NPS and others testified that the aquifer transmissivity appears to be lower in this area than throughout much of the LWRFS, the hydrologic evidence conclusively establishes that this area is hydrologically connected to the LWRFS. Additionally, the other lines of evidence proffered by Lincoln County/Vidler, such as differences in water levels, water chemistry and water temperatures in the area, when viewed in proper context, tend to support the hydrologic connection of Kane Springs Valley with the LWRFS.

Finally, of particular significance was the testimony of several former employees of the Nevada State Engineer's office, which strongly support the incorporation of Kane Springs Valley into the LWRFS. Former State Engineer, Hugh Ricci and former Deputy State Engineer, Robert Coache, who were directly involved in establishing Order 1169 and permitting Lincoln County/Vidler's existing water rights in Kane Spring Valley, both testified that in hindsight, if they had the current hydrogeological data available to them when deciding which basins to include under Order 1169, they would have included Kane Springs Valley under the order. Similarly, former Deputy Administrator and Chief of the Hydrology Division, Richard Felling, after initially taking the position in NV Energy's rebuttal report that Kane Springs Valley should not be included in the LWRFS joint management area, subsequently testified that he found that the scientific and technical evidence presented in the reports and at the hearing was so compelling that he was convinced of the need to include Kane Springs Valley into the joint management area.

Groundwater Level Trends in the LWRFS.

Within the carbonate aquifer in the LWRFS basins, there has been a trend of declining water levels observed for at least two decades. Many hydrologists have attributed this decline to drought conditions. However, this interpretation does not take into account that water levels have been rising in many other areas in southern Nevada. The NPS and USFWS presented numerous examples of groundwater hydrographs in their rebuttal reports that clearly show that water levels have been rising for several decades in southern Nevada in areas where groundwater production is absent or minor. The fact that there are numerous examples of rising groundwater levels in neighboring basins to the west, south, east and north of the current LWRFS basins suggests that the LWRFS basins also would have been affected by rising groundwater levels during the same period of time reflected in the water level records in these valleys. With the exception of one objection to the NPS' presentation of this information during the hearing, it's noteworthy that no other stakeholder testimony was presented to refute that rising groundwater levels have been occurring throughout much of southern Nevada for several decades.

In the LWRFS basins, where groundwater pumping has been occurring throughout much of this same period, groundwater levels have been on a decline. This decline only can be explained by the pumping occurring in the LWRFS basins and not by current drought conditions that may or may not be occurring. The groundwater pumping in the LWRFS has been of sufficient magnitude to overwhelm the rising water level response that likely would have been widely observable in the LWRFS basins in the absence of any pumping. Even though a significant reduction in alluvial pumping in the MRSA since 2015 has resulted in noticeable recovery of groundwater levels and spring discharge in the MRSA, continued pumping at current levels still appears to be limiting (or extending the period to) full recovery from the pumping effects observed from the Order 1169 pumping test.

If the amount of recent pumping has been sufficient to overwhelm the rising water level trend and create the observed water level declines, then there are more serious management implications ahead when the current period of wetter conditions reverts to a period of drier conditions. If the recent amount of pumping is allowed to continue, then this declining trend will be exacerbated not only for groundwater levels, but also for spring and river discharges in the MRSA and elsewhere in the LWRFS during an extended period of drier conditions. Conjunctive management in the LWRFS should factor in long-term monitoring of groundwater levels in several surrounding basins that are distant from pumping in the LWRFS basins to gauge the real-time climatic response being transmitted through the aquifers in southern Nevada. Such information could then be used to adjust the amounts of permissible groundwater pumping in order to prevent injurious declines in groundwater levels, and spring and river discharges.

The Relationship of Pumping Location on the Capture of Spring and River Flows.

The NPS was the only stakeholder to provide a robust qualitative evaluation of the possible effects on spring and river flows from the redistribution of groundwater pumping within and between the carbonate and alluvial aquifers in the LWRFS. This evaluation was achieved using the current version of the Tetra Tech groundwater flow model and the same total annual pumping rate that occurred during the Order 1169 pumping test period for each of the simulations conducted. The simulation results indicated that pumping at approximately 14,535 afy under several different pumping configurations caused similar declines in discharge in the MRSA area over time, thus indicating to the NPS that the annual sustainable quantity of groundwater available is less than 14,500 afy. Similar modeling simulations conducted at lower pumping rates, coupled with long-term water level and discharge monitoring, may help to ascertain what this annual sustainable quantity may be.

The simulations indicated that there would be short-term benefit on the flows of the Muddy River Springs and the Muddy River from moving greater amounts of alluvial and/or carbonate withdrawals from the northern basins into the southern basins. The similarity in the results from all three simulations over time appears to refute some stakeholder contentions that redistributing pumping further away from the MRSA would permit more groundwater to be withdrawn without adversely affecting senior rights. The simulations also revealed that moving greater amounts of pumping closer to the NPS' springs would raise the likelihood of adverse impacts to these springs over time.

Although it has been suggested that decreasing pumping from the Muddy River alluvium would reduce the capture of the surface flow and result in having more surface water available to satisfy downstream decreed water rights, the simulations indicate that this increase is not enough to fully offset the reduction in surface flow that is predicted in later years. Moving greater amounts of pumping further away from the MRSA and from the alluvial aquifer to the carbonate aquifer delays impacts by a few decades, but does not eliminate subsequent injurious effects. Ultimately, the degree of hydraulic connectedness will be a primary factor in determining whether relocating pumping will be effective in minimizing injurious effects to senior surface water rights.

IN THE OFFICE OF THE STATE ENGINEER
OF THE STATE OF NEVADA

IN THE MATTER OF THE ADMINISTRATION AND MANAGEMENT OF THE LOWER WHITE RIVER FLOW SYSTEM WITHIN COYOTE SPRING VALLEY HYDROGRAPHIC BASIN (210), A PORTION OF BLACK MOUNTAINS AREA HYDROGRAPHIC BASIN (215), GARNET VALLEY HYDROGRAPHIC BASIN (216), HIDDEN VALLEY HYDROGRAPHIC BASIN (217), CALIFORNIA WASH HYDROGRAPHIC BASIN (218), AND MUDDY RIVER SPRINGS AREA (AKA UPPER MOAPA VALLEY) HYDROGRAPHIC BASIN (219).

Post-hearing brief of Nevada Cogeneration Associates Nos. 1 and 2 pertaining to Amended Notice of Hearing Interim Order #1303 following the hearing conducted September 23, 2019, through October 4, 2019, before the Nevada State Engineer

Nevada Cogeneration Associates Nos. 1 and 2 (collectively "NCA," and separately "NCA 1" and "NCA 2"), provides the following post-hearing brief for consideration by the Nevada State Engineer following the completion of the Phase 1 hearings in the above referenced matter involving the Lower White River Flow System ("LWRFS"), which hearings were conducted over a two-week period from September 23, 2019, through October 4, 2019. This brief is presented on behalf of NCA by counsel for NCA, Alex J. Flangas of the firm of Kaempfer Crowell, with the assistance of Mr. Jason M. Dixon, P.E. (Dixon Hydrologic, PLLC), Mr. Robert A. Coache, P.E., and Mr. Hugh Ricci, P.E. both of whom are working in conjunction with Mr. Dixon through Dixon Hydrologic PLLC.

Background: Interim Order #1303 acknowledges in the first paragraph on page 1 that the "purpose of this Interim Order *is to designate a multi-basin area known to share a close hydrologic connection as a joint administrative unit,* which shall be known as the Lower White River Flow System." The third full paragraph on page 1 of Interim Order #1303 then expressly ended up defining the scope of the Phase 1 hearings and their purpose:

> ... during the interim period that this Order is in effect, holders of existing rights and other interested parties are encouraged to submit reports to the Nevada Division of Water Resources (NDWR) analyzing the data available *regarding sustainable groundwater development in the LWRFS*, the *geographic extent of the LWRFS*, and considerations relating to groundwater pumping *within the LWRFS* and *its effects on the fully decreed Muddy River*. This collected and analyzed data is an essential step to optimize the beneficial use of the available water supply in the LWRFS.

(Emphasis added.) The concluding paragraphs of Interim Order #1303, at pages 13 and 14, further clarified the points to be included in the "reports," stating:

Reports filed with the Office of the State Engineer should address the following matters:

a. The geographic boundary of the hydrologically connected groundwater and surface water systems comprising the Lower White River Flow System;
b. The information obtained from the Order 1169 aquifer test and Muddy River headwater spring flow as it relates to aquifer recovery since the completion of the aquifer test;
c. The long-term annual quantity of groundwater that may be pumped from the Lower White River Flow System, including the relationships between the location of pumping on discharge to the Muddy River Springs, and the capture of Muddy River flow;
d. The effects of movement of water rights between alluvial wells and carbonate wells on deliveries of senior decreed rights to the Muddy River; and
e. Any other matter believed to be relevant to the State Engineer's analysis.

The first four of those points – (a) through (d) -- became the focus *and the limitation* of the Phase 1 hearings, as outlined in the State's Amended Notice of Hearing issued August 26, 2019, and as reiterated several times by Deputy Administrator Micheline Fairbank during the hearing.

During the hearing, NCA focused its presentation on essentially two of the four elements that were at issue: items (a) the geographic boundary of the LWRFS; and item (c) the long-term annual quantity of groundwater (*sustainable groundwater development)* that may be pumped from the LWRFS. Some discussion was had on the other points, but this brief will focus primarily on those two elements, as they are the main post-hearing points to which NCA will direct the State Engineer with some focus on testimony and evidence that was presented to clarify those points – especially as they affect NCA's interests in this proceeding.

1. **The Evidence and Analysis presented to the State Engineer strongly suggests that the Geographic Boundary of the LWRFS may need to be adjusted in two areas:**
    a. **to *exclude* the NCA production wells in the Black Mountains Area, and**
    b. **to *include* the Kane Springs Valley Basin in the LWRFS.**

A. <u>Evidence supports excluding NCA's production wells from the LWRFS.</u>

(i) <u>SNWA's experts agree that "the Black Mountain area production wells probably should not be within the Lower White River Flow System boundary."</u>

Significantly, a primary source of initial analysis for the conclusion that the NCA production wells are likely *outside* the boundary of the LWRFS came not directly from NCA's experts, but rather from other experts who independently reached the conclusion that NCA's production wells did not appear to be connected to the LWRFS system. The significance of this independent determination should not be minimized.

Southern Nevada Water Authority ("SNWA") presented an August 13, 2019, rebuttal report entitled, "Response to Stakeholder Reports Submitted to the Nevada State Engineer with Regards to Interim Order 1303."[1] The authors of that report emphasize that carbonate wells *inside* the LWRFS demonstrate impacts on wells near the Muddy River Springs Area ("MRSA"), whereas other wells appear unconnected suggesting the boundary in that area is likely "off."

The SNWA authors initially comment at page 2 of their Rebuttal Report that the data they have observed, "do not support interpretations of hydraulically-isolated flow paths, capture zones, or structural blocks *within the LWRFS.*" *(Emphasis added here.)* Rather, say the authors, assertions that blocks of carbonate rock "within" the LWRFS can be hydrologically isolated is erroneous, as is demonstrated by the significant evidence of responses shown through their multiple linear regression ("MLR") analysis of well response data. For most locations, that data demonstrates a close connection between the pumping from the various basins and a particular well located near the MSRA that was used for the analysis – that being EH-4.

As was explained by both SNWA and Jay Dixon during NCA's testimony, that MLR analysis partitioned the EH-4 hydrograph into several hydrographs of responses to groundwater production from each of the five LWRFS basins. It demonstrated close connections at several locations; indeed, for the period 2006 through 2019, the hydrographs for CSVM-2 and CSVM-1 (Coyote Springs Valley), UMVM-1 (Muddy River Springs Area), and GV-1 (Garnet Valley) all virtually mirror the hydrograph for EH-4 (Muddy River Springs Area).[2] Notably, however, that same MLR analysis produced a significantly *different* result when it was applied to the production wells in the Black Mountains Area ("BMA").

SNWA's Rebuttal Report discusses the MLR at pages 15-20 and specifically recognizes at p.17 that a strong correlation applies between EH-4 in the MSRA and a monitoring well located in the Black Mountains Area, BM-DL-2, that showed an extremely high correlation value (R^2 of 0.95), but no such correlation was found to exist in connection with the NCA wells. The authors concluded, "[t]his indicates that while well BM-DL-2 is undoubtedly within the carbonate aquifer of the LWRFS, ***the current production wells (Figure 2-8) are probably not.***" (Emphasis added.) At the hearing, when Ms. Warda Drici, the lead hydrologist who co-authored the SNWA Rebuttal Report, was asked, "[n]ow, that means 'are probably not' within the

[1] Burns, A., Drici, W., and Marshall, Zl, 2019, Response to Stakeholder Reports Submitted to the Nevada State Engineer with Regards to Interim Order 1303: Southern Nevada Water Authority, Las Vegas, Nevada. (Hereinafter, "SNWA Rebuttal Report")
[2] *See Fig. 2-4*, SNWA Reb. Report at p. 8.

carbonate aquifer of the LWRFS; isn't that correct? Isn't that what that means?," Ms. Drici answered in the affirmative, [y]es, it is."[3] Importantly, Mr. Andrew G. Burns, who co-authored the SNWA Rebuttal Report with Ms. Drici, confirmed that he concurred in the analysis, as did Jim Rogers at SNWA.[4]

In her direct testimony during the hearing, at pages 905 and 906, Ms. Drici was even more specific about the "boundary" of the LWRFS and the production wells in the Black Mountains Area. Referencing slide No. 17 in SNWA's presentation which contained Figure A-3, Ms. Drici discussed the BMA in particular and explained the MLR (multiple liner regression) analysis, stating as follows:

> So when we conduct this analysis and we extract the responses to the individual basin groundwater production from the carbonate aquifer, and if you look at the first graph there, the slide [No. 17, Fig. A-3], that would be the Black Mountain area. And it appears, from this analysis, that the groundwater production from Black Mountain is not really affecting water levels at EH-4.
>
> ***So it's an indication that, perhaps, the boundary down there might be a little bit off because the boundary was defined based on the observation well, the VMDL-2 [sic][5], I believe.***
>
> ***And*** VMDL-2 did respond to the MX-5 pumping during the Order 1169 aquifer test, and these wells, the production wells are just a little bit south of there. ***So this is an indication that, perhaps, the boundary might be a little bit off.*** (Emphasis added.)[6]

Notably, Fig. A-3 from SNWA's presentation (depicting the BMA production pumping wells) shows a completely horizontal line for the water levels in EH-4 throughout the entire time that SNWA tracked data from 1996 through 2018 – which is significantly different than what was shown in MLR results for California Wash, Coyote Springs Valley, and Garnet Valley (Figures A-4, A-5, and A-6 – slides 17 and 18 of SNWA presentation).

Finally, Ms. Drici confirmed that a part of her conclusion in this regard was based upon the 'P' values calculated for the responses observed from the various wells and pumping in the different basins, including in the BMA. In response to cross examination by Ms. Karen Peterson,

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[3] Transcript of Hearings, Vol. V, p.m. session, Sept. 27, 2019, p.1019, lines 13-21. Ms. Drici then clarified her report statement somewhat, stating that the word "probably" simply meant that she could not say, "with hundred percent certainty that it is true. I mean to demonstrate things like this, you would need to look at it from different angles. So, this analysis indicates that maybe they are not in there...." *Id.* At p. 1019, lines 21-24, and p. 1020, lines 1-4.

[4] Trans., Vol. V, p.m. session, Sept. 27, 2019, p. 1020, lines 13-14, p. 2021 lines 1-3 (Mr. Burns referenced Mr. Rogers, specifically, as having concurred in the analysis along with he and Ms. Drici.).

[5] The Ct. Reporter heard "VMDL-2," but this should be "BM-DL-2."

[6] Trans., Vol. V, a.m. session, Sept. 27, 2019, p. 905, lines 11-24, p. 906, line 1.

the attorney for Lincoln/Vidler, Ms. Drici discussed the differing P values for the BMA, and again confirmed that, "we already showed the results that we think that Black Mountain area production wells ***probably should not be within the Lower White River Flow System boundary***."[7]

In summary, the experts for SNWA uniformly suggested in both SNWA's Rebuttal Report and in their direct testimony at the hearing that the ***boundary*** in the Black Mountains Area was questionable by including the NCA production wells, because those wells ***probably should not be within the LWRFS***.[8]

(ii) NCA's Experts' review and analysis of the data and conclusions of SNWA also supports removal of the NCA wells from the BMA, as well as a relocation of the Boundary in the BMA.

The data relied upon and the conclusions reached by SNWA's experts were analyzed by NCA's own experts, and they too concluded that NCA's wells reacted noticeably differently than the other monitoring well only 3,600 feet away, BM-DL-2. At the hearing Jay Dixon, the lead hydrologist on NCA's team, discussing slides Nos. 7 and 8 of the NCA presentation, testified that the NCA production wells were intentionally sited by Marty Mifflin in the early 1990s (acting as a consultant to the owners of NCA) because "[h]e was aware of a series of strike slip faults and you can see coming off the east side of the Dry Lake Range."[9] As Mr. Dixon explained:

> Again, still staying on this recommendation regarding this boundary and focusing on the geologic section GG that I pointed out in the previous slide. The NCA wells, as you can see, are put right in the middle of those strike-slip faults. That's where Marty purposely sited them.

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[7] Trans. Vol. V, a.m. session, Sept. 27, 2019, p. 984, lines 17-20.

[8] Curiously, despite the repeated testimony of Ms. Drici and Mr. Burns testimony that he and Jim Rogers of SNWA had reviewed and supported the conclusions reached in SNWA's Reb. Report regarding the production wells not appearing to affect the Muddy Springs Area or being part of the LWRFS, when asked by the State Engineer whether SNWA still supported the State Engineer's recommendations on the LWRFS "boundary" even with regard to the Black Mountains Area Mr. Burns stated he would still support the recommendation that the boundary "was appropriate." (*See* Trans. Vol. V, p.m. session, Sept. 27, 2019, p. 1051, lines 1-6.) Notably, however, Mr. Burns quickly referenced Ms. Colby Pellegrino's position, stating, "[b]ut, what I'm also saying or what we're also saying is that it's, as Colby mentioned this morning, if there is prospects of moving production from one part of an adjacent basin to the boundary of LWRFS, and particularly this boundary *which I think a little uncertain*, we think applications to change those points of diversion in that regard should be scrutinized." (*Id.* at lines 6-14).

The undersigned would suggest that Mr. Burn's reticence to directly respond to the State Engineer has more to do with the fact that SNWA did not identify a specific line or point where the boundary should be moved in the Black Mountains Area, and thus did not want to wade in without more information. The conclusion those experts drew, however, is unmistakable: the **LWRFS boundary** should ***not*** include the NCA production wells, and since it currently does, it should probably be changed to exclude them because the boundary in that area is "a bit off."

[9] Trans. Vol. IX, Oct. 3, 2019, at p.1618, lines 4-23.

> And referring back to the larger question should the entire basin be included? As you continue to the east, you see a complete different map[ped] geology on this side. There is no apparent consistency in the geology on the other side of that Muddy Mountain thrust fault, at least relative to this pumping.[10]

Mr. Dixon further acknowledged that well EBM-3 "has a monitoring record that goes back to 1993 and its continuous,"[11] and Mr. Dixon explained that after hearing what SNWA had concluded and reviewing their P values and MLR analysis, he and his colleagues "did a little investigation, obviously, we spent a lot of time reviewing Marty Mifflin's work. He did a very good job of documenting what he saw when he was out there in the early nineties."[12] Mr. Dixon then described certain "high angle fractures," fractured limestone, and – importantly – confirmation that the wells were located *in the fault.*[13] Finally, he noted that "SNWA didn't look at it beyond what they have,"[14] but Mr. Dixon and his colleagues did, and they provided even more information for consideration by the State Engineer.

Finally, Mr. Dixon discussed the same P-values that Ms. Drici had briefly touched upon, and Mr. Dixon explained the significance of the difference that was demonstrated by the BMA production well, EBP-2 (as reported by EBM-3, its adjacent monitoring well), as compared to the monitoring well only 3,600 feet away, BM-DL-2. Both wells are approximately 30 miles from EH-4, yet BM-DL-2 correlates nearly 1 to 1 with EH-4, while the NCA well is statistically so far off on the correlation that it caused SNWA to question whether there was any connection whatsoever. Indeed, SNWA's Figure A-3 showed no influence from BMA pumping of production wells, which Mr. Dixon explained would be consistent with the vastly different P-values. However, Mr. Dixon did note that there was "noise" associated with the well data for EBM-3 (the NCA well), and noted that it would be helpful to have additional work done to analyze the data more thoroughly.[15]

Following the conclusion of the hearing, Mr. Dixon did precisely that – he analyzed the existing monitoring record back to 1993, and performed a more thorough review of information already in the State's record. Notably, nothing herein is added to the record that was made available to the Nevada State Engineer during the hearing, but instead is rather a more thorough review of the materials from the NCA Permit files that are part of the record, using the data

[10] Trans. Vol. IX, Oct. 3, 2019, at p. 1619, lines 3-13.
[11] *Id.* at p. 1619, line 24, p. 1620, line 1.
[12] *Id.* at p. 1620, lines 23-24, p. 1621, lines 1-2.
[13] *Id.* at p. 1621, lines 3-24, p. 1622, lines 1-2.
[14] *Id.* at p. 1622, lines 20-21.
[15] *Id.* at p. 1622, lines 21-22, p. 1625, lines 2-6.

provided therein and assessing exactly what was discussed at the hearing involving the Black Mountains Area and the differing effects noted from the production wells in that area as compared to nearly all the other wells reported upon and analyzed by SNWA and others. Mr. Dixon provided the following analysis, which is included as part of this closing brief:

BACKGROUND

The purpose of this Memorandum is to provide a summary of an additional review and analysis of regional carbonate groundwater level response and pumping in the Black Mountain Area (BMA) basin from the Nevada Cogeneration Associates (NCA) wells. The justification for this follow-up analysis was to further examine the possibility that pumping in the BMA from the NCA wells may have limited or no effect on observed spring flow and carbonate groundwater responses in the Muddy River Springs Area (MRSA) and therefore, could be managed outside of the proposed Lower White River Flow System (LWRFS) administrative unit. The data used for this work relied on existing information and reports at NDWR, with some of that data being filtered and used in support of the same (type of) analyses reported by NCA and others for the Order 1303 Hearing (hereinafter, the "Hearing").

ORDER 1303 – BMA PUMPING AND EFFECTS CONCLUSIONS

The Southern Nevada Water Authority (SNWA) provided detailed information on historical pumping, surface water flows and water levels within the proposed LWRFS in their initial report, SNWA (2019a)[16], including interpretations on the extent of correlation between groundwater levels in the LWRFS basins and MRSA responses (spring flow and carbonate groundwater levels). However, the report did not discuss the apparent lack of contributions from pumping in the BMA. The follow-up SNWA (rebuttal) report (SNWA, 2019b)[17] presented results of a multiple linear regression (MLR) analysis that partitioned the EH-4 hydrograph into several hydrographs of responses to groundwater production from each of the five (5) LWRFS basins. As shown in **Figure 1** attached to this Closing Brief, SNWA (2019b) demonstrated "*that groundwater production from the Black Mountains Area causes the least effect ....*" *See* SNWA (2019b) at p. 16. The analysis performed by SNWA as described in SNWA (2019b) concluded that production wells in the BMA are "probably not" within the proposed LWRFS. *See* SNWA (2019b) at p. 17. The same conclusions were reiterated by SNWA experts during the Order 1303 Hearing in Sept. – Oct. 2019.

FOLLOW-UP REVIEW OF NCA PUMPING AND GROUNDWATER LEVELS

During the Order 1303 Hearing, evidence was presented by SNWA and NCA experts that reiterated that carbonate groundwater levels in the BMA behaved differently than elsewhere in the LWRFS and pumping in the BMA appears to have little to no effect on spring flow and carbonate groundwater levels in the MRSA. However, these conclusions were repeatedly conditioned with uncertainty due to apparent differences in the responses to pumping based on carbonate groundwater observations at EBM-3 when compared to BM-DL-2 and EH-4. Some of this uncertainty was likely due to interference at EBM-3, a non-pumping observation well, from nearby pumping well EBP-2, which is located only 200 ft away (*see* **Map 1**, attached to this Closing Brief). As shown in **Map 1**, BM-DL-2 is located 2,660 ft northwest of the nearest NCA pumping wells (and approximately 3,600 feet from EMB-3). The data used by SNWA, NCA and other experts during the Hearing originated from records at NDWR made available via an online database. This data is reported to NDWR by various stakeholders in the LWRFS with ongoing monitoring and reporting obligations, which includes the years 1992 to 2017.

[16] Burns, A., Drici, W., Collins, C., and Watrus, J., 2019, Assessment of Lower White River Flow System Water Resource Conditions and Aquifer Response, Presentation to the Office of the Nevada State Engineer: Southern Nevada Water Authority, Las Vegas, Nevada.

[17] Burns, A., Drici, W., and Marshall, Zl, 2019, Response to Stakeholder Reports Submitted to the Nevada State Engineer with Regards to Interim Order 1303: Southern Nevada Water Authority, Las Vegas, Nevada.

In order to further investigate the relationship between BMA pumping and carbonate groundwater observations, a series of steps were taken as summarized below:

1. Extensive review of NCA pumping files at NDWR, which included hard-copy reports submitted by NCA to NDWR on a quarterly basis beginning in 1992 through 2017. Beginning in 2017 the reports were submitted in digital format (Excel spreadsheets). Each hard-copy report was manually digitized and converted and transferred into a digital format (Excel spreadsheet). These reports included monthly pumping and water level observations.

2. Groundwater level observations have been reported by NCA for three (3) wells (see **Map 1** for locations). Wells EGV-3 and EBM-4 were reported as pumping wells from December 1991 through June 2015. Beginning in September 2015, Wells EGV-3 and EBM-4 were replaced (as pumping wells) and converted to monitoring wells. Water level observations for these wells is sporadic and highly variable, depending when the levels were measured relative to pumping as shown in **Figure 2** (attached to this Closing Brief). The NCA reports filed at NDWR generally indicate whether the groundwater levels are taken when the production wells are on or off, but the amount of time between pump shut-in and water level measurements was never indicated.

3. Groundwater level observations have been reported by NCA for EBM-3 since 1993. The data from this well has the longest continuous record in the BMA as reported on the NDWR database. The database also includes eight (8) water level observation reported by the USGS, but the earliest record (August 1991) appears to have been taken directly from the Well Log (#46122). Even though well EBM-3 was used only for monitoring purposes, it is located only 200 ft away from NCA pumping well EBP-2. EBM-3 was no longer accessible for groundwater monitoring purposes after December 2017. As discussed by NCA during the Hearing, water levels measured at EBM-3 appear to vary by approximately 5 ft over short periods of time. This variability has been interpreted as dynamic influence from nearby pumping, particularly at EBP-2. The NCA reports filed at NDWR do not indicate (directly) the pumping status of nearby wells, and most importantly the status of EBP-2, when the EBM-3 water levels are measured.

4. EBM-3 groundwater level data was filtered such that only NCA water level observations made during months when EBP-2 registered no pumping were plotted over time. This data was also combined with USGS observations in the NDWR database for months when EBP-2 was not pumping. For this analysis, it was assumed that using only water level data reported during months with no pumping (from EBP-2) helped ensure that groundwater levels were more representative of actual background, or relative static aquifer conditions, at the well. As shown in **Figure 3** (attached to this Closing Brief), some variability in EBM-3 data still exists, but an interpretive (average) plot was added to provide a better, or more continuous, visual representation of observed trends within the time-series data points.

5. During the Hearing, NCA experts presented the results of a simple linear regression analysis for BM-DL-2 vs. EH-4 and EBM-3 vs. EH-4 (NCA hearing presentation Slide 16[18]). Results of the BM-DL-2 vs. EH-4 analysis indicated a high correlation with an R^2 value of 0.95, which matched the results presented by SNWA (2019a, b). The results of the EBM-3 vs. EH-4 correlation analysis indicated low correlation with a R^2 value of 0.52. However, as was noted during the Hearing, the data included several water level measurements that were the same value within the nearest 1-ft and measurements taken when nearby EBP-2 was being pumped or had recently pumped which are considered unrepresentative of actual (background) groundwater conditions at the EBM-3 well. **Figure 4** (attached to this Closing Brief) includes a revised regression plot for EBM-3 vs. EH-4 using only data reported by NCA and USGS during months when EBP-2 was not pumped.

[18] Dixon, J., Coache, R. and Ricci, H., October 3, 2019. Administrative Hearing in the Matter of Administration and Management of the Lower White River Flow System – Demonstrative Presentation in Support of Direct Testimony. Carson City, Nevada.

6. Additionally, the reports filed prior to and testimony provided during the Hearing did not examine water level data at BM-DL-1. As shown in Map 1, BM-DL-1 is located 2,176 ft east of BM-DL-2 and approximately 1,530 ft north of the northern-most NCA production well (EBM-5). As shown in **Figure 5** (attached to this Closing Brief), the hydrographs from BM-DL-1 and BM-DL-2 are shown in the same hydrograph plot to provide a simple visual comparison between groundwater levels in the two wells.

RESULTS OF FOLLOW-UP REVIEW

Using only data reported by NDWR, an additional review was performed to further investigate the relationship, if any, between NCA pumping in the BMA and water level responses in the regional carbonate aquifer *within the proposed LWRFS boundary*. No new analyses were performed as part of this follow-up review. Existing data was filtered as described herein and presented in **Figures 1** through **4**. A summary of the results of this follow-up review and limited analysis is listed below:

1. The SNWA (2019a, b) reports incorrectly reported the start of pumping (from NCA) in the BMA as being 1996. As shown in **Figure 3**, NCA pumping within the BMA actually began in July 1992.

2. Carbonate pumping in the BMA was 0 ac-ft in 1991, 479 ac-ft in 1992 and averaged 1,537 ac-ft from 1993 through 1997, ***yet the carbonate groundwater levels in the MRSA as observed at EH-4 were stable during this time reflecting only normal seasonal trends***. In fact, groundwater levels at EH-4 actually ***increased*** by 0.9 ft between 1992 and 1993 within the first full year of NCA groundwater production while static groundwater levels at EBM-3 in the BMA dropped by 14 ft from NCA pumping. *See* **Figure 3**.

3. Overall seasonal carbonate groundwater hydrograph trends are nearly identical for BM-DL-2 and EH-4 even though the wells are 29.5 miles apart and in separate hydrographic basins. However, same seasonal trends are not observed in EBM-3 as compared to BM-DL-2 and EH-4 even though EBM-3 is located only approximately 3600 ft away from BM-DL-2. This suggests that while a strong hydrologic connection appears to exist between EH-4 and BM-DL-2, the same does not appear to be true for EH-4 and EBM-3, or between BM-DL-2 and EBM-3.

4. As shown in **Figure 5**, visual comparison between the hydrographs for BM-DL-1 and BM-DL-2 reflect a significant departure in groundwater level trends between 2007 and 2011, which seems to indicate different hydrogeologic conditions between those two wells.

5. Even though it appears that some regional response in carbonate levels can be seen in EBM-3 observations (**Figure 3**), as shown in **Figure 4**, groundwater levels at EBM-3 do **not** correlate well with corresponding levels at EH-4 with regression analysis results indicating an (updated) R^2 value of less than 0.5, and by inference EBM-3 does not correlate well with nearby BM-DL-2 either.

6. During the Hearing, NCA experts provided testimony in review of the Mifflin and Associates 1992 well completion reports for NCA, which indicated the presence of significant structural features encountered during well drilling. As shown in Map 2, Rowley (2017)[19], Mifflin's descriptions are supported by the mapping of a (buried) strike-slip fault extending south of the Dry Lake Range through the NCA well field. Because of the lack of response in the LWRFS to pumping from the NCA wells in the BMA, the poor correlation in groundwater level (response) between observations

[19] Rowley, P.D., Dixon, G.L., Mankinen, E.A., Pari, K.T., McPhee, D.K., McKee, E.H., Burns, A.G., Watrus, J.M., Ekren, E.B., Patrick, W.G., and Brandt, J.M., 2017, Geology and Geophysics of White Pine and Lincoln Counties, Nevada, and adjacent parts of Nevada and Utah: The geologic framework of regional groundwater flow systems, Nevada Bureau of Mines and Geology Report 56, Prepared cooperatively by Geologic Mapping, Inc., New Harmony, Utah, U.S. Geological Survey, Menlo Park, California, Southern Nevada Water Authority, Las Vegas, Nevada and Private consultant, White Sulphur Springs, Montana.

made at EBM-3, BM-DL-1 and EH-4 it is apparent that ***an adjustment to a portion of the proposed LWRFS boundary in Basin 215 (BMA) is warranted.*** As shown in Map 2, the proposed boundary modification would generally place the south and western-most boundary within the Basin 215 portion of the LWRFS to be coincident with the strike-slip fault mapped by Rowley (2017) with a slight adjustment west such that the fault and boundary lie west of the NCA well field and BM-DL-1. Essentially this modified portion of the area currently within Basin 215 should become part of the administrative boundary for Basin 216 (Garnet Valley), leaving the NCA wells (EBP-2, EBM-5 and EBM-6) and BM-DL-1 inside of Basin 215, but outside of the LWRFS administrative unit.

CONCLUSIONS

Based on the results of this limited follow-up analysis using only existing data available at NDWR, it appears that pumping from carbonate wells in the BMA does not have an appreciable influence on carbonate groundwater levels observed in EH-4. This lack of correlation corroborates SNWA's statements and conclusions regarding contributions from NCA pumping in the BMA to observed impacts in carbonate groundwater levels and changes in spring flow in the MRSA.

Due to the lack of response to pumping from the BMA and poor correlation between carbonate groundwater levels near the NCA well field and within the LWRFS (EH-4) an adjustment to the portion of the LWRFS boundary within Basin 215 is warranted. The boundary adjustment, as shown in Map 2, is further supported by mapped geologic structural features from Rowley (2017).

Conclusion as to the boundary in the Black Mountains Area: Notably, Map 2 included by Mr. Dixon shows a meaningful, geologic structure that should be used to form the actual Southern (LWRFS) boundary proposed for what is currently part of the Black Mountains Area. It is based on an actual strike-slip fault that was mapped, photographed, and into which NCA's production wells were intentionally sited. It is not surprising, really, that they perform outside the LWRFS. All of this data was discussed during the hearing; Mr. Dixon explained during the hearing the reasons why this made sense and explained precisely why NCA's production wells did *not* affect EH-4 the way that other wells in other basins *within the LWRFS* did.[20]

B. Evidence and Analysis supports the inclusion of Kane Springs Valley Basin as part of the LWRFS.

An additional geographic 'boundary' adjustment is also warranted by the evidence and analysis that was presented to the State Engineer both by the initial Reports, the Rebuttal Reports, and the testimony presented during the hearing. Several sources demonstrated that a direct, hydrologic connection exists in the carbonate aquifer between Kane Springs Valley Basin and the MSRA such that it would be appropriate to include Kane Springs Valley in the LWRFS.

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[20] Mr. Dixon's supplemental discussion for the Post-Hearing Brief does, in fact, identify a better and more scientifically supported boundary than the arbitrary straight-line previously applied to form the Southern boundary of the LWRFS. As such, it is a "recommendation" made to a public agency by an engineer, and thus this Post-Hearing Brief of NCA will bear Mr. Dixon's professional engineer's stamp and signature, along with the undersigned, as representatives of NCA, in order to comply with NAC 625.612.

As such, the geographic boundary of the LWRFS should be adjusted to include Kane Springs Valley Basin.

In NCA's Rebuttal Report at section 4, beginning on page 8, NCA's experts addressed several comments made by Lincoln County/Vidler in their initial report titled, "Lower White River Flow System Interim Order #1303 Report Focused on the Northern Boundary of the Proposed Administrative Unit," dated July 3, 2019 (the "Lincoln/Vidler Report"), beginning with the reliance by Lincoln/Vidler on the purported statement that the State Engineer had supposedly found that there would be no significant impact for hundreds of years. In fact, as pointed out by NCA's experts, no such determination was made by the State Engineer with regard to Kane Springs Basin or Lincoln/Vidler's rights.

An actual review of Ruling 5712 -- issued February 2, 2007, at a time when the State Engineer had only limited data relevant to the impacts caused by carbonate groundwater pumpage within the LWRFS and no direct statutory right to "conjunctively manage" water sources – nonetheless *still* highlights the following findings made by the State Engineer *at that time:*

- "The State Engineer further finds that the Applicants' pumping test supports the conclusion that there is considerable potential for ground-water flow in the carbonate rocks in the vicinity of well KPW-1" (Pg. 7)
- "The State Engineer finds the evidence indicates a strong hydrologic connection between Kane Springs Valley and Coyote Spring Valley, specifically, that ground water flows from Kane Springs Valley into Coyote Spring Valley." (Pg. 21)
- "Given the unique hydrologic connection between the Kane Springs Valley Hydrographic Basin and the Coyote Spring Valley Hydrographic Basin, the development of ground water within Kane Springs Valley will ultimately affect water levels and flows in the White River regional carbonate-rock aquifer system." (Pg. 15)

Notably, as was pointed out in slide 31 of the NCA presentation, several parties – not just NCA – found that CSVM-4 and KMV-1 (in Kane Springs Valley Basin) showed effects resulting from the Order 1169 aquifer test; SNWA, Moapa Valley Water District, US Fish and Wildlife Service, National Park Service, the Center for Biological Diversity, and NCA all made similar findings. Additionally, the values for several wells including CSVM-4 were then plotted against EH-4 for various periods and there was a high correlation between all the carbonate wells within the LWRFS plotted against EH-4, indicating a high level of hydraulic connectivity across the basins within the LWRFS; CSVM-4 vs. EH-4, for example, resulted in a value of 0.82 – a high correlation indeed, taken from the SNWA Initial Report.[21]

But SNWA did *not* calculate a correlation between EH-4 and KMW-1. NCA's experts, however, did perform a visual comparison of the hydrographs for KMW-1 and CSVM-4 (as the correlation had been made between CSVM-4 and EH-4), and the hydrographs were *virtually identical.* Slide 33 of NCA's presentation demonstrated the similarity, and the testimony of Robert Coache on this topic cemented the analysis by estimating the R^2 value to be greater that 0.9, which Mr. Coache explained, "indicates a high correlation between KMW-1 and carbonate wells in the Lower White River Flow System with a high level of hydrologic connectivity across all of the basins within the Lower White River Flow System."[22]

Importantly, when SNWA discussed the analysis provided by Mr. Greg Bushner (a Lincoln/Vidler panel expert) and his supposed "science-based reasons" to exclude Kane Springs Valley and northern Coyote Spring Valley from the LWRFS, SNWA concluded that Bushner's reliance was primarily on new geophysical surveys and "an implausible interpretation of the hydrogeologic framework in which a new, unmapped fault is postulated in northeastern Coyote Spring Valley."[23] The SNWA analysis points out the errors in the postulated position, including the convenient perpendicular manner in which the new fault would run in comparison to the range-front faults of the Delamar Mountains and Meadow Valley Mountains – and even to the Kane Springs Fault Zone, which is the dominant feature in the area. Also coincidentally, the new, unmapped fault just happens to be coincident with the boundary of the two basins.[24]

SNWA also questions the Bushner analysis based on water quality, geochemical, and stable-isotope data wherein Bushner relied on CH2M Hill (2006), noting that the water that makes up the carbonate comes from many different sources – which is what makes the carbonate aquifer such an issue to begin with. The conclusion, therefore, that Kane Springs Valley water cannot be *identified* does not mean it is not mixed with the other carbonate sources; indeed, it is precisely the opposite. The connection shown by the hydrographs and the gradient from KSV into Coyote Spring Valley demonstrate the connection – and the water eventually makes its way to the MSRA.

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[21] Slide 32, NCA presentation, taken from SNWA Initial Report, Assessment of Lower White River Flow System Water Resource Conditions and Aquifer Response, June 27, 2019, p. 5-12.
[22] Trans. Vol. IX, Oct. 3, 2019, at p.1637, lines 16-20.
[23] SNWA Reb. Report, at Sec. 2.1, p.2.
[24] SNWA Reb. Report, Sec. 2.1 at p. 2.

Also, additional engineering reports known well to Lincoln/Vidler found that significant amounts of water were flowing from Kane Springs Valley Basin, through the carbonate, into Coyote Spring Valley. During cross examination of Lincoln/Vidler's panel, Mr. Bushner confirmed his knowledge of the 2006 CH2M Hill report that found "local groundwater discharge into Coyote Spring Valley" "16,000 acre-feet a year based on analysis by Walker."[25] Mr. Bushner confirmed that if there was such a flow, it was coming "[m]ost likely through the carbonate."[26] Notably, Lincoln County commissioned that report, but – while they did not present it at the Hearings – Lincoln/Vidler did nothing at the Hearing to discredit its findings.

And, perhaps most tellingly, certain stakeholders' counsel took the opportunity to question two of NCA's panel members who were instrumental in the establishment of the Order 1169 pump tests that brought this matter to a head and foreshadowed these proceedings -- former State Engineer Hugh Ricci, and former Deputy State Engineer Robert Coache – asking each what they would have concluded regarding whether to include Kane Springs Valley Basin in the proposed administrative unit that is the Lower White River Flow System *had they known then what they know now* after all these studies have been performed and all these reports have been presented. Given the State Engineer's prior statements in Ruling 5712 expressing concerns nearly twelve years ago about the pumping of Kane Springs Valley Basin water and the potential "effect" on the "White River regional carbonate aquifer system," it is not surprising that the responses were as follows:

> Q: (by Greg Morrison) There's a substantial amount of institutional knowledge up there at the table right now. I'll start with Mr. Ricci. If you were the State Engineer October 2019 faced [with] all the evidence we've been looking at for the last couple of weeks, would you include Kane Springs in the management area?
>
> A: (by Hugh Ricci) Hugh Ricci. I would have another option. I could retire. But I will have to go back to 2002, actually 2001, when the hearing was held on Coyote Springs Valley as far as the Southern Nevada Water Authority applications in Coyote Springs Investments. And when that order was written, it did not include Kane Springs at that time. And the reason I think was that there was nothing going on in Kane Springs. Had I had the knowledge that I would today as of a result and had to issue Order 1169 again, Kane Springs would have been included.

[25] Trans. Vol. VII, Oct. 1, 2019, at p. 1390, lines 9-17.
[26] *Id.* at p. 1391, lines 3-7.

Q: (Mr. Morrison) Okay. Thanks. Mr. Coache, what about you, if I posed the same question. If you were sitting where Mr. Wilson is today, would you want to include Kane Springs in this management area?

A: (by Robert Coache): MR. COACHE: Yes, I would.[27]

In response to follow up questions by Ms. Peterson, the attorney for Lincoln/Vidler, who questioned why "presentation" slide No. 40 of NCA suggested the boundary should remain the same, Mr. Coache explained that perhaps this first phase of the proceedings wasn't the proper venue for making that determination (to modify the boundary for Kane Springs), but he did not waiver as to whether Kane Springs Valley should be included.[28] Mr. Ricci, too, did not alter his testimony regarding whether – if he knew then what he knows today – he would have included Kane Springs Valley Basin in the Lower White River Flow System for management purposes.[29] Like Mr. Coache, Mr. Ricci was not certain at the time of the testimony whether a 'boundary' adjustment was in order during this phase, or during another phase of these proceedings.

Conclusion as to Kane Springs: At this point, it is the position of NCA that, having considered the fundamental purpose of Interim Order #1303 and its direct recommendation that the parties work to inform the State Engineer where they believe the *extent* of the "geographic boundary" of the Lower White River System is, then NCA now takes the position – despite its statement on Slide 40 of its presentation – that the "boundary" should be adjusted to include Kane Springs Valley Basin as part of the management area that is the Lower White River Flow System. There is simply too much data to ignore the hydrologic connection, and too much reason previously given by the State Engineer years ago that foreshadowed that result. The inclusion of Kane Springs Valley Basin makes good scientific sense, and its exclusion is not based on sound principles but rather on past comments made at a time when the parties knew less of the workings of the system than they do today.

2. **The long-term annual quantity of groundwater that may be pumped from the LWRFS is less than 9,318 afa once the Black Mountains Area boundary is adjusted to exclude the NCA production wells.**

NCA has repeatedly endorsed the State Engineer's figure of 9,318 afa as a supportable figure for the pumping that should continue to be allowed within the LWRFS. It is NCA's understanding that the figure was arrived at in large part through a determination of the actual

[27] Trans. Vol. IX, Oct. 3, 2019, at p. 1659, line 24, p. 1660, lines 1-20.
[28] *Id.* at p.1662, lines 7-12.
[29] *Id.* at p. 1661, lines 11-24, p.1662, line 1.

pumping that was occurring in the system, coupled with the finding that the system appears to have somewhat stabilized and is essentially in a recovery mode. If NCA was to be included in the LWRFS, then NCA would still support that figure of 9,318 afa as a figure for sustainable groundwater development in the system.

NCA's contention, however, was predicated on the understanding that the pumping calculation included the groundwater production from the BMA made by NCA for its facilities in the BMA. NCA averages approximately 1,600 afa annually for its pumping to operate its facilities, and has done so for many years. Indeed, NCA is one of few water right stakeholders in this process who has fully perfected its rights by completing its beneficial use and, as a result, has fully certificated water rights. But NCA has demonstrated a strong position that the NCA production wells *are not within the LWRFS as currently proposed.* This position is based in part on science developed by an independent stakeholder – SNWA – who agrees that the 'boundary' in the southern part of the BMA is probably "a bit off," and the NCA's production wells are probably "not within the LWRFS."

As a result, should the State Engineer agree with NCA and make the determination to adjust the boundary in the BMA to exclude the NCA production wells from the LWRFS, then the pumping figure attributable to NCA's production well pumping should be removed from the 9,318 afa number in arriving at the proper amount for actual LWRFS pumping. It would be intellectually inaccurate to ignore this result if the 9,318 figure was arrived at based on the *inclusion* of NCA's pumping, and then eliminate those wells from the "boundary" but not eliminate the pumping from those wells in the annual amount of sustainable groundwater that can be developed from the LWRFS.[30]

3. Lower Meadow Valley Wash water rights should Not be included in the LWRFS

As was explained by Jay Dixon in NCA's Rebuttal Report at Sec. 3, pp.3-7, bolstered by NCA's presentation slides at Nos. 19-24 and his accompanying testimony[31], the geology of the Lower Meadow Valley Wash ("LMVal.W") and the actual water use there does not support its inclusion for several reasons: (a) there is no carbonate pumping occurring in that area (the wells there are shallow, alluvial-depth wells), and thus the "connection" must be inferred but has not been proven, nor has the effect of actual pumping been determined; (b) the depth to the carbonate is great in the LMVal.W, making it difficult to establish a carbonate source of water

[30] Of course, if the State Engineer does not adjust the BMA boundary and leaves NCA's production wells inside the LWRFS, there is no reason to reduce this figure from the 9,318.
[31] Trans. Vol. IX, Oct. 3, 2019, at pp.1627-1629.

there[32]; (c) there were no effects from LWRFS pumping observed in groundwater levels; (d) the current pumping in the basin is minimal; and (e) if the water rights are simply *included* in the LWRFS the potential exists for inactive water rights to be given artificial *new life* by virtue of potentially being classified as "carbonate, underground rights" when they have essentially never been pumped or managed in that fashion previously, to the detriment of other LWRFS stakeholders – especially those who have actually put water rights to use.

FINAL CONCLUSION

For all the foregoing reasons, NCA recommends: (1) the modification of the LWRFS boundary in the BMA in accordance with the recommendation of Mr. Jay Dixon, P.E. as shown on Map 2, which would exclude NCA's production and monitoring wells from the LWRFS; (2) the modification of the LWRFS boundary to include Kane Springs Valley Basin within the LWRFS; (3) the total, annual groundwater development in the LWRFS be considered with regard to a figure that is something less than the 9,318 afa determined to be the appropriate amount should NCA's production wells be excluded from the LWRFS, as would be proper given the circumstances and the evidence; and (4) the Lower Meadow Valley Wash *not* be included in the LWRFS.

Date: December 3, 2019.

KAEMPFER CROWELL

BY: ______________________________
Alex J. Flangas
Nevada Bar No. 664
50 West Liberty Street, Suite 700
Reno, NV 89501
Attorneys for Nevada Cogeneration Associates Nos. 1 and 2

PROFESSIONAL ENGINEER · STATE OF NEVADA
JASON M. DIXON
Exp. 12-31-20
CIVIL
No. 15553
12-3-2019

DIXON HYDROLOGIC, PLLC

____
Jason M. Dixon, P.E.
10299 Culiacan Pass Trail
Reno, NV 89521
Engineer for Nevada Cogeneration Associates Nos. 1 and 2

[32] NCA's Reb. Report at p. 7 stated that, as explained in Burbey (1997) and shown in geologic sections included in Rowely, et al. (2017), development of a carbonate aquifer source in the LMVal.W (anywhere near the southern boundary would require a well completed to a depth of approximately 4,000 ft., which is highly unlikely.

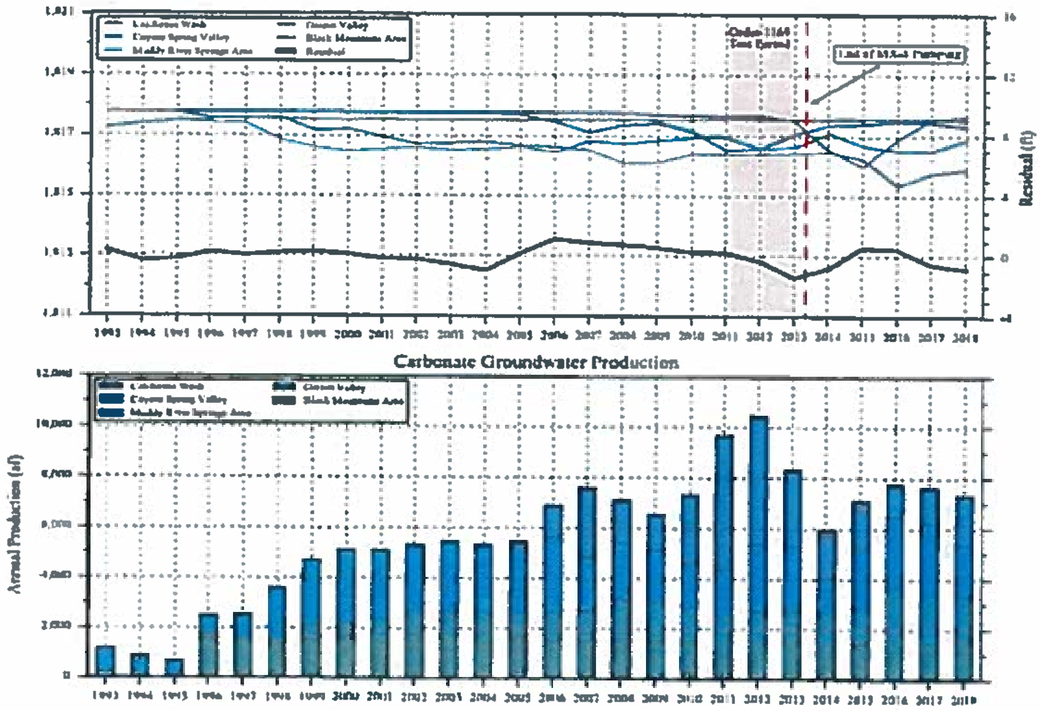


Figure 1. Taken from SNWA 2019b (Figure 3-1). MLR results reflecting decomposed Well EH-4 water levels due to carbonate groundwater production by basin. Results indicate limited to no response at EH-4 due to pumping in the BMA due to NCA (carbonate) wells.

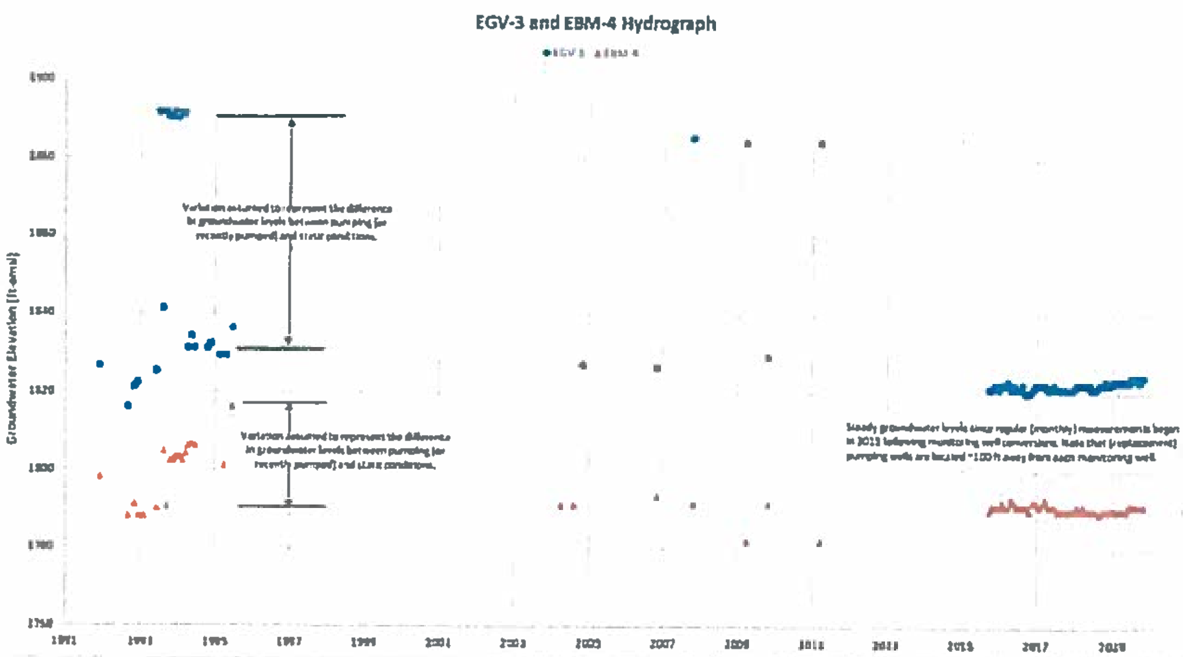


Figure 2. Hydrograph data based on hard-copy and digital reports filed by NCA at NDWR

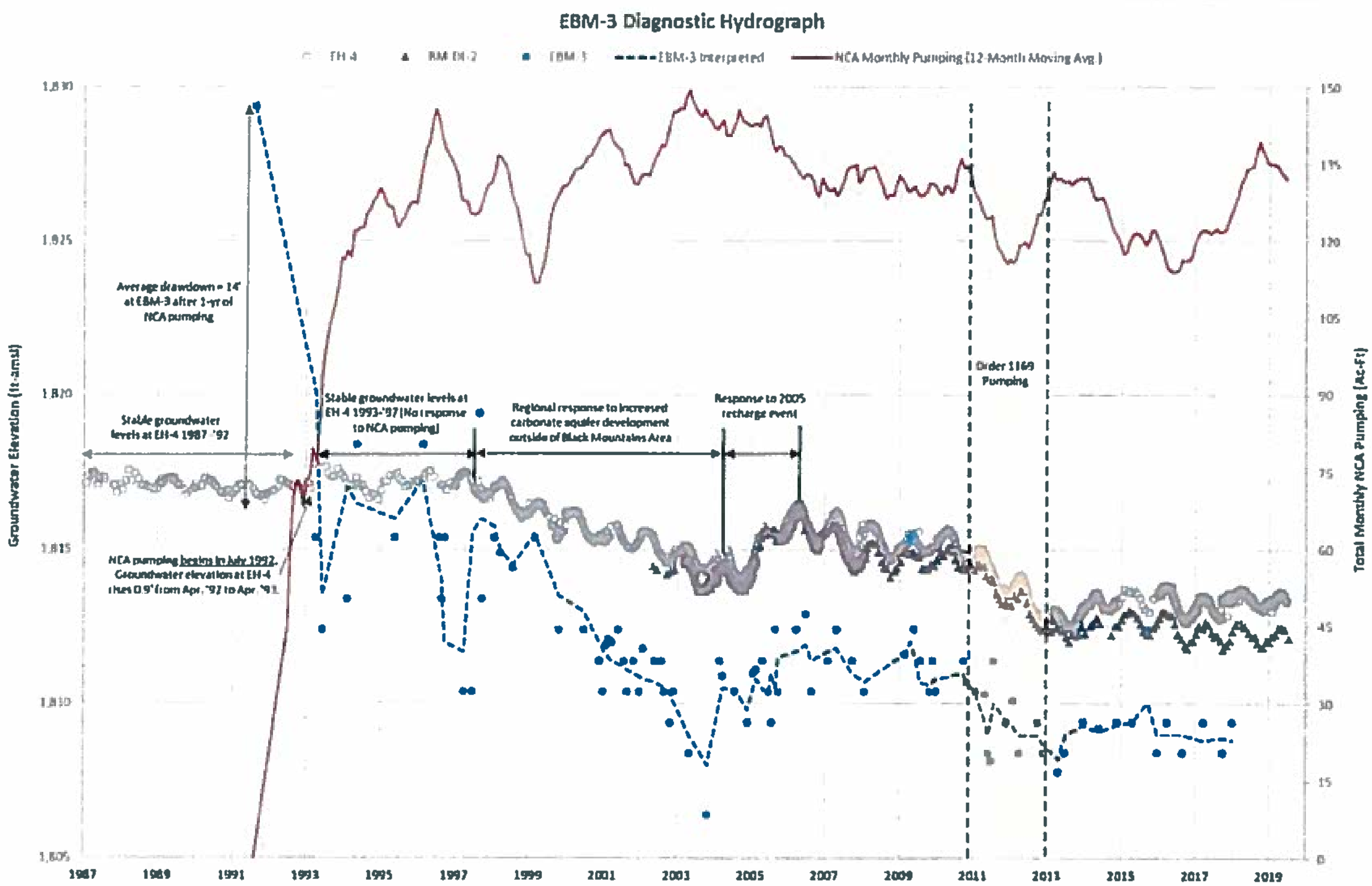


Figure 3. Diagnostic composite hydrograph data based on non-pumping filtered water level data from hard-copy and digital reports filed by NCA and USGS at NDWR for EBM-3, water level data for BM-DL-2 and EH-4 as reported on NDWR database and monthly NCA pumping as reported by NCA to NDWR (hard-copy and digital reports).

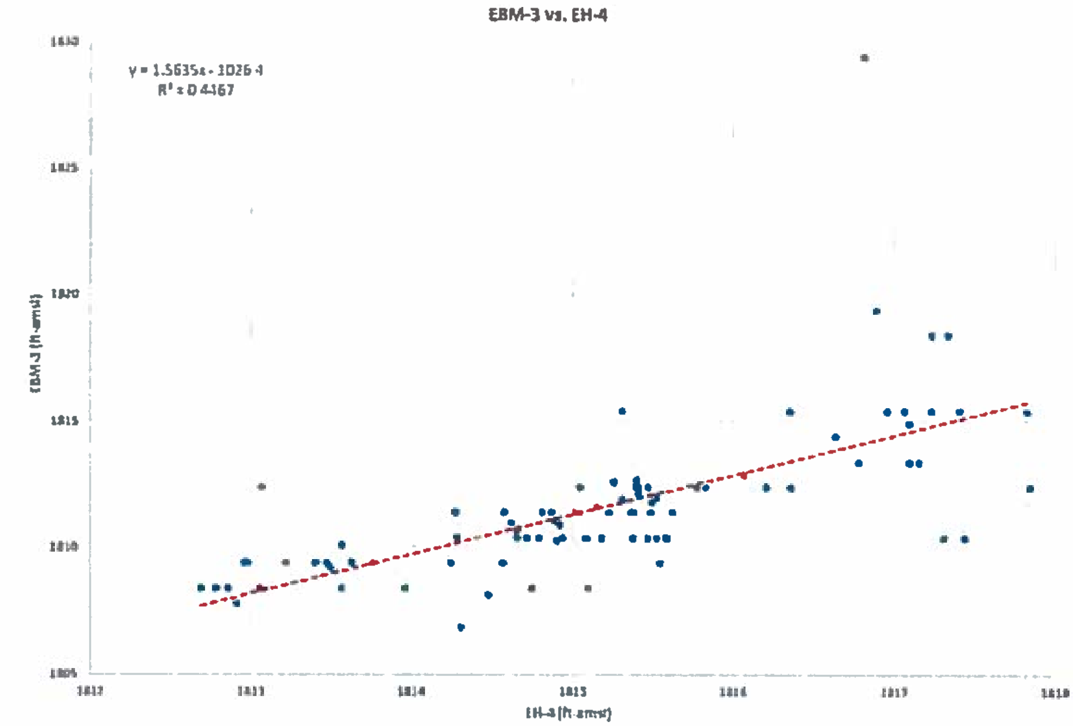


Figure 4. Results of the simple linear regression analysis between EBM-3 and EH-4 based on filtered (non-pumping influenced) data from EBM-3.

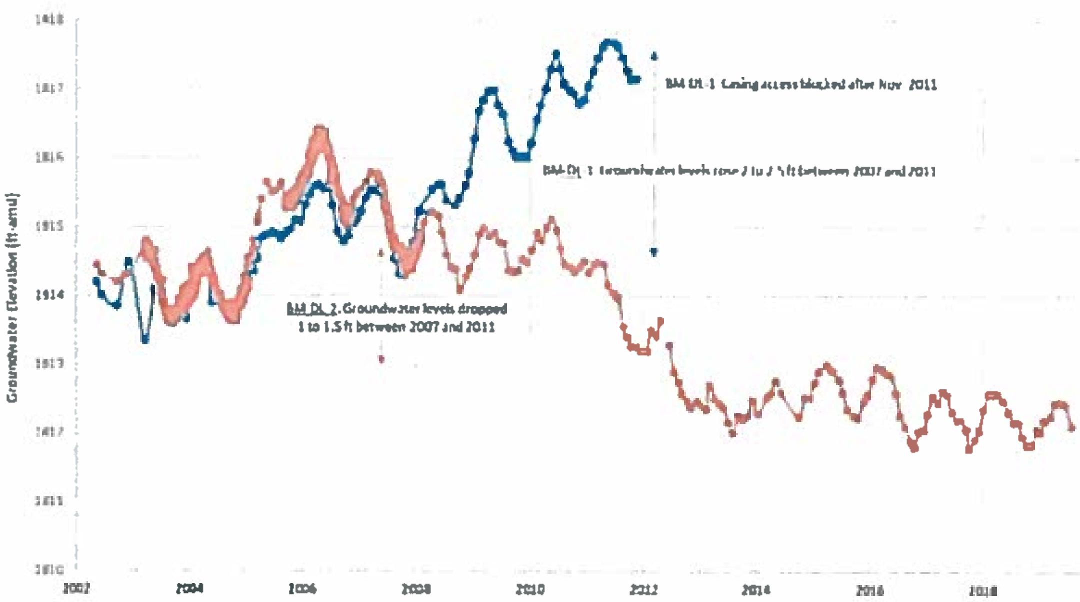
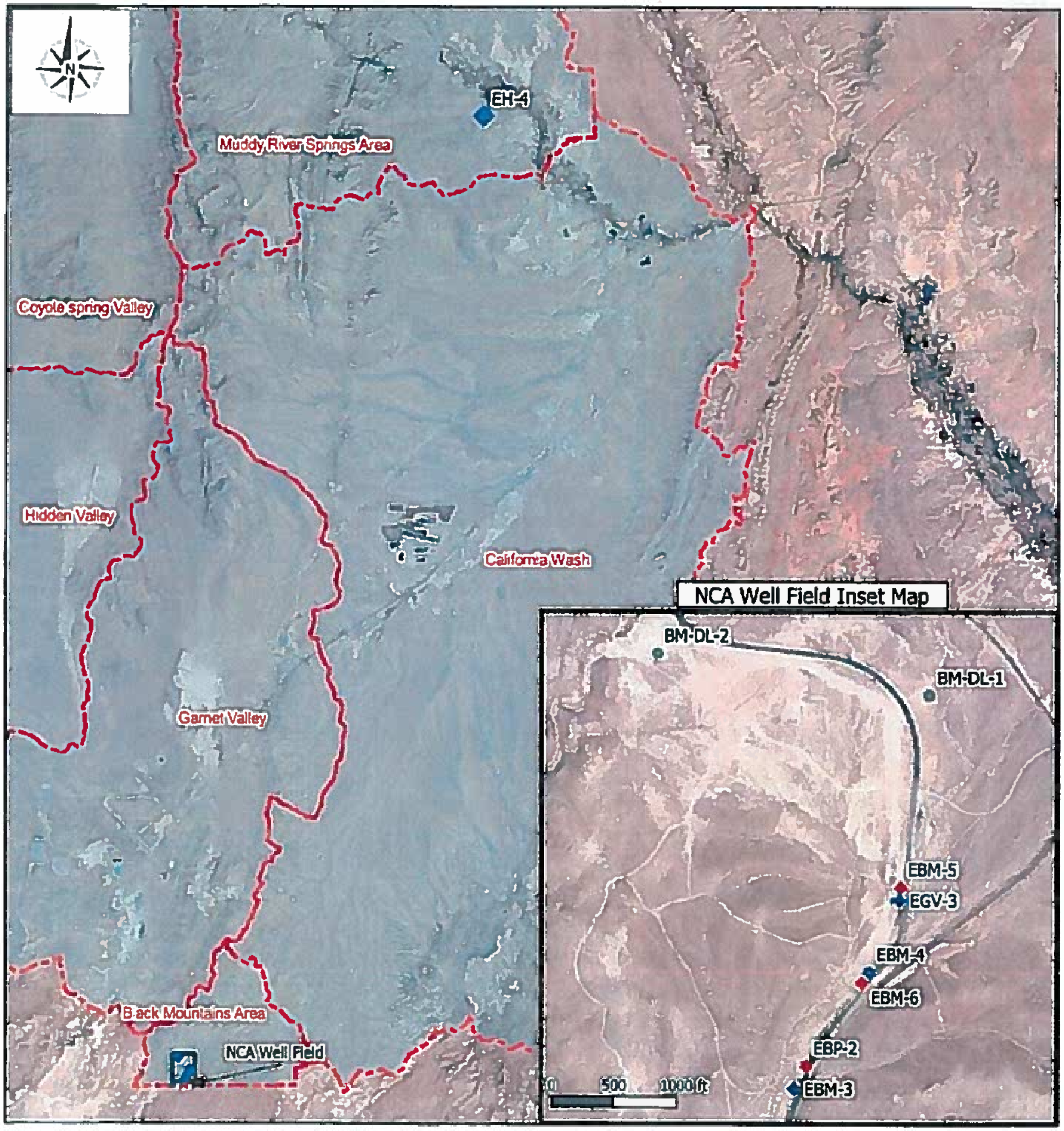


Figure 5. Groundwater elevation (hydrographs) for BM-DL-1 and BM-DL-2.



Legend

Regional Boundaries

- LWRFS Basins (As Proposed in Order 1303)
- NDWR Basins 2015

Water Levels

- Post 1303 Hearing Analysis Wells

NCA Well Field (Vicinity Wells)

- Monitoring
- Pumping
- Non-NCA Wells

DRG Layers

Google Eath Aerial

Graphic Scale

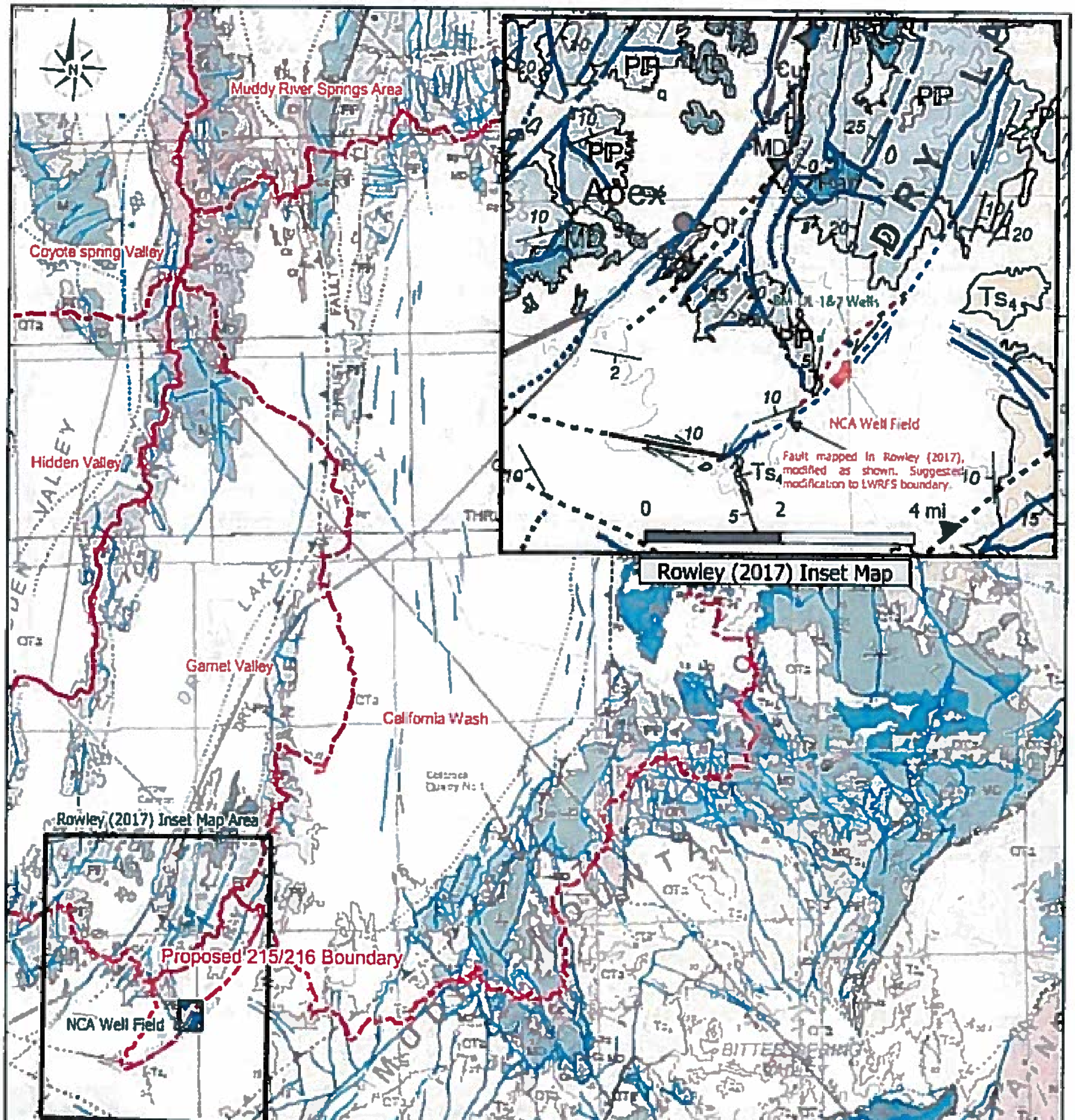
0 5 10 mi

Nevada Cogeneration Associates

Order 1303 Follow-Up Review

Map 1

Date: 12/1/2019	Jay Dixon, P.E.



Legend

Regional Boundaries

- LWRFS Basins (As Proposed in Order 1303)
- Proposed Modification- Basins 215/216
- NDWR Basins 2015

Water Levels

- Post 1303 Hearing Analysis Wells

NCA Well Field (Vicinity Wells)

- Monitoring
- Pumping
- Non-NCA Wells

DRG Layers

Rowley (2017) Digitized Map

Graphic Scale

0 5 10 mi

Nevada Cogeneration Associates

Order 1303 Follow-Up Review

Map 2

Date: 12/1/2019 | Jay Dixon, P.E.

CERTIFICATE OF SERVICE

I hereby certify that I am an employee of KEMPFER CROWELL, and on this date, I caused the foregoing document to be served via electronic transmission as follows:

8milelister@gmail.com;
ablack@mcdonaldcarano.com;
admin.mbop@moapabandofpaiutes.org;
aflangas@kcnvlaw.com
alaskajulie12@gmail.com;
andrew.burns@snwa.com;
barbnwalt325@gmail.com;
bbaldwin@ziontzchestnut.com;
bostajohn@gmail.com;
bvann@ndow.org;
chair.mbop@moapabandofpaiutes.org;
chris.benkman@nsgen.com;
Colby.pellegrino@snwa.com;
Coop@opd5.com;
coopergs@ldschurch.org;
craig.primas@snvgrowers.com;
craig.wilkinson@pabcogypsum.com;
dan.peressini@lasvegaspaving.com;
david_stone@fws.gov;
Dbrown@ldalv.com;
dennis.barrett10@gmail.com;
derekm@westernelite.com;
devaulr@cityofnorthlasvegas.com;
dfrehner@lincolncountynv.gov;
dixonjm@gmail.com;
dorothy@vidlerwater.com;
doug@nvfb.org;
dvossmer@republicservices.com;
dwight.smith@interflowhydro.com;
edna@comcast.net;
emilia.cargill@coyotesprings.com;
EveryoneWaterResources@water.nv.gov;
fan4philly@gmail.com;
gary_karst@nps.gov;
gbushner@vidlerwater.com;
glen_knowles@fws.gov;
gmorrison@parsonsbehle.com;
golden@apexindustrialpark.com;
golds@nevcogen.com;
greatsam@usfds.com;
jmordhorst@water.nv.gov;
joe@moapawater.com;
Karen.glasgow@sol.doi.gov;
kbrown@vvh2o.com;
Kevin_Desroberts@fws.gov;
kimberley.jenkins@clarkcountynv.gov;
kingmont@charter.net;
kpeterson@allisonmackenzie.com;
krobison@rssblaw.com;
kurthlawoffice@gmail.com;
lazarus@glorietageo.com;
lbelenky@biologicaldiversity.org;
lbenezet@yahoo.com;
liamleavitt@hotmail.com;
Lindseyd@mvdsl.com;
Lisa@ldalv.com;
lle@mvdsl.com;
lon@moapawater.com;
lroy@broadbentinc.com;
LuckyDirt@icloud.com;
luke.miller@sol.doi.gov;
martinmifflin@yahoo.com
mfairbank@water.nv.gov
mflatley@water.nv.gov
MBHoffice@earthlink.net;
Michael_schwemm@fws.gov;
mjohns@nvenergy.com;
mmmiller@cox.net;
moapalewis@gmail.com;
moorea@cityofnorthlasvegas.com;
muddyvalley@mvdsl.com;
oldnevadanwater@gmail.com;
onesharp1@gmail.com;
paul@legaltnt.com;
pdonnelly@biologicaldiversity.org;
progress@mvdsl.com;
rafelling@charter.net;
raymond.roessel@bia.gov;
rberley@ziontzchestnut.com;
rhoerth@vidlerwater.com;

greg.walch@lvvwd.com;
hartthethird@gmail.com;
howard.forepaugh@nsgen.com;
ircady@yahoo.com;
info4gbwn@gmail.com;
JCaviglia@nvenergy.com;
Jeff.phillips@lasvegaspaving.com;
jim.watrus@snwa.com;
mordhorst@water.nv.gov

robert.dreyfus@gmail.com;
Rott@nvenergy.com;
rozaki@opd5.com;
rteague@republicservices.com;
Sarahpeterson@blm.gov;
SCarlson@kcnvlaw.com;
sc.anderson@lvvwd.com;
sc.anderson@snwa.com;
sharrison@mcdonaldcarano.com;
stever@stetsonengineers.com;

sue_braumiller@fws.gov;
technichrome@ips.net;
tim@legaltnt.com;
tomg@nevadawatersolutions.com;
tommyers1872@gmail.com;
trobinson@mvdsl.com;
twtemt@hotmail.com;
veronica.rowan@sol.doi.gov;
vsandu@republicservices.com;
whitfam@mvdsl.com;
william.paff@rocklandcapital.com;
wpoulsen@lincolnnv.com;
therese@water-law.com;
schroeder@water-law.com;
c.skulan@water-law.com;
l.gage@water-law.com;
jeanette_pizarro@fws.gov;
RShaffer@parsonsbehle.com

Additionally, a the original and a copy of this document was delivered for filing to the Division of Water Resources this same day.

DATED December 3, 2019.

Employee of Kaempfer Crowell

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CARSON CITY, NEVADA, MONDAY, SEPTEMBER 23, 2019, A.M. SESSION

-o0o-

HEARING OFFICER FAIRBANK: Let's go ahead and go on the record. Good morning. So this is the time and place set for the hearing in the matter of Lower White River Flow System in the Order 1303 proceedings.

My name is Micheline Fairbank, I will be the hearing officer today. And with me is the staff from the Division of Water Resources. We have Tim Wilson, acting State Engineer. We have Adam Sullivan, Deputy State Engineer. Levi Kryder who is our chief of our hydrology section. Jon Benedict who is one of our hydrologists. Christi Cooper who's staffed out of our Las Vegas office who's a geologist and familiar with and works quite extensively in the Lower White River Flow System area.

With me also is Melissa Flatly who is the chief of our hearing section. Michelle Barnes, the supervising professional engineer of our hearing section. And Bridget Bliss who is the basin engineer for the Lower White River Flow System basins.

Just as a couple preliminary remarks. I wish to go ahead and remind everyone that this proceeding is for the express purpose of providing the State Engineer a concise

summary of the salient conclusions set forth in the Order 1303 reports and rebuttal reports and to direct our office to the evidence and analysis that is supportive of that testimony.

I want to just reiterate, and we've been trying to make this clear, that this is not a contested or adversarial proceeding. The scope of this proceeding is for the limited purpose of addressing those four issues plus the fifth.

And while that fifth issue is we're on it is not intended to expand the scope of this hearing into making policy determinations with respect to management of the Lower White River Flow System basin's individual water rights, those different types of things, because those are going to be decisions that would have to be made in subsequent proceedings should they be necessary.

Additionally, just to go ahead and provide some procedural matters. This morning we'll be starting with Coyote Springs Investments, they were going to have half of the time today and today we have a total of about seven hours.

So they're going to have approximately three and a half hours today to go through all of the presentation of the conclusions and reports and evidence on behalf of CSI as well as for cross-examination.

And again the opportunity for cross-examination

is not for an adversarial or contested proceeding, it's to provide the State Engineer a robust record in which to analyze all of the data and conclusions that are being provided to our office.

Cross-examination this afternoon will be limited to 14 minutes for the participants and we will have an audible alarm at the end of that time period. We're going to go ahead and take two breaks today, the first one will be about two hours in around 10:30 and then we'll take another ten-minute break this afternoon.

Additionally, time left this afternoon after those -- the participants are provided their time for questioning will be reserved for the State Engineer and his staff to ask questions.

And if there's additional time remaining at the end of the day before we have to conclude at 4:30, then we may open that up for additional questions by participants and cross-examination. But we do have to conclude at 4:30. We have to be -- everyone has to be out of the legislative building no later than 5:00 today and that's pursuant to LCB's requirements.

Additionally, if you plan on leaving documents or materials in the office at the conclusion of -- excuse me, in the hearing room the conclusion today, if there's anything

that you -- is confidential or is something that you don't want to have publicly accessible you will need to take that with you. While the room is locked up there's no guarantee of security or anything of that nature.

Let's see, finally, when it comes to the cross-examination of the witnesses, I just want to go ahead and just make it very clear, the expectation on behalf of the State Engineer and staff is that the witnesses are being responsive and courteous to the time during those that are cross-examining.

We understand that this is a limited time period and so we want to have -- we are going to conduct this hearing in a manner to allow a fair opportunity for individuals to ask questions of witnesses.

And if there's any perceived effort to stall or to draw out the time of a cross-examining party, then we're going to go ahead and address those matters. Because those -- this is intended to be a fair opportunity and really the focus of this is to provide the State Engineer with the most comprehensive evaluation of the data.

Also as a reminder, the proceedings are available to be viewed on the internet via the legislative website. And we also have it being cast down to the Las Vegas legislative offices as well.

of record, 1990 to 2019.

I also looked at Palmer Hydrologic Drought Index for Division 4 and that's plotted on the bottom plot there along with the PDSI. There was very little difference so I really didn't do much with that except plot it.

But, again, here, what we see if we look -- step back and look at this, first of all, let me explain what the Palmer Drought Severity Index is in terms of units. It's a standardized index. And so what that means is zero, a value of zero on the index represents average conditions. It's neither dry, it's neither wet. And the units of the drought index can be thought of as standard deviations.

So if you have a value of one, that means that you are one standard deviation wetter than the average conditions. All right. And a value of negative one, you're one standard deviation drier than average conditions.

And so Palmer defined negative 3 or 3 standard deviations drier than average as severe drought, okay? And correspondingly, he defined positive 3 or a 3 standard deviations wetter than average as severe wet conditions. So that gives you some idea of the relative value of what you're looking at here in these plots.

So we see -- we go from severe drought to severe wet, back to severe drought, severe wet. Bounce around a lot,

more so in the first half of the record, but then the second half of the record. But, again, we don't see any kind of long-term drying trend or drought in these data.

And even in the second half of the record, which looks a little bit drier, you still have some wet periods in there, some average or wet periods, especially one around the -- in the aquifer test, the time of the aquifer test.

And then I will note that both divisions showed that it's become severely wet in the last year or so. So things have gotten wet. We don't see that kind of similar recovery or that similar trend in the water level data or the spring flow data.

So next, I looked at well hydrographs for basins that were close to or adjacent to the Lower White River Flow System, but basins where there's little or no pumping. This includes Dry Lake Valley and Delamar Valley.

Delamar Valley is tributary to Coyote Spring Valley and the Lower White River Flow System and Dry Lake Valley is just north of Delamar Valley and tributary to Delamar Valley. And then I also looked at Tule Desert, and this basin is just east of the Lower Meadow Valley Wash and the Kane Springs area.

So presumably all these basins are responding to the same climate signal as what's happening in the Lower White

River Flow System. There's no reason to believe that there's different climate down in the Lower White River Flow System from these basins. And these basins have little or no pumping, as I say, so the well hydrographs in these basins should represent the climate response.

So this is the -- this is four monitoring wells monitored by SNWA and Dry Lake Valley for the period 2008 or 2010 to 2019. And if you look at these levels, the top plot, let's see, on the left there, is stable.

The top right plot shows a slight decline and then the bottom two plots here show slight increases. So certainly no consistent decline in these water levels in this basin.

Next, I dropped down to Delamar basin, which is, as I said, adjacent to Coyote Spring Valley, just north of it. And here we see two water levels, the top left plot and the bottom plot are stable, and then the top right plot shows a decline, but that really doesn't start until about 2015 or so. So it doesn't look like a strong drought signal in these water levels either.

Next, I looked at 13 monitoring wells in Tule Desert. Now, in the report, I only graphed these four, but I did discuss all 13 and I included them as exhibits, which I'll get to when I get to the next slide. But these four were

graphed in the report and you can see here that three of the wells show increases in water levels and one is stable.

And there's some funny things that happen in the first part of the record in all these wells, I think maybe there was adjustment in the elevations or measuring points or something. But if you look beyond that, basically three of the four wells are increasing over this period from 2007 to 2019.

Next, this is six more of the 13 wells in Tule Desert for the same period and all six of these wells show increases in water levels. And then finally these are the -- and I'm sorry, if I back up there, if you're looking for these graphs, these are exhibits down here in the lower left-hand corner.

These were not in the report, these six monitoring wells and neither were these last three on the left part of the slide. And those are exhibits, again, listed down in the lower left-hand corner presentation. But, again, these are three -- the last three of the 13 monitoring wells that I looked at, and you see increases in water levels in all these wells in addition. So certainly no drought signal in this basin either.

And then finally I looked at -- in the report, Figure 9, looked at the water levels in CSVM-5, which is the

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exclude Kane Springs from this management area as you have it included in your map up there?
A. Well, you could always hypothesize any number of such things. But what I noted is that water level fluctuations in CSVM-6 or MX-5, there's 4 or 5 wells in central monitor -- carbonate wells in central Coyote Springs Valley.
In any of those, you saw the same water level fluctuations as CSVM-4. They were of different magnitude, but there's clearly a hydraulic -- this is where -- don't touch that thing.
This is where it does make a sense to look at time series, right, as a hydrologist or hydrogeologist, okay? So there's a clear hydraulic connection. It's just the transmissivity is much less between central Coyote Spring Valley and southern Kane Springs Valley, but it is still transmissive.
Q. All right.
A. Right.
Q. Thanks.
A. Yeah.
Q. All right. And this generally is directed to Mr. Mayer, but I think any or all of you might be qualified to answer it. So if anyone feels more comfortable, please.

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You concluded that the triggers from the 2006 Memorandum of Understanding based on Warm Springs West flows, those are valid and important for protecting the springs in the Pederson Unit or the Pederson Unit?
ANSWERS BY MR. MAYER:
A. Yes, I concluded that.
Q. Okay. And you're familiar with the amended stipulation between the Fish and Wildlife Service and Lincoln County, Vidler? It's on the record as Fish and Wildlife Service Exhibit 57.
A. Yes, I'm familiar with that.
Q. Does that agreement also have some trigger levels based on Warm Springs West flows?
A. Yes, it does.
Q. Would you say that those trigger levels -- those trigger levels are also valid and important to protect Pederson Unit Springs?
A. Yes, I would agree, they are.
Q. All right. I want to dig a little deeper into that stipulation with Lincoln Vidler. So that stipulation requires the formation of a technical review team, TRT; is that correct?
A. Yes. Is this more you, Sue or --
ANSWERS BY MS. BRAUMILLER:

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A. I think you're right.
MR. MAYER: Yeah, it was. Yeah --
ANSWERS BY MS. BRAUMILLER:
A. And that team was never formed and never met, um-hum.
Q. That was my question. Great. Thank you.
When did it last meet is another. Has the stipulation, to your knowledge, has it ever been modified or cancelled according to its terms over the years?
ANSWERS BY MR. MAYER:
A. Well, it was -- there was a provision that required a monitoring well in the northern part of Coyote Spring Valley, two actually. One on Kane, one in Coyote Spring, one --
ANSWERS BY MS. BRAUMILLER:
A. One on --
MR. MAYER: I can't remember. Yeah, anyway, so that was modified. There was an agreement by the Fish and Wildlife Service to allow -- was it CSVM-4 to still be substituted?
MS. BRAUMILLER: I don't remember.
MR. MAYER: There was another well that was drilled that was substituted by SNWA that was substituted for the well that was required in the stipulation. But that was

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just the one well. There was never anything addressed as far as the other wells as far as I know.
Q. So your knowledge then was one well was substituted and the second one was never drilled?
A. As far as I know, yes.
Q. All right. Was there ever -- so there was never any agreement obviously from the TRT that those monitoring wells wouldn't be required because the TRT didn't meet?
ANSWERS BY MS. BRAUMILLER:
A. Never met.
MR. MORRISON: All right. That's all I have. Thank you.
HEARING OFFICER FAIRBANK: And next up is Lincoln County with Vidler Water Company.
CROSS-EXAMINATION
MS. PETERSON: Good morning, panel, Karen Pederson representing Lincoln County Water District and Vidler Water Company. And I just had a question for Dr. Schwemm.
Are you familiar with the biological opinion U.S. Fish and Wildlife Exhibit 59?
ANSWERS BY MR. SCHWEMM:
A. Not really. I didn't really address the -- this is Mike Schwemm. Not really. I didn't address the biological opinion in my report. I just spoke of what the triggers

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themselves and the values that were in that amended stipulation in relation to the Dace themselves. But I'm not overly familiar with the biological opinion.
MS. PETERSON: May I approach the witness?
HEARING OFFICER FAIRBANK: Yes.
MS. PETERSON: Thank you.
I am going to hand you and your counsel a copy of your Fish and Wildlife Exhibit 59, which is a biological opinion, and if you could turn to page 37.
ANSWERS BY MR. SCHWEMM:
A. Okay.
Q. I hate to waste my time on this. I mean, I need you to read it, not out loud, to yourself. But if you could read quickly, that would be great.
A. Which section?
Q. I'm sorry, number three.
A. (Complies.) Okay.
Q. All right. And do you agree that in this document, it's the Service's biological opinion that the action, as proposed and analyzed -- and again, this is related to the Kane Springs Valley groundwater development project in Lincoln County; do you agree with that?
A. Well, I haven't reviewed this document. So it's new to me in -- so I don't really know the entire -- the

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entirely of what's referred to in the document.
Q. Do you agree that paragraph 3 there on this page, page 37 of what I'll represent to you is Fish and Wildlife Service Exhibit 59, indicates that it's the Service's biological opinion that the action, as proposed and analyzed, is not likely to jeopardize the continued existence of the endangered Moapa Dace?
A. Yeah, I can read that, but I don't really know what was stated in the biological opinion because I did not analyze that in my report.
Q. Do you think it was important to analyze the biological opinion before you drafted your report?
A. It could have been and it was -- would have been good background. But specifically what I wanted to address was if there was a -- the change in flow and how that might affect the species itself.
So I was just interested in the biological effect of how flow changes would affect the species and not the compliance issues because I did not address those in my report.
Q. My next questions are directed to Ms. Braumiller.
ANSWERS BY MS. BRAUMILLER:
A. Um-hum.
Q. You were not qualified in this proceeding as a

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geologist, as an expert in the area of geology; is that correct?
A. Yep. Right. Yes.
HEARING OFFICER FAIRBANK: Please turn your mic on.
MS. BRAUMILLER: Oh, it's on actually. Okay. Yes, no.
BY MS. PETERSON:
Q. And you were also not qualified as an expert in the area of hydrogeology; is that correct?
A. No, I didn't ask to be qualified as a hydrogeologist.
Q. Would you agree that you provided a lot of opinions in your presentation that would be in the areas of geology and hydrogeology?
A. Yes, and I asked to be qualified as a groundwater hydrologist because I am a groundwater hydrologist by formal training and work experience. And I have become a hydrogeologist of a result of over 24 years of work. But I do not have a geology degree and so I was very conservative about that.
MS. PETERSON: And I just asked the State Engineer and panel to take the appropriate -- take into consideration that in offering the opinions today, that

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Ms. Braumiller is not qualified as an expert in geology or hydrogeology.
HEARING OFFICER FAIRBANK: Thank you. We'll note that.
BY MS. PETERSON:
Q. Do you agree, Ms. Braumiller, that the boundary issue with regard to the Lower White River Flow System is a structural geology issue?
A. We're trying to define the boundaries of a flow system. So, in part, it's a geology issue; and in part, large part, it is not.
Q. Would you agree, then, that structural geology of the region controls the groundwater flow of this region?
A. It is. It's one factor influencing groundwater flow in this region, one of several.
Q. Do you agree, as a hydrologist, that you're making conclusions about where groundwater flows in this region. But if you're structural geology is wrong, your opinions could be wrong?
A. Well, but as I said, I have 24 years of work experience doing groundwater hydrology that cannot be done without also doing hydrogeology. So although I did not ask to be officially qualified as a hydrogeologist out of, you know, a sense of respect for the fact that I do not have a geology

degree, I have been doing hydrogeology for 24 years.
Q. Would you agree, though, if your assumptions about structural geology were wrong or if you had no assumptions about geology in your flow analysis, that your opinions could be wrong?
A. No, I don't, and here's the reason. Everywhere where I cited the likely existence of geologic discontinuities, I said subject to hydraulic confirmation. And there is not everywhere, hydraulic confirmation for those no-flow boundaries, if that's what you're specifically referring to. But at many locations, there are.
And so my approach is to first look at geology, look for geologic discontinuities that are very significant, and then look for hydraulic confirmation. I don't believe you can infer hydraulic connections or a lack thereof just based on geology.
Q. Directing your attention to pages 15 and 16 of your report, which is the Fish and Wildlife Exhibit 5?
A. Okay.
Q. You make some conclusions about 12 wells on those pages, that they're in the carbonate; do you recall that?
A. Let's see. Wait a minute. Oh, there were several -- there were 14, yeah, several of the carbonate wells that were the water level records for some of the carbonate

wells that were analyzed using SeriesSEE in 2013 are not part of the regional aquifer. So maybe you have to clarify your question a little bit.
Q. Well, directing your attention to the 12 wells that you have on pages 15 and 16; do you see those?
A. I see there are -- there's 1, 2 -- yeah. Okay, yeah, I see them.
Q. All right. You used a geologic map to determine which geologic units the wells represent; is that correct?
A. Not only geologic maps, but also the well logs.
Q. You did look at the well logs?
A. Absolutely.
Q. Did you note that in your report?
A. I don't know. If you want me to read the text, I'll do it right now. But I can tell you I looked at the well logs and the geologic mapping, of course.
Q. For all the wells listed on pages 15 and 16?
A. Correct, um-hum. Right, um-hum.
Q. And then directing your attention to page 14 of your report?
A. Um-hum.
Q. Exhibit 5?
A. Uh-huh, right.
Q. You talk about the parameters of the Theis

transforms. Do you see that? It's in the third paragraph down.
A. Um-hum.
Q. You're familiar with that sentence?
A. Which sentence are you talking about?
Q. It starts with "the parameters of the Theis transforms as applied in SeriesSEE analysis"?
A. Yeah, okay.
Q. Do you see that?
A. Right, right.
Q. That they're not intended or -- to represent or serve as estimates of aquifer parameters?
A. Correct, um-hum.
Q. Are you saying that the SeriesSEE analysis allows you to ignore structural geology and well construction?
A. It doesn't take those things into account because it's a Curve-fitting tool, Curve-fitting tool. You're fitting analytical approximations of various stresses that account for changes in water level in the well to document water level records for wells. That's the nature of it.
Q. And would you agree -- and this might have been asked already, so I apologize if it's a repeat. Would you agree that the SeriesSEE analysis does not incorporate recharge due to weather events, such as high precipitation in

2005 or 2010?
A. It could be made to do that, but that is not the way it was applied to interpret the Order 1169 pumping test, because our purpose was to characterize the aerial extent of the drawdown created by the test pumping.
And then secondarily, we were surprised to see how uniform it was over such a large area. It was not the purpose. This was pure application of SeriesSEE.
Q. Did the SeriesSEE analysis drawdown impacts extend from the Order 1169 pumping to Kane Springs Valley, which is about over 15 miles away?
A. You know, I don't believe KMW-1 was officially one of the water monitoring wells for the Order 1169 study, although there was monitoring. I found the hydrographs, of course, in the State Engineer's data basis. And it was not officially -- oh, I'm sorry, I'm getting to my point here.
It was not -- in fact, there was an explicit decision in 2007 not to include it in the Order 1169 pumping test. I know it was -- there was a decision not to include it in the pumping test. I think it was based on the 2007 ruling 5217. But there is groundwater level data for KMW-1 through the pumping tests and I think the monitoring started in about 2007 perhaps, something like that. So it's there, um-hum.
Q. Right. But I think I was asking you about -- and

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I believe you've stated that your SeriesSEE analysis, there were no drawdown impacts that extended from the Order 1169 pumping to Kane Springs Valley; is that correct?
A. No. What I'm saying is that the SeriesSEE analysis was only -- we only -- Keith Halford, okay, only analyzed a select number of carbonate wells throughout the Order 1169 study area because there were many, many monitor carbonate wells.
So he selected carbonate wells from far flung locations throughout the Order 1169 pumping test that were also based on other considerations, water level records, geologic mapping, well logs, et cetera, also believed to be completed in the regional carbonate aquifer, some carbonate wells that are apparently complete outside the carbonate aquifer and some other geologic units.
But at any rate, he didn't happen to choose KMW-1 as one of the records that was analyzed. So it just wasn't analyzed, um-hum.
Q. How come Mr. Halford is not here, testifying today about the work he did?
A. Well, we refer to the 2013 DOI report, okay? We refer to that. We cited it. I re-explained, verified the SeriesSEE analysis in my report because it's so foundational to the identification of the basins that it should be

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considered the Lower White River Flow System.
But we're not relitigating, as far as I know, Keith Halford's Curve-fitting in 2013. The results, the analysis that was done is described in the DOI 2013 report as one of our exhibits. I cited it. The results and our interpretation are also described and cited in our DOI 2013 report.
There is no need for Dr. Halford to be here, although I think it would have been helpful. I would have loved to heard him explain since he's the author of SeriesSEE, what it is and is not because there does seem to be a lot of confusion about that.
Q. Did you or Dr. Halford do any analysis of Kane Springs pumping impacts on the Muddy River?
A. No. No, not --
Q. And are you aware of the amended stipulation? You were answering questions about it. It's Fish and Wildlife Exhibit 57, I believe, the amended stipulation in Kane Springs with U.S. Fish and Wildlife and Lincoln County Water District and Vidler?
A. I think that Tim Mayer responded to those questions. And I do not have a lot of knowledge of amendments to the original stipulation agreement.
Q. And are you aware, in that stipulation, that Fish

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and Wildlife asked the State Engineer not to include Kane Springs in Order 1169?
A. I'm not terribly familiar with the original stipulation or with any amendment to it.
Q. And then directing your attention to page 22 of Exhibit 57?
A. Okay, um-hum. Sure.
Q. Where you want to --
MS. PETERSON: I'll be back.
HEARING OFFICER FAIRBANK: Actually if you want to finish that one question and then we'll break after that.
BY MS. PETERSON:
Q. You're asking about the geophysical surveys for the Kane Springs wells?
A. Well, I'm not asking about it. I'm just noting that I reviewed a URS well completion report that included a description of down hole surveys, including geophysical surveys that were conducted in both KMW-1 AKVW-1, and that in the interpretive material in that report, I saw no conclusions about which or perhaps maybe both sides -- these are both very deep wells completed over a large interval -- whether they are -- the completion intervals span the Kane Springs Wash Fault Zone or they're entirely limited to the northwest side of the Kane Springs Wash Fault Zone.

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I saw no indication in your report that that was interpreted from the geophysical surveys. And I just think that's critical because when you look at hydraulic data from either or both of those wells, we don't know what it means. So I do think that that question needs to be cleared up.
MS. PETERSON: I will be back.
MS. BRAUMILLER: Okay. Thank you.
HEARING OFFICER FAIRBANK: All right. So we'll go ahead and break for a lunch break. We will go ahead and get back on record and return to our proceedings at 1:15. So promptly at 1:15.
(Proceedings concluded at 12:09 p.m.)

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Q. And do you understand that the position that you -- that U.S. Fish and Wildlife is taking in this proceeding by wanting to include Kane Springs into the Lower White River Flow System would impact Lincoln County Water District and their various property rights?
ANSWERS BY MS. BRAUMILLER:
A. Well, first of all, I have to disagree with the premise of your question. I don't want Kane Springs Valley to be included. I said I think it should be considered for inclusion pending clarification of what or which sides of the Kane Springs Wash fault the two wells are completed in and the collection of additional hydraulic data to characterize the nature of the connection between Kane Springs Valley and Coyote Spring Valley. I don't -- I think what I was trying to clarify -- and I certainly don't want Kane Springs Valley to be included in the Lower White River Flow System.
I said that I think it should be considered pending clarification of what side or sides of the Kane Springs Wash fault the two existing wells are completed on and the collection of the additional hydraulic data to fully characterize the hydraulic connection between

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Kane Springs Valley and Southern Kane Springs Valley and Central Coyote Spring Valley, Consequently the remainder of the Lower White River Flow System.
Q. Mr. Mayer, sorry, I don't mean to be rude. I just -- I'm sorry. I thought I heard you say that pumping from the Arrow Canyon wells impacts Pederson Springs?
ANSWERS BY MR. MAYER:
A. Yes, I may have said that. It does.
Q. Okay. What are the impacts?
A. It lowers the groundwater level.
Q. And do you -- do you have a quantification of that?
A. It's the top plot in figure 19 in the report.
Q. Okay. Thank you.
And, Mr. Mayer, again, is the hydrologic setting for the Tule basin the same as the Lower White River Flow System?
A. The hydrologic setting? Could you define that?
Q. Like the geologic structure?
A. I don't know.
Q. I'm sorry?
A. I don't know.
Q. You don't know?

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A. No.
Q. Okay. Do you know if the recharge sources are the same?
A. I would assume that the climate's the same.
MS. PETERSON: Darn it. Thank you. Thank you.
HEARING OFFICER FAIRBANK: City of North Las Vegas.
MS. SCHROEDER: No questions.
HEARING OFFICER FAIRBANK: So, no additional questions.
Centers for -- Center for Biological Diversity.
MR. DONNELLY: Okay. Thank you.

RECROSS EXAMINATION
BY MR. DONNELLY:
Q. Patrick Donnelly, Center for Biological Diversity. I want to go back to this question of take. And so, the -- I'm trying to get at a question that involves both Ms. Braumiller and Dr. Schwemm, and so, you're going to have to build on each other's answers I think.
So, Ms. Braumiller, as you said earlier, just to confirm, carbonate pumping in the Lower White River Flow System causes spring flow declines in the Muddy

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River Spring area; is that correct?
ANSWERS BY MS. BRAUMILLER:
A. Yes, generally.
Q. Dr. Schwemm, spring declines caused a loss in habitat; is that correct?
ANSWERS BY DR. SCHWEMM:
A. Correct.
Q. Loss in habitat causes a loss of individual dace; is that correct?
A. Likely, yes.
Q. As we confirmed based on your general knowledge of the Endangered Species Act earlier, a loss of individual dace constitutes take; does it not?
A. If could, yes.
Q. Therefore, carbonate pumping causes take?
A. Yes.
Q. And thus as we defined section nine of the Endangered Species Act earlier, carbonate pumping would be a violation of the Endanger Species Act?
A. Yes.
Q. To go to the line of questioning that came up just earlier regarding the population trends of the Moapa -- oh, I'm sorry, were you not done?
A. Yeah. If it -- if it's below the -- I assume

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MX-4, the initiation of MX-5 testing, which increased the slope of decline. And then shut off of the well, we see recovery. And then it looks like we've got declining water levels going on again.

And what I was going to try to show on the other slide was that during the Order 1169 test, pumping stopped for a fairly short period of time, as I understand, to do some work on the arsenic treatment facility. But it resulted in a pretty sharp increase in water levels. And then when the pumping started again there was decline in one of those. It shows up nicely in the transducer data. So this is another part of the signature of the MX-5 pumping.

So in these two examples, you see the seasonal pumping, you see the Order 1169 pumping. MX-4 we saw Arrow Canyon pumping. I would turn these wells being well connected with the source of the stresses, those sources being Muddy River Springs area and -- Well, let's just say Muddy River Springs area for the seasonal signal and then MX-5 for the Order 1169. So it's well connected to both areas.

Same kind of story on CSVM-6, shown again pretty close to MX-5. We see similar types of responses. The seasonal pumping, the decline prior to initiation of MX-5 pumping, the shutdown of the well about halfway through the

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testing, recovery at the end of the test. And now it looks like water levels are starting to decline again after that recovery.

Another well, CSV-2, looks similar to what we saw with MX-4. So a fairly stable water levels early on, a lot of noise in the measurements. Measurement protocols were being worked on, developed, to improve those or perhaps getting new equipment that responded better. And transducer data that shows the seasonal effects, shows the 2005 recharge event, the decline in water levels following that event. Order 1169 pumping recovery and now water levels appearing to start downward again.

Okay. This is a well, CSVM-2, which is located quite a bit to the south along the highway. MX-5 is in this general location. CSI testified that that well penetrates the fault on the east side of the structural block and that the reason it's so productive is because of faults or fracturing faulting -- fracturing associated with that faulting.

And, according to the model of the permeability associated with faults, that permeability runs parallel to the strike of the fault, the high permeability. And then the low permeability perpendicular to it. And, again, this structural block is one that CSI has interpreted as being a

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low permeability.

So here we see seasonal effects and transducer data indicating connection with the Muddy River Springs area. We see the increase in slope with MX-5 pumping. We see the recovery that takes place after that and then a decline starting to appear in the more recent record. And this well is quite a bit to the south.

I'm not going to present hydrographs from California Wash or from Garnet, but they have similar responses to these, showing that those areas are well connected.

CSV-3 -- The other wells that I presented are all on carbonate. And CSV-3 is completed alluvium. And it shows similar but attenuated responses. So, fairly flat hydrograph up until initiation of Arrow Canyon pumping where we start seeing water levels decline. We see the 2004-2005 wet winter creating an increase in water levels, the decline in water levels following that until initiation of MX-5 pumping, at which time the slope of the decline increases. We see the recovery from MX-5 towards the end of this record and then water levels starting to go down.

So what this shows us is that at least at this location the basin fill aquifer is also connected with these areas. When that means is that if you wanted to go in and

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pump from the basin fill in this area, you would obviously get different responses because of the different properties in the basin fill compared with the carbonates. But the water level changes in the basin fill will be transmitted downward in to the carbonate aquifer. And because of the connectedness both with Muddy River Springs area and MX-5, those effects will be transmitted to those areas.

CSVM-4 is one that is of interest with respect to the connectedness with Kane Spring Valley. We still see similar responses, although, they are greatly attenuated compared to the others. Now, we see an increase in water levels associated with 2004-2005 wet winter recharge event. We see a decline in water levels that kind of matches the slope that we've seen in others. We see an increase in the slope associated with Order 1169 pumping. We see recovery following cessation of MX-5 pumping. And then we see water levels start to go down again.

So I would term this, instead of being well connected, I say this is connected. We're not seeing the seasonal effect of the pumping in ET in the Muddy River Springs area. But we are seeing all the other characteristics of the hydrographs that we've seen. And, you know, obviously there are reasons for why this is attenuated that CSI has discussed and Vidler has in their reports. And

I'll get in to those. Did I skip one? Yeah.

So this is CE-VF-2, which is located along the highway on the west side of this structural block. And, unfortunately, from this plot it's a little difficult to see what's going on with the hydrograph. And I guess for the record I should say that all of these hydrographs that I've been showing are out of Nevada State Engineer Exhibit Number 228, which is the 2018 HRT report. And these are all plots that were produced by SNWA.

So this is the well that had a casing failure during the Order 1169 test. So there's a sharp increase in water levels as water levels in the well try to start to calibrate with the higher water levels in the alluvium overlying the carbonates.

And what we see in it is basically a flat response and basically the noise disappeared for the most part in these measurements up until a certain point. And then we see water levels starting to go down beginning with pumping in Arrow Canyon. We see the 2004-2005 wet water recharge event. There's a period of additional decline. And I think that it's kind of hard to pick out, a decrease in water levels associated with Order 1169. At the bottom of this, I show that the later part of that record expanded just to make it a little bit easier to see. We do see that there

is still this seasonal response. But I don't think it's as well defined as what we had otherwise.

Order 1169 started approximately here and then there's a change in slope. But, unfortunately, the record is not as complete in others. And so there's still a question about are we seeing MX-5 pumping. I think we are. But it certainly can be debated. But the overall parts of the hydrograph looks similar to what I've been showing you.

CSVM-3 on, this is slide 16, is located in the northern part of Coyote Spring Valley. It is shown here right along the highway. There's an increase in water level occurring. The record starts about the same time as the recharge event, 2004-2005. This increase in water level seems to continue longer than what we see in other areas. The hydrograph flattens out and then starts going down again. And basically this is not as well connected as the other areas that we've been talking about. It's got some of the characteristics of the other hydrographs, but it's certainly much more difficult to make a definite statement that, oh, we're seeing MX-5 pumping in this well. So the degree of connection -- connectedness is less than what I've been showing you.

And then, finally -- And you've seen this hydrograph before. This is CSVM-5, which is located further

to the west. And this one is pretty anomalous to what everybody -- you know, all of the other wells have been looking at. This isn't new to you. You've seen this.

There's the recharge pulse. There's rising water levels. There's probably an adjustment of the measurement data at this break in the record and then continuation of increasing water levels to the present.

But this one clearly behaves differently than the other wells further to the east. And I'll show you gradient information a little bit later. But this well has a higher water level than those to the east.

Because of this different hydrograph response, I classify this as not connected. It doesn't mean that it's not connected. But based on the data we've got, I classify it as not connected.

So CSI has made claims that the wells that are on the western side of the structural block don't show a response to pumping the signals generated in the springs area or MX-5. I differ in my interpretation from them. I think that CSVM-2 located to the south is well connected. I showed you that hydrograph. It's got the seasonal effects. It's got all the hallmarks that we saw in, for example, MX-4. It's well connected to the sources of those signals.

On the other hand, CSVM-3 is, I classify it as

poorly connected.

CSVM-4, the one just southwest of Kane Spring Valley, I say is connected. It is on the eastern side of the structural block.

CSVM-5 I agree with that's not connected.

And this well, CE-VF-02, which is on the western side of the fault that was -- that defines that structural block has a weak connection.

Their basic claim is that as you go from east to west the degree of connection with, for example, MX-5 or with the spring area decreases. And I would say in a general way I agree with that, that it does decrease. But it doesn't necessarily mean that it's not connected.

They have made the claim that the structural block is impermeable, this is carbonate rock that is impermeable. Recognize that the carbonate aquifer is the aquifer that's transmitting all of this water. This block itself is impermeable, according to CSI.

So why would the permeability of the carbonate rock in this horst block, this structurally high block, be low? I agree with them that permeability is perpendicular to the fault is probably lower than parallel to the fault. There is a gouge zone that's developed. There is fracturing on either side of the fault that would enhance permeability parallel to the fault. So we agree on that.

But, within the fault block itself, I think the permeability is high. And I'll first talk about just in a general sense why within the region we don't -- we don't think that carbonate rock blocks between faults have low permeability or are impermeable.

You can go in to these wells when you're doing aquifer testing and run flow surveys or temperature surveys during pumping and see where water is coming in to the well bore. We did this all the time on the test site. And what you find out is that, one, you can't predict very well where the water is going to come in because you don't know where the permeable fracture zones are. You also find that in instances you know from the core or the cuttings that are collected in the well that you've gone through a fault and you see no water coming in through that fault. Certainly much, much less, I mean, to the point of not being easily detectible than what you see in other areas.

So, the structures, the fracture zones, within the carbonate block that are not the fault in many of these instances turn out to be the permeable part of the rock, not the fault zone itself.

So we know that we have of permeability elsewhere than just the faults.

I already mentioned this pumping test of ER-6-1#2. I can't get into details, because the report has not been released by the USGS. I talked a little bit about the responses seem to pumping in the near vicinity within a few miles of the pumping well itself. But USGS has done an analysis and has determined that they see responses from that pumping test in a well called Army 1, which was an old carbonate water supply well located just to the south of Mercury. And those -- Like I say, I can't get in to details, because it has not been released yet.

But there is an Amargosa tracer site located a little bit further down, a little bit further meaning in the context here, several miles, further down gradient where those pumping responses were also picked up. So we've got another example of where pumping responses from this pumping went tens of miles. And ER-6-1#2 was in the middle of this fault block. There were faults on either side of it. But we were pumping -- I say we were. I helped design the test, but I left the program by the time the test was run. But the well was in a fault block, not along the edges, not the fault down to the edges.

The carbonate aquifer that is up gradient of Ash Meadows is very transmissive. I don't know if it's the same as what we see between MX-5 and the Muddy River Springs area,

if it's that high. But it's very transmissive. There's 17, 18,000 acre feet of water coming out at Ash Meadows. And all of that water is traveling through this area to the northeast of that, which has a very low gradient. I don't have specific information that it's not moving just to the faults, but it makes sense that it's moving through the rock and the faults might assist.

The Amargosa Tracer Site, I mentioned a while ago, is a site that the USGS had constructed in the early, mid-seventies, early to mid-seventies to evaluate tracer movement, in fact, radionuclide movement in the carbonate aquifer. They actually injected tritium in to the aquifer and watched its recovery. And I don't recall the details on the wells and their productivity. But I think there were, like, six-inch wells that produced in the vicinity of eight or 900 GPM out at Bonanza King. And certainly a lot of permeability there.

And I mentioned earlier the very low gradient in most of the Lower White River Flow System I think is an indication that the fault, although they certainly have probably more barriers, is that the rock itself is permeable and plays a significant role in the transmission of water.

We mentioned earlier that we had put together a flow model, a three-dimensional flow model of this system as

well as aquifers to the east. As part of that effort we compiled transmissivity information from aquifer tests that were performed in these wells. We had I think about 25 or 30 analyses that we found. And I went through and just listed the ones with transmissivities greater than 100,000 feet squared per day. MX-5 certainly showed up in this list. MX-4 did. Arrow Canyon did. There's a lot of carbonate wells, including one way down to the south.

Let me correct something real quick. The upper ones came out of our modeling report. Well BM-DL-2, the number I pulled was the one that Moapa Band of Paiutes had put in to their initial report for transmissivity.

And so there was a significant number of wells, significant population out of this, say, 25 wells where we've got data or that I had readily available data that show high permeability. This is maybe a fourth of the wells. So, you know, there's transmissive rock out there.

Moving on to slide 21, I want to discuss in a little bit more detail the structural block as a barrier. I like CSAMT. I think that it does a very good job of picking up changes in electrical resistivity which can provide clues as to not only the geology but the hydrology.

In the profiles that were shown by CSI and in profiles that Vidler has prepared, you can definitely see where you've got faulting associated with carbonate blocks. Because if the carbonate comes up high enough that it's within the depth of investigation of the technique. You see a very definite change in the measured resistivity from the lower resistivity of the carbonate block to the higher resistivity basin fill. Yeah, I got that backwards. Higher resistivity of the carbonate rock and the lower resistivity basin fill. So it is very good at that.

It does not measure hydraulic properties. There's nothing in that technique -- It's responding to the rock matrix. It's not responding to the fractures. It does not provide you information on the hydraulic properties of the rock. It shows you where there's fault and displacements very well if you have good contracts. And, in general, I think it's a good technique and provides various flow information.

I think there is a high degree of connectivity that's been demonstrated across this block. MX-5 was said to be penetrating, getting productivity out of the fault, on the eastern side of the block.

CSVM-2, the well to the south and on the west side of the block, is highly connected with both MX-5 and the Muddy River Spring area. That signal is being transmitted across the structural block that is reported to be

impermeable. I think that indicates it is not impermeable.

And my comment here is that if there's going to be a claim that a block or whatever is impermeable, that needs to be demonstrated. The CSAMT does not provide you information on that. You just can't make the assumption because it has a high resistivity that it has low permeability. That's an invalid interpretation.

So how do you get that? You can do aquifer tests. I mentioned the response that you see across the block between MX-5 and CSVM-2. If hydrology is correct, you can maybe measure hydraulic gradients across the block. But, you know, you can have low gradients across a block that do not show that it's permeable. That may be due to just the geometry of the flow system. So you have to be careful on how you interpret stuff. And I'll show you an example a little later, I think, that also provides information this structural block has permeability.

So let's get back to the geographic boundary of the flow system. I'm going to talk about three different areas: Kane Spring Valley, which is one that others said should be included. Las Vegas Valley. I mentioned early in the presentation that there's one that I recommend kind of tongue in cheek. That's Las Vegas Valley. And then the remainder of the Black Mountains area. And I'll talk about

Rogers and Blue Point Spring in the context of that.

So Kane Spring Valley I've already discussed. The hydrograph, this is just another set of those. The presentation provided by Lincoln County, Vidler produced the diagram on the left. And this is that CSVM-4 and Kane Vidler 1 in it. And the same information is shown on the right presented in a slightly different form. It's the same data.

And one of the things that Lincoln County Vidler did on theirs was draw a line in here which talks about -- Let me look at that. I think the long term water level trend line. And that kind of draws your eye to there's this declining water level in there, at least it drew my eye to that, and drew it away from the fact that we have an increase in the slope of the decline associated with the Order 1169 test.

And so on the right what we had done is to break the lineup in to different segments, three different segments, and run regressions on those. I know you can't read the numbers on the slide. But it is in the report as well. And what we see in both of these wells is an initial trend of declining water levels, an increase in the slope of declining water levels during the period of the Order 1169 testing and then at the cessation of MX-5 pumping either a trend that is shown as being slightly increasing -- I'm not

going to claim that it is increasing. This may be the data set. We see that in Kane W-1. And then in the other well which is located to the southwest in Coyote Spring Valley return to declining water levels. And note that the slope post Order 1169 record is basically the same as what the slope was prior to that.

Lincoln County, Vidler, also performed CSAMT testing. I think it provides useful information. Again, I think it's a good technique that provides you information on the structure, especially where you have carbonates shallow enough to be picked up by the technique. If they're too deep, you can't see them.

I didn't say a while ago, but in these profiles that were produced, and I think they mentioned this, if you see blue up near the surface, it's indicative of unsaturated sediments. There's not water in the sediments to increase the conductivity or decrease the resistivity of the rocks. And that shows up as blue. It looks like it might be carbonate, but it's not. It's dry sediment. You can see in the basin fill where the sediments are saturated. They show up as red. So you can get some hydrologic information on water content and that kind of stuff as well as the location of carbonates.

So Vidler, Lincoln County, ran CSAMT surveys.

One is shown here. The trends from this outcrop area in the southeastern side of Kane Spring Wash across the wash to the northwest. Another line that has a similar trend, just to locate it a little bit further to the southwest, and then across the line. And the two lines that trend from southeast to northwest have a different response. They show different geology. That was their interpretation. That's my interpretation.

And on the basis of that difference between those two lines, they say there must be a fault in between those two. And that's the fault that's shown on their diagram as a red dash line and they have named that fault -- Let me make sure I get it right -- the northern LWFSX boundary fault. So in their interpretation, this is the boundary of the flow system. And normally a geologist wouldn't say, you know, give it a name like that. You know, they might say, you know -- I know geologist who has done a lot of work in the area and he likes naming his stuff after women that he knows. So he might call that the Susan fault or something like that. So it could be the Weiser or the Kane Spring Valley termination fault or something like that. But not, you know, indicating it's the fault, it's the boundary for the flow system.

And I don't necessarily disagree that there's a

fault in this area. I provided in my report -- And this is referred to by CSI -- a gravity interpretation that was published by Phelps and others for Coyote Spring Valley. And CSI had discussed these lines further to the south and the results from those.

And I want to concentrate a little bit on what's going on further to the north near Kane Spring Valley. And basically what this shows is that on the eastern side of Kane Spring Valley there is a gravity low in this area that indicates that carbonate rocks are deeper than they are further to the west. And there is an area of high gradient on the eastern side of that gravity level. And one of their profiles in two goes across that, not in the middle of it, because they didn't know where the middle of it was at the time they were in the survey. But their interpretation of N-2 is that there's a fault on the eastern end of that profile. And you see closely spaced contour lines in that area leading down in to the basin. The gravity data had picked up a fault in that location.

Similarly, further to the south and closer to where CSI was looking, we see another area of high gradient. The contour lines are close together. And here we have gravity profiles that again picked up faulting in that area to that gravity level in that location. And these are data

that have been available for years and are very useful. We use data, these data and other data, when we constructed our flow model.

Between N-2 and N-1, two of the survey profiles, there is an area of moderate gradient in the contour lines that extends from southeast toward northwest over to an outcrop area in the northwestern corner of the right panel on this figure that is carbonate outcrop. And this indicates that there is also likely to be some faulting in this area, something that is causing the carbonate to be deeper on the southwestern side of that moderate gradient gravity signature than to the northeast.

And this is in the same general area where Lincoln, Vidler County(sic) has interpreted a fault to be present. So I think that the location might be somewhat uncertain. This third east/west profile that they ran did not really pick up the location of that fault, but it's because the carbonate rock is too deep to be picked up by the technique.

So, you know, there's likely to be faulting in that area. We don't know specifically where it is. And based upon this conceptual model that normal faults, which these would be, produce an impediment to flow -- I like to use the term impediment as opposed to barrier, because

barrier sounds pretty absolute. Impediment allows flow to go across it. So I'm going to try to say impediment, but I'm going to forget sometimes and say barrier. I'll try to be clear, when I say barrier, I'm talking about a significant barrier. Here I'll say these faults are likely to be impediments to flow.

So we're basically in agreement with CSI that there's faulting in this area and that those faults may impede flow through Kane Spring Valley in to Coyote Spring Valley.

I had mentioned gradients earlier and this has been an argument that data set that's been available for quite a long time. And, in fact, in a previous order from the State Engineer's office pertaining to whether or not Kane Spring Valley should be included -- I don't know the terminology at that time, but, you know, their area of concern I guess for the carbonate aquifer. They had noted that -- or you had noted -- I don't know if any of you were part of that process -- but that there is water that's moving from Kane Spring Valley in to Coyote Spring Valley, that there's an area of higher gradients in northern Coyote Spring Valley than what we find to the south. So in our figure there are gradients listed in such a small font that they're difficult to read on the printed page. I put those in

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scientific notation in boxes so that you can read those.
So, up to the north between Kane W-1 and CSVM-4, we had measured a gradient that is indicated here as five E minus three. That's L-4 tran terminology. It means five times ten to the minus three. And the units would be feet per foot or meters per meter or whatever. But five times ten to the minus three is what that indicates.
A little bit further to the southwest, moving between CSVM-4 and CVF-2, the gradient is somewhat lower, but recognize that it is calculated over a much larger area and there may be higher gradient areas along that profile. We're looking at the average between those two wells. But that's four times ten to the minus four.
Another area up in the north, again, a long distance between wells, you're looking at a gradient of five times ten to the minus three. These are all reasonable gradient that you see in groundwater systems everywhere. If you saw these numbers for a gradient in, say, a basin study, your response would be that's pretty typical, you know, that's not a high gradient. That's a pretty common gradient.
When they move further to the south -- And I'll skip on down to the gradient calculated between I think that says CSVM-5 but I'm not sure, and EH-4, this well that's close to the Muddy River Spring area that Tim Mayer talked

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about, we see gradients considerably lower, three times ten to the minus five. So we're about two orders of magnitude in this area lower than what we see in the northern part of the Coyote Spring Valley.
So the argument that it's less permeable to the north I think is substantiated by the gradients that we see. We have a very good idea of how much water is moving through this area because of the discharge measurements in the Muddy River Spring area. And, you know, we know that this is very transmissive. This area to the north is less transmissive. And I think Sue Braumiller yesterday was using language like it's much, much lower or something like that.
You know, the transmissivity is potentially a couple of order of magnitude lower than what we see in this area even though you have to take in to consideration that the cross-section, the area across which the flow is occurring is larger than it is in this corridor between Coyote Spring Valley leading to the southeast down to EH-4.
CSVM-5, which I had classified as not connected to either the MX-5 pumping or to the seasonal pumping in the spring area, we see six times ten to the minus three. But, again, that is averaged over this distance.
We don't know what causes this to have a higher head and a separate hydrograph response than the other wells.

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But there's likely a structure on the east side of the elbow range in here which provides the barrier effect. And I use the word barrier here. I didn't say impediment. It doesn't mean that it does not flow across it. But it's more significant than what we see in this area. And I make that statement based upon the different hydrographic response we see in CSVM-5 than we see in these two wells at the mouth of the Kane Spring Valley.
Interestingly enough, down here to the south, which I think is CSVM-2 -- I can't read it either. But these data show a gradient -- a gradient for flow back to the north. Water levels are lower in the central part of the Coyote Spring Valley than they are to the south down where there's this little break in the range between Arrow Canyon range and the Elbow range. So water levels are higher here and they decrease to the north. We see a low gradient, you know, approximately ten to the minus four, but a little bit lower than that between those wells.
And just an aside here, the conceptual model generally has been that water is moving to the south through Coyote Spring Valley and continuing further down in to Hidden and Garnet Valley, just kind of as a continuous pathway. I haven't done an in-depth study of what's going on in this well, but that conceptual model may be a little bit of an

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error, it may be that that groundwater divide in the southern part of Coyote Spring Valley at least in the shallow part of the aquifer, maybe the depth we would have an underflow to the south. You know, we don't know.
It doesn't really affect this question of connectivity. This is a -- If this is a divide, it's a divide based on water levels. It's not a divide based on a barrier between the two basins.
To the west in the Sheep range, we have a divide in both water levels. You know, when water levels are highest and associated with the springs and the kind of stuff we see here and measured levels either to the east or west. And, in addition, we've got low permeability rock that's present in here, what's been termed by Ike Winograd as the lower class to defining unit. That's a permeability barrier as well. We have no evidence of permeability down in this area of CSVM-5.
So Vidler's argument is that the lower hydraulic gradients in the northern part of Coyote Spring Valley are indicative of lower transmissivities in the northern part of the valley. And I agree with that one on that. Something had resulted in lower permeability and lower transmissivity in the northern part of the Coyote Spring Valley than what we find in the central and southern part.

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Just another geologic aside, we've talked some about normal faulting and thrust faulting. And then there are lateral strike slip faults that are also present. And Kane Spring Valley is one of these. The primary strike slip faults in the region is the Las Vegas Valley shear zone which runs from southeast to northwest. It's a right lateral strike slip fault and it's got kilometers of displacement across it. It's believed to be a significant permeability barrier.

There are some other right lateral strike slip faults. And at least some have been mapped. And it shows up on the Reilly and others map of this area between Central and Coyote Spring Valley, the area where MX-5 pumping occurred and the other production wells are and the Muddy River Springs area. If you look on Pete's map and there is right lateral strikes that faulting indicated in this area that may be responsible for the high transmissivity we see in that area.

To the north of this figure is the Pahranagat shear zone. It's a left lateral strike slip fault and is a permeability barrier. The White River Flow System flows to the south. Water hits that barrier. And because of the high gradient that gets developed across it on the northern side of the barrier, groundwater discharges. There is surface

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water discharge in that area. There's a lot evapotranspiration that's occurring because of the low permeability caused by the Pahranagat shear zone.

There's another left lateral fault that runs up Kane Spring Valley. This is another one of these shear zones. And the argument has been that the presence of the shear zone on the southeastern side with that strike slip fault comes and turns to the south and forms a normal fault on the east side of Coyote Spring Valley, which is part of the basin range pull-apart structure. Others have interpreted it as extending a little bit further towards the middle of the valley. We don't really know.

So the presence of these right lateral faults is significant to the hydrology and hydraulic properties is significant to the hydrology of the area.

So here is the Reilly and others map of the Kane Spring Valley area. It's kind of hard to pick up. And you have to be careful that you're not -- There's also some thrust faulting that shows up in the Paleozoic rocks in this area. There's some mapping of this left lateral shear zone through here. You can see lots of older non-basin range faulting that runs through -- I take it back. I'm getting confused with the volcanics and the boulder limestones and other. You see basin range associated with faulting in the

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volcanics in this area.

One thing that I wanted to point out to you -- Oh, before I move on. This is one of the displays of the Pahranagat shear zone. So one of the displays here a little bit further to the north is another. This is left lateral movement. There's a third. This would be on echelon faulting. Basically the movement across the shear zone is taken up on several distinct faults that have been mapped and outcropped in this area.

But what I wanted to point out -- It's kind of hard to see just because of the calibration and that kind of stuff. And I'm outlining something called the Kane Springs Launch Caldera Complex. Most of that caldera complex is on the northwestern side of the Kane Spring Valley. Just to the northeast of the Kane Spring Wash Complex is another caldera complex called Boulder Canyon. And then there's a third one to the north of it, Narrow Canyon Caldera. What these calderas are, are ancient, ancient meaning tertiary, volcanic centers. A caldera is a volcanic feature in which the magma is high silica, high water content. And when they erupt, they tend to erupt explosively. So you get this large volume of ash that comes out of the caldera complex. You then have an instant magma chamber. What used to be a magma chamber is now basically empty. And the overlying rock of the volcano

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fall back in to that magma chamber and you end up with a caldera complex.

On the test site there's a large series of these that are present up in the Paiute Mesa area. Timber Mountain is a well known caldera in that area that is a little bit different. It's got a resurgent dome. These do not have resurgent domes.

They are important here though is not the fact that we've got these complexes with the boundaries as depicted here. It's the fact that we had this large magma chamber sitting in this area that had a lot of heat associated with it. You know, we're looking at temperatures in the magma chamber that are, you know, a thousand to 2,000 degrees celsius, so hot rock, a lot of heat.

Why is this important to the hydrology? That heat makes a very good tracer for water coming out of Kane Spring Valley. This is a figure that Lincoln Vidler put together showing temperatures measured in wells in the northern part of Coyote Spring Valley as well as down in the central part. And what we see here, again, the calderas are in kind of the central part of Kane Spring Valley, kind of where the labeling is. The hottest water temperature measured was 130 -- 136 degrees Farenheit in Kane W-1. A little bit to the southwest of that we had a measurement of

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106 degrees. This is warm water. And typically we talk about warm water springs occurring down in the measurement spring area. You know, yeah, there is warm water but it's not of the same temperature.

A short distance to the northwest where we've got water coming down out of Pahranagat Valley across the shear zone, water temperatures are in the upper seventies. So we're looking about, you know, 30 or 40 degrees Farenheit temperature difference between these two sets of wells in the northern part of Coyote Spring Valley.

As we go to the south, temperatures decrease, but they still remain elevated on the eastern side of Coyote Spring Valley. We've reached this complex of wells that we've been talking about and looking at values of 90, a hundred, 106 degrees. Continuing down to the south to CSVM-2 where we have still got a hundred degrees.

And then as we go, this water that's moving toward the spring area, the temperatures decline to about 90 degrees in EH-4. When the Arrow Canyon well was first pumped its temperature was similar. I'm not saying it's changed. But we're looking at similar temperature water in the upper part of the carbonate aquifer of that location.

And then, like I said, up in the northern Coyote Spring Valley on the western side, we've got temperatures in

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the upper seventies.

Move down to CSVM-5, which is this well that has a different hydrographic response on the west side, it's about the same temperature. And so what Vidler has done is interpreted flow along these paths connecting areas of similar temperature. So the wells in the northwestern part of Coyote Spring Valley with temperatures of 77 is associated with flow in CSVM-5 where the temperature is 76. So here's a western flow path in their interpretation. And I don't disagree with that.

And then they also -- they don't show flow from Kane Spring Valley down to these areas in the eastern part of the Coyote Spring Valley. But they show a flow line from this well. And I can't read what it is. But with a temperature of 99 degrees extending to the south to CSVM-2 with a temperature of a hundred degrees and then some movement. 89 degrees in the central part down to the warm springs on the Muddy River Spring area.

What's important about this is -- Well, two things that are important. The first is that this demonstrates that we've got water moving out of Kane Spring Valley in to the eastern part of Coyote Spring Valley. Kane Spring Valley is contributing flow to Coyote Spring Valley and it's contributing flow to the Muddy River Springs area.

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This is hydraulic connection. So that's one interpretation from this that I think is important.

The other is related to the structural block that CSI maintains is impermeable. We've got water on the eastern side of that block up to the north -- northern end of up close to the Lincoln County line that flows across that block to CSVM-2, which is on the western side of the block. Something is carrying this heat down to this location. It's not another magma chamber sitting down here. It's transport of heat by water from the area on the eastern side of the structural block to the western side of the structural block.

The structural block itself is permeable enough to allow that flow to occur. The faults on the side of that structural block are permeable enough to allow that flow to occur. So I've got another signal here in the data that tells us that this impermeable structural block is being mischaracterized by Vidler -- I'm sorry -- Lincoln County.

And then final note, we have gradients, and this has been known for quite a while for flow to occur out of Kane Spring Valley. The heads, the springs are about 3200 feet at the head of the valley and at the southwestern down around 1880 feet. So we know we've got flow that's coming out that's contributing flow to the Lower White River Valley flow system.

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Okay. Las Vegas Valley. I wanted to talk about this in the context of some statements made by the Moapa Band of Paiute Indians. The common interpretation of the Las Vegas Valley shear zone is it's got low permeability. Some of the first indications of that were -- Well, at least they were identified by Ike Winograd in his landmark professional paper on the Death Valley System with the springs at Indian Springs and Corn Creek on the northern and southern side. Corn Creek is on the northern side of the shear zone. Indian Springs is water coming off the Spring Mountains that's on the southern side of the shear zone. So on both sides we know that we've got a permeability barrier that causes this groundwater flow to move to the surface for discharge.

There may have been other hydrologists that picked that up earlier. Ike's is just, his was the first one that I became aware of.

In SNWA's Exhibit 9 where they were also responding to the Moapa Band of Paiute Indian claims they talked about the low permeability sediments in wells near the Las Vegas Valley near the shear zone. I'm going to say if anybody knows about the geology of Las Vegas Valley, it ought to be SNWA and the Las Vegas Valley Water District. I think this is a very significant finding or comment from them.

Jim Harrill, who is a USGS hydrologist who worked

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in Nevada for decades and moved the regional hydrology of Nevada very well was hired by the National Park Service to develop estimates to help guide us in our modeling effort of this area. And he estimated, I can't remember the number. We ended up using a value of zero, treating the shear zone as a no flow boundary based upon his recommendation.

And then, finally, when you look at water level data, you're not seeing a gradient, a nice strong gradient across the shear zone, which you would expect to see if you're getting a lot of water movement across the shear zone. On both the north side and the south side of this shear zone flow is to the southeast. So there's no indication from the data that we've got that the shear zone is a permeable area that's allowing water to leave the, you know, the area that we're concerned about. Senior moment here. So it does not appear to be a discharge area for flow from the carbonate aquifer.

City of Las Vegas did some modeling. Their estimate is that there's about 700 acre-feet flowing actually in to our flow system from Las Vegas Valley. I'm not sure I believe that. But it's still we're looking at low numbers in terms of what that flux is.

In contrast, the Moapa Band of Paiute Indians calculated the flow of about 40,000 acre-feet using darcy

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calculations of water moving across the shear zone from a well in that area that I showed you that has a value greater than 100,000 feet squared per day. And this is a considerable amount of water. And I think they're saying this so that they say that there's excess water that's available for somebody to pump.

And the reason I'm bringing this in -- Well, there's another part of this. They made this one calculation and then did a second calculation using combination flow and heat transport modeling that for their Las Vegas center they used what the current groundwater production is in an assumed steady state for the flow and it shows all of these flow lines going in to that pumping center. And I think that calculated a large area but it's including flow from the Death Valley system as well as in our system. And it's even a larger number.

So my interpretation is I believe the conventional conceptual model, I see no evidence to suggest that it's invalid. But just a tongue in cheek I guess that if Moapa Band of Paiute Indian interpretation is correct and if they get water rights based upon all of this excess water then somebody is going to be impacted by that pumping and it's going to be Las Vegas Valley, which has water that's been beneficial use for years. So don't put Las Vegas Valley

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in to the definition of this, the area.

HEARING OFFICER FAIRBANK: Dr. Waddell, we've been going for about two hours. Is this a good time to maybe take a break?

THE WITNESS: It's a great place.

HEARING OFFICER FAIRBANK: Okay. Perfect. Let's go ahead and take about a ten-minute break and so we'll go back on the record at 10:34. Thank you.

(Break was taken)

HEARING OFFICER FAIRBANK: Dr. Waddell, you may continue.

THE WITNESS: So at this point I would like to discuss the Rogers and Blue Point Springs and the reason that the National Park Service is participating in this process. Rogers and Blue Point are a couple of springs that are located in this approximate location near the Overton arm of Lake Mead. You can't see it all that well. I'll show you a geological map in just a minute. But there's an escarpment along the northern edge here of this block and the Rogers Spring fault is in this general location.

And looking at it in greater detail in this Google Earth image, Blue Point Springs is the spring that's located kind of at the apex of this geomorphic feature associated with the Arrowhead fault in this location and the

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Rogers Spring fault in this location.

So this is Blue Point. And then a little bit to the southwest is another spring, Rogers Spring. And flow from both of these areas, the discharge flows in to Lake Mead. And you can see the increase of vegetation in this area that creates habitat and is one of the few locations in this area with these type features.

There are other springs that are present along the Rogers Spring fault that I'm highlighting on the northwestern side of the road between Blue Point and Rogers Springs. And then some others that are a little more difficult to see further to the southwest.

This is the hydrograph for Rogers Spring. A little over one and a half CFS discharges. It's got a little bit of noise. When you're measuring discharge from something like this, you have problems with the flume getting chock with vegetation and stuff like that. So the record tends to be a little noisy. But we're looking on average, according to this calculation, about 1.6 CFS discharge. And I really wouldn't want to say I see trends in these data.

This is the discharge hydrograph for Blue Point Spring. A little over .5 CFS. When we get out in time, 2013, something was going on in the record here. The discharge decreased. There's a gap in the record that was

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A. I believe there is, yes.
Q. And what is that?
A. I think it's the observed water level response in those two wells to pumping of MX-5 during the 1169 testing.
Q. Okay. And we'll get to that.
I did want to ask you a question about your model. The model, did you simulate Kane Spring's pumping in your model?
A. We did.
Q. And was it a thousand acre-feet?
A. I think so. But I would have to check. On the order of that, yes.
Q. And there was drawdown at Muddy -- the Muddy River Springs area from the Kane pumping?
A. I did not investigate that.
Q. So, your model simulated the Kane pumping, but you did not investigate whether there was any impact or drawdown at the Muddy River Springs area from the Kane Spring's pumping?
A. We did not simulate that. Now, we could have done that by running simulation with that pumping, and then a second simulation absent that pumping, and then comparing the two results, but we did not do that.

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Q. Did you do any simulations of Kane pumping for drawdown at Rogers and Blue Point?
A. No.
Q. And then direct your attention to slide 23. You just had some questions about what you -- what you have showing here in your hydrograph.
The MX-5 test started November 2010, and ended in March 2013; is that correct?
A. I don't recall the exact dates, but that sounds correct.
Q. All right. And your yellow dots that you show in your hydrograph here, they start approximately nine months after the MX pumping starts?
A. Correct.
Q. And what is the explanation for that delay?
A. There was testimony yesterday by Ms. Braumiller and then testimony by me today that we both believe that there's a decrease in transmissivity as you move further north in Coyote Spring Valley, and that lower transmissivity delays the transmission of affects to the location of these wells.
Q. And then you show water levels don't start recovery until the beginning of 2015; is that correct?
A. I don't believe that's correct, no. It looks

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like it occurs -- starts to occur before that.
Q. And when do you have it occurring?
A. For KW-1, early in 2014. And for the other well there's a gap in the data at that location. It looks like based on a limited number of data points, recovery was occurring later in 2014, but then changed into a declining trend.
Q. Is there any reason why drawdown and recovery responses would be different?
A. Yes.
Q. And what is that?
A. When pumping occurs for a period of time, you get a response curve that shows faster drawdown and slower recovery. It's because of the depletion in amount of water stored in the aquifer, and the lower gradient that exists during the recovery phase.
There was a paper prepared by Stan Leake of the USGS in Arizona that evaluated this through a modeling exercise and showed very significant affects. We saw those same affects in our model of the aquifer in that Black Mesa area in Arizona. Because it's a function at how long the well is pumped in terms of the different apparent behavior in the draw -- initial drawdown and the late recovery responses.

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Q. Did you do any analysis of the affects of pumping the Arrow Canyon wells?
A. No.
Q. And in Appendix B of your report you -- well, on page 15 of your report you indicate there was pumping and you included for Kane, Tule, and Virgin River Valley. Do you recall that in your report?
A. I do.
Q. And in Appendix B, we don't see any rate of pumping for Kane, Tule, and Virgin River Valley?
A. You're referring to the table that we provided?
Q. Yes.
A. That's correct. I believe it's correct. I haven't -- reviewed that. But this table was intended to provide with the changes in pumping for the three scenarios. And the pumping in those other valleys was maintained I believe at the rates that we used for scenario one in our, approximately -- I think 2012 report on affects of pumping that had seven different scenarios. But, it was not modified in this report, and would not have impacted results from this report.
Q. The Kane -- the Kane, the Tule, and the Virgin River Valley pumping would not have impacted the results of your report?

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A. I'm sorry. The Kane would have, yes.
Q. Okay. But I thought you said you didn't -- you I didn't know -- well, you simulated pumping, you didn't know what the results were at the Muddy Springs area? Okay.
A. Correct.
Q. All right. Is there any where in your report where the affects of the Kane pumping are described or quantified?
A. I think all we showed were on some maps of drawdowns, that there was drawdown associated with the pumping of the Kane Spring wells and that drawdown extended into Coyote Spring Valley.
Q. But, of course, with your model, you wouldn't be able to have any kind of precise quantification of that that you could rely on; is that fair?
A. That's fair, yes.
Q. And if Kane should be included in the Order 1169 proceedings, shouldn't Dry Lake, Delamar, Pahranagat Valley, Cave, Garden, all the way up the pipeline to Ely, shouldn't they all be included?
A. I would say at some point the line has to be drawn. We have evidence from the responses in those two wells to the MX-5 pumping, as well as the other

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evidence that I presented earlier today, that there's a close association of Kane Spring Valley discharge with Coyote Spring Valley. And it's my opinion that pumping in the carbonate in Kane Spring Valley would effect water levels in Coyote Spring Valley.
I have not investigated whether or not that that would be -- if you could test it by pumping only Kane Spring Valley and no other wells, then you would detect that at the Muddy River Springs. My opinion is that you wouldn't, but, that in combination with the other pumping, you would see affects.
Q. And this -- that would be based on your model?
A. No.
Q. And if you could look at slide 27. You made some statements there based on the water levels you have at the bottom of the slide there. One of them you said was a 3200-foot spring at the head of the valley. Isn't it correct that that's sort of a spring in the Delamar Mountain?
A. My recollection is -- it's for a spring that's at the northeastern end of the valley.
Q. Which spring?
A. I couldn't tell you.
Q. And would you agree that the 1880-foot

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reference there to the water level at the southwest end of the valley is for the carbonate monitoring well, KMW-1?
A. It probably is, yes.
Q. And then one of the statements that you made in your report which is Exhibit 2, I believe it was on page 22, you indicate the model predicts that the carbonate aquifer at the Kane Spring Valley and Coyote Spring Valley are connected. Do you recall that statement?
A. I don't remember it specifically, but, it sounds like something that we would put in.
Q. And wouldn't you agree that connections such as your indicating -- well, such as between Kane Spring Valley and Coyote Spring Valley are built into models by their authors?
A. Would you repeat that question?
Q. Would you agree that connections such as between Kane Spring Valley and Coyote Spring Valley are built into models by their authors?
A. I would agree. I don't know if you would say that we were guided in how we built our framework model based upon the work of Rick Page and the geologic maps I had available for the area.

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MS. PETERSON: This you.
HEARING OFFICER FAIRBANK: Thank you. Next City of North Las Vegas.

CROSS-EXAMINATION
BY MS. SCHROEDER:

Q. Hello. I'm Laura Schroeder. I represent the City of North Las Vegas, and I am just going to ask you for some clarifications.
And in doing that, I'm going to have you look at your slide 40 in comparison to 41, because I'm wanting to understand better how you explained the -- how the water -- the source waters get to those springs. Because when I look at 41 in my simple lawyer way, it looks like it's an easier path than when I'm looking at 40 to get the water there.
That's the one question. Why are we trying the more difficult path? And I'll let -- I'll start with that one.
A. Thank you for giving me one at a time. Yeah, there's a thrust fault to that area that has permanent rocks in the -- up a thrust sheet that extends over a large area in the mountains.
Q. So we're looking at 40?

15 centimeters a year of recharge into the carbonate rocks. So that's the conceptual model.
That's a conceptual model and it's easily recorded or documented in our submittal. So that's what a submittal does. It's not a calculation tool, it's an illustration of how we think about the problem.
Q. So would you agree it's not a -- it's not a calibrated model, you said if it's an illustration?
A. Well, it's calibrated because we have a calibration point. We have a temperature and a head at Tule Springs that we're trying to match. And so we matched it as closely as we could with the uniform transmissivity.
See, our -- part of the -- part of the reason we did it this way is what does this system look like in the absence of features? It's unform -- uniformly anisotropic -- how should I say? There's no faults, there's no faults. There's no heterogeneity, it's all the same transmissivity, just the orientations are different.
So you take out all that stuff that the others build into -- or typically we build into a framework and we don't have that. So our model is really simple. It's not a -- it's not a calculation tool.
It's an illustration of how we think about the system with the potential for being calibrated, depending on

what your purpose might be, because this is a -- it's a powerful software that can do lots of different things that we haven't tried to do.
We just tried to set out the geometry and answer the question, why is this recommended flow domain so big, because that's where the physical boundaries are. And what are the -- what are the properties of this great big thing? Well, transmissivity pretty much has to be what it takes to get the water and the heat at the right place at the right temperature.
And so it's a beginning. It's a beginning and it's not calibrated in the sense that management tool would be calibrated, not even close. But there was a period of time devoted to calibration just as there was a period of time prior to that developing the mesh, dealing with the anisotropy angles, you know, a number of things before we could even think about calibrating in the last couple of days before sending the thing.
So it illustrates how we're thinking about it, and if we ever get back into it or someone else does, they can start making it work better.
Q. Do you -- is it a tool or calibrated in any fashion that impacts could be -- impacts could be shown that would be reliable?

A. Well, I -- at this point, and depending where, I think you could use it for first approximation of impacts. You know, something you might -- might help you design an aquifer test maybe, maybe in terms of how much area might I need for this aquifer test, because if it's tight rock, you need to be enclosed if it's like we have, you know, you'll get responses possibly miles away.
So it could be useful for test design, for identifying areas where we're less confident about the relationships, but not in a quantitative sense to -- it's not a management tool, but perhaps could be grown to be one.
Q. And so directing your attention to page 59 of Appendix 3 in your Exhibit 2?
A. Um-hum.
Q. You make a statement there at the bottom of the page with regard to pumping in Kane Springs Valley?
A. I'm sorry. I'm looking for the page.
Q. Yes.
A. Okay. Okay. 59?
Q. Yes, 59 on the bottom?
A. Okay.
Q. The very last paragraph?
A. Um-hum. Right. Those are the time of travel capture zones that the program computes.

Q. Correct. But do you agree that that should -- that's, I guess -- well, sorry.
Did you calculate the propagation of drawdown from assumed pumping in Kane Springs Valley?
A. Well, the model is a steady state model, so no.
Q. All right. And how about in Delamar Valley?
A. Well, it's a steady state model, so it's all constant in time.
Q. And then, Dr. Johnson, I'm going to direct you to Lincoln County, Vidler, Exhibit 19, and I have a copy for you here and I have a copy for your counsel.
MS. PETERSON: And may I approach?
HEARING OFFICER FAIRBANK: Yes.
BY MS. PETERSON:
Q. Are you familiar with that, Dr. Johnson?
A. I wrote it, at least part -- no, I'm sorry. I wrote it with Marty Mifflin.
Q. Yes. And if I could direct your attention to Table 1, which is on page -- well, it's page 31 on the bottom?
A. Yes.
Q. And could you read -- do you see the -- on the left-hand side, there's a column that says "far field controls," and under V-12, it says, "Kane Springs Wash Fault fault". Do you see that?

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predevelopment conditions.
So you go down the line that way. From the third column, we convert those numbers into acre feet per year, and in the fourth column, we calculate the corresponding volume of water that the total discharge to the springs area would decrease by.
And this decrease, of course, could be caused by different stresses. It could be climate or it could be production. But in our calculation, we're saying it -- we would attribute these to groundwater production for management purposes because we can't control what the climate does. We can only control what we do, educating the production from the carbonate aquifer.
Q. Okay. And then in the columns related to MRSA discharge, what is contained there?
A. Well, that is the basically the number in CFS, you just take the Warm Springs West discharge and CFS, and of course you don't do it for the first one, but you would be dividing -- you know -- well, you would get zero anyway.
But anyway you take the decrease in the Warm Springs West discharge, for example, 0.22, you divide that by the ratio of 0.076 and you get a 2.89 decrease in the MRSA discharge.
Convert it to acre feet, that means if the Warm

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Springs West, it drops to divide .22 CFS -- no, I was in acre feet. If the Warm Springs West discharge drops by 159 in acre feet per year, that would mean that the total discharge to the MRSA is going down by about a couple thousand acre feet.
And if all that's going on is groundwater production from the carbonate aquifer, you could equate that to the groundwater carbonate aquifer. You turn it around and you say, if I pump a couple thousand acre-feet, the Warm Springs West discharge will go drop by about 0.2 CFS.
Q. And according to this analysis, what amount of carbonate pumping can occur in the Lower White River Flow System to maintain the 3.2 CFS at Warm Springs West Gage?
A. Well, on this table, if you look at the rows -- the row where the Warm Springs West in the first column is at 3.2 CFS, you go across and you see that's the corresponding decrease in the discharge in the springs area is about 6,000-acre-feet per year.
I'm not going to say that these numbers are a hundred percent accurate. They are approximate again, because the analysis, we don't have like extremely accurate data. That's why we chose a range rather than a number.
Q. And you chose 6,000, is that what you mean by --
A. Well, we said that to protect the Warm Springs West discharge or keep it at about 3.2 CFS per year. We

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shouldn't be pumping more than 4 to 6,000-acre-feet per year from the carbonate aquifer.
Q. And that's rounding up from the 5908?
A. Yeah.
Q. Based on the limitations of the approach that you just described?
A. Yeah, definitely. I mean, we kept the -- all the significant digits here just for tracing the calculations. But we know it's not going to be down.
Q. Okay.
A. To that level of accuracy.
Q. Now, at the beginning of your discussion of this proportional flow analysis, you indicated that this was related to the Moapa Dace.
Is there a different analysis for what amount of pumping is allowable without impacting senior groundwater rights -- or let me ask it differently.
Is this a separate and distinct concept from what would be required regarding senior groundwater rights?
A. Yes, definitely.
Q. Okay. All right. We're going to move to another topic. This might be a good time for a break.
HEARING OFFICER FAIRBANK: We've been going for about an hour and a half, but we can go ahead and take a break

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right now if that works, if that's convenient for everybody.
MR. TAGGART: I think that would be good.
HEARING OFFICER FAIRBANK: Okay. Let's go ahead and take a ten-minute break and we'll get back at 10:15.
MR. TAGGART: Thank you.
(Recess at 10:05 a.m.)
HEARING OFFICER FAIRBANK: Okay. Let's go ahead and go back on the record. Mr. Taggart, you may continue.
MR. TAGGART: Thank you.
BY MR. TAGGART:
Q. All right. Welcome back. And my next set of questions are to you, Mr. Burns.
The number of experts in this proceeding have offered opinions regarding weather. The Lower White River Flow System groundwater levels are in a steady state condition or are continuing to decline. Have you reviewed that question?
ANSWERS BY MR. BURNS:
A. I have.
Q. Okay. And what is your view on that question?
A. Well, when I look at the water levels in the carbonate system throughout the domain, I see, after the recovery period, that I believe sort of obtained it's peak in 2016. About the first quarter, I see after that period of

within a month. But as far as recharge from other areas located farther, I can't tell you.
I did a lot of theories about that. I think that they come in pulses, like every year, you know, the precipitation of the mountains infiltrates down and creates like a recharge pulse and it moves down.
So this is probably a bunch of those coming down. So people think like recharge from thousands of years ago, you know, are coming down. So it's like a continuous and we cannot really -- we can't see that from, identify them from the record.
BY MS. BALDWIN:
Q. So water levels could be responding to all sorts of climate variability going back tens, hundreds, thousands of years?
A. It could be. But like in the analysis that I showed for the period since we've been pumping from the carbonate aquifer, the effect of recharge during that time period is much smaller than the effects of pumping.
It was probably like maximum 1.4 foot due -- changing the water level at EH-4 due to recharge changes versus four feet changed from like the early '90's to 2018 due to groundwater production to the carbonate aquifer.
Q. And that -- so that period, early 90's to 2018,

that's only about 30 years?
A. Yeah.
Q. So the water levels could be responding to something happening before that 30-year period?
A. Yeah, sure. In that recharge within the residual, it's like the effects of all of it. I can't separate it.
MS. BALDWIN: Okay. That's all. Thank you.
MS. DRICI: You're welcome.
HEARING OFFICER FAIRBANK: Next is the Moapa Valley Water District.
CROSS-EXAMINATION
BY MR. MORRISON:
Q. Morning, everybody. I'm Greg Morrison with Moapa Valley Water District. I just wanted to follow up on a couple questions regarding the efforts SNWA put into preparing its Order 1303 report.
So whoever would like to answer, feel free. I'll direct these at Mr. Burns, but if there's someone better.
So in your role as the water resources division manager, did you oversee and/or coordinate SNWA's efforts in preparing the Order 1303 report?
ANSWERS BY MR. BURNS:
A. Yes, I did.

Q. All right. And you're aware of SNWA's scientific, be it, geologic or geohydrological efforts that resulted in the reports' conclusions?
A. Yes.
Q. And in between October 2018 and July 2019, did SNWA conduct or contract to have conducted on its behalf any geohydrological studies specific to boundary flows between Kane Springs Valley and Coyote Springs Valley?
A. Not to my recollection, no.
Q. And SNWA didn't conduct or contract to have conducted on its behalf any geohydrological studies in northern Coyote Springs Valley?
A. No.
MR. MORRISON: Okay. That's all I have. Thank you.
HEARING OFFICER FAIRBANK: Lincoln County and Vidler Water Company.
CROSS-EXAMINATION
BY MS. PETERSON:
Q. Good morning, panel. Karen Peterson here, representing Lincoln County Water District and Vidler Water Company.
And, Mr. Burns, I just put in front of you a page from Nevada State Engineer Exhibit 245, which is -- it's

page 36 of the SNWA June 27, 2013, Order 1169 report.
And do you have that in front of you, the one-page document I gave you?
ANSWERS BY MR. BURNS:
A. Yes, ma'am.
Q. And at the top of the paragraph there, there is a statement having to do with CSVM-4; do you see that?
A. Yes.
Q. And is it true that this report -- your report -- SNWA's report, sorry, lets everybody know that the transducer in CSVM-4 has had a high failure rate due to the high water temperature in the well, so fluctuations of a foot or less should not be used to infer an absolute response.
Do you see that?
A. I see that.
Q. And do you -- I'm going to show you the thick document I gave you was State Engineer's Exhibit 115, which is the water level data from that CSVM-4?
A. (Nodded head.)
Q. Do you have that?
A. Yes, ma'am.
Q. Okay. And if you could look at the second page, it looks like the transducer was removed 10/14/2013; do you see that?

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A. Could you say the date again, please?
Q. 10/14/2013. It's on the second page.
A. Yes, I see that.
Q. All right. And that aquifer test, the 1169 test was conducted between November 2010 and April 2013; is that correct?
A. The test ended at the end of 2012, but MX-5 pumping continued into April of 2013.
Q. And the transducer was pulled after the end of all the pumping by about six months?
A. Are you talking from 10/14 to 5/6 -- what's your reference again?
Q. I'm sorry. When did the MX-5 pumping end?
A. Oh, in April of 2013.
Q. Okay. So between April 2013 and when the transducer was pulled in 10 of 2013, we're still having the suspect transducer or the error transducer taking those water level measurements; is that correct?
A. Well, it looks to me -- yeah, there was a failure. Failure could not connect the transducer. So for the period -- I'm just looking at the measurements and there is data.
So it's likely that once it's failed, we've installed a new transducer, but supplementing the transducer

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record are periodic measurements as well.
Q. Correct. But after 10/2013, it looks like they're all sounder measurements; is that correct?
A. After -- well, I'm going the wrong --
Q. Yeah, you've got to go up?
A. Okay. All right. That makes more sense now. Yes, they are E takes, yes.
Q. Okay. And has SNWA indicated in this page from Nevada Power State Engineer Exhibit 245, what -- how long that transducer data is suspect for that CSVM-4?
A. It doesn't appear so.
Q. And did you take that transducer failure information into effect when you were analyzing your hydrographs?
A. We use -- let me look at the hydrograph, just a sec. We have both reflected in the record, so there's a transducer and a periodic measurement.
Q. Right.
A. So --
Q. But there's no -- you know how sometimes you -- like you put on those hydrographs when the 1169 test was or there's a break because there's no data, that kind of thing. You don't have anything in your hydrographs that explains this transducer area of a foot, is there?

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A. No.
Q. And has anybody that you've heard testify earlier this week indicated in any of their hydrographs that they've accounted for this transducer error failure of a foot or so?
A. Not that I heard.
Q. All right. And the drawdowns that were -- or the impacts, I guess, or the effects that everybody's been talking about this week with regard to CSVM-4 are in that one-foot range; aren't they?
A. Yes.
Q. All right. Directing your attention to Slide 11?
A. Okay.
Q. Was there an R-squared criteria that you were using?
A. I'm not sure I understand your question.
Q. Was there any kind of target R-squared criteria that you were trying to get to?
A. Oh, for any -- for CSVM-4, the maximum.
Q. Which is?
A. Well, in this case, .82.
Q. All right. And I know you indicated in your testimony that you thought maybe that was the maximum because of the Kane Spring Wash Fault, that there was lower permeability; is that correct?

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A. Well, let me clarify, if you'll indulge me for just a second.
Q. Just a second.
A. Okay. I'm sorry, as quick as possible. What I was saying is that the effects that we see at CSVM-4 attenuated by the fabric of the Kane Springs fault structure or some other lower permeability, relatively lower permeability feature.
And we use this analysis to estimate what -- the lag time that those attenuating features have on the response measured at the well.
Q. And if there was an another new fault in that area, would your analysis still be the same with regard to the attenuated effects?
A. Yeah, the fault -- I mean, what's there is there.
Q. (Nodded head.)
A. So whether we map two more faults, five more faults, this would be the same response.
Q. Okay.
A. You know, what's there is there, right.
Q. What -- is there a scientific reference or where did you get this idea to do a regression analysis to determine interconnectedness by comparing water levels between wells?
A. Well, if you remember at the start of our

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With my recollection, just south of the spring, the spring area in California Wash, and what we're trying to look at is what is the flux in the basin fill there. So the properties we used for the transmissivity, for example, were derived from what we could find for the Muddy Creek formation.

Sadly, I guess, none of the those estimates were in that area. So, I'd say the estimate is pretty uncertain.

But there was a flux to calculate or there was calculation to determine or estimate the flux through that material at that location.

With respect to capturing that water, I think Nevada Power Company back years ago in the early '90s, maybe late '80s, tried to -- they had a well field they put in south of their I guess it'd be south and east of the springs, in the Muddy Creek formation, trying to capture some of that water.

And my recollection was that water levels declined over a period of years, and then water quality decreased and they abandoned well field. So I don't think production from that area promising.

Elsewhere, in the basin we find because of this connection, I find it would be hard to construct a well

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in carbonate system in these locations we've looked at that would not have some impact to the Garnet system and water levels in the spring area. And as we've shown there is that proportional effect to the discharge.

So, I can't think of a well location that that I would put a well thinking I'm just going to capture outflow or a large percentage of it.

Q. Okay. Thank you.

EXAMINATION

BY HEARING OFFICER FAIRBANK:

Q. I have a question for Mr. Burns.

And I'm going to refer to page 39 of your slide show, which is also Exhibit 7, page 7-5. 7.2. I believe the original report was filed in July of this year.

And I guess one of the questions I had was can you explain how assigning a dollar value could be analyzed depletion of the Muddy River ICS credits relates to the specific questions that we're set forth in Order 1303 listed by the State Engineer?

ANSWERS BY MR. BURNS:

A. I think these last two columns don't associate

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with those questions. But I do think demonstrating the impact of depleted flows at the Muddy Valley Irrigation Company is important. One of the -- I can't remember which letter, but, I believe it was -- actually I can tell you. One of the letters about capture of Muddy River flows, and spring flows. I think it relates to that to that.

C. It's actually C. C as I paraphrased here in conclusions Groundwater Production and Capture of Muddy River Springs and River Flows.

The costs, impacts in terms of cost don't relate to this. But the analysis, that illustrates the depletion on this river as result of capture of Muddy River and spring flows I think is pertinent.

Q. So I guess just as a quick follow up, so based upon that, is that an inference that SNWA may be amenable to financial mitigation of conflicts if SNWA decreed Muddy River surface water rights are depleted.

MR. TAGGART: I'm going to object. I thought this case was about facts and not about management.

HEARING OFFICER FAIRBANK: You presented the evidence, Mr. Taggart.

MR. TAGGART: You specifically told us this was not a conflicts hearing. And we submitted that

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evidence before you made that clear.

HEARING OFFICER FAIRBANK: The evidence was presented today, Mr. Taggart. Thank you.

ANSWER BY MS. PELLEGRINO:

A. I'll answer the question.

We are one shareholder in the Muddy Valley Irrigation Company and we cannot speak on behalf of what is appropriate mitigation to the Muddy Valley Irrigation Company.

There are many options which we think would be amenable to us, the least favorable of which would be financial mitigation. Because this is one of the most valuable resources to Nevada and Southern Nevada, considering that our water supply is there for seven out of every ten Nevadans and about three-quarters of the economic output of our state.

HEARING OFFICER FAIRBANK: Thank you.

EXAMINATION

BY ACTING STATE ENGINEER WILSON:

Q. Tim Wilson for the record.

I think my staff asked most of the questions as usual, which is great. But I do want some clarification on the Black Mountains area.

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ongoing temperature monitoring in the springs?
A. I'm not aware of Fish and Wildlife Services conducting temperature monitoring.
I know that SNWA is looking at installing a network of publications through the system to begin monitoring temperature.
Q. What about chemical or isotopic monitoring?
A. I'm not aware.
Q. Okay. So the only active monitoring that you know about is flow monitoring; is that -- is that fair?
A. Flow monitoring and monitoring of the Moapa Dace population.
Q. Okay. Were either of you involved in the design of the 1169 pump test?
A. I was not.
MR. BURLEY: Is that my time being up?
HEARING OFFICER FAIRBANK: That is your time, but if we have time --
MR. BURLEY: Okay.
HEARING OFFICER FAIRBANK: -- at the end, we'll circle back around. Thank you.
MR. BURLEY: No more questions. Thank you.
HEARING OFFICER FAIRBANK: Next is the Moapa Valley Water District.

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MR. MORRISON: Good morning. Greg Morrison for Moapa Valley Water District.
CROSS-EXAMINATION
BY MR. MORRISON:
Q. Mr. Marshall, I just want to clarify one thing. I wasn't sure if I heard it correctly.
Did you say that the MOA was or was not intended to apply in perpetuity?
ANSWERS BY MR. MARSHALL:
A. I believe the MOA was intended for the long-term development of the 16,100 acre-feet of water rights that -- that -- that the parties that signed the MOA had identified at the time.
So, I believe it was for the test. There were elements of the MOA that were specific to the test, but I believe the MOA overall was intended for the long-term development of the -- of the -- of those water rights.
Q. All right. And you're aware of the Moapa Valley Water District's dedication of its join springs water right pursuant to the MOA?
A. Yes.
Q. Was that dedication intended in any way to be temporary or is that a permanent dedication?
A. It's a permanent dedication, and it's very

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important to the conservation of Moapa Dace.
MR. MORRISON: Thanks a lot.
HEARING OFFICER FAIRBANK: Next is Lincoln County, Vidler Water Company.
CROSS-EXAMINATION
MS. PETERSON: Good morning. Karen Peterson representing Lincoln County Water District and Vidler Water Company.
BY MS. PETERSON:
Q. Mr. Williams, I had a couple questions for you. I'm showing you -- or I had provided to you Fish and Wildlife Service Exhibit 59. It's a biological opinion dated October 29th, 2008 for Kane Springs Valley.
Do you see that in front of you?
ANSWERS BY MR. WILLIAMS:
A. Yes, I do.
Q. And it was signed on page 50 by Robert D. Williams, Field Supervisor?
A. Yes.
Q. Do you see that?
A. Yes.
Q. Was that you?
A. That was me. Still is me.
Q. Okay. And do you -- sorry. Do you remember --

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or if you could turn to page 37, there -- there was a statement there regarding the Dace.
Do you see that?
A. In the middle of -- in the middle of the page?
Q. Yes.
A. Yes.
Q. And it was the service's biological opinion that the action as proposed and analyzed the Kane Springs Valley Groundwater Development Project is not likely to jeopardize the continued existence of the endangered Moapa Dace.
Do you see that?
A. Yes.
Q. And then also implementation of the project's conservation action will minimize any potential impacts.
Do you agree with that?
A. Yes.
Q. And then directing your attention to the other document I provided to you, it's an amended stipulation for withdrawal of protests. It's Fish and Wildlife Service Exhibit 57 and Lincoln County-Vidler Exhibit 16.
Do you see that in front of you?
A. Yes, I see the Exhibit.
Q. Do you remember the negotiations regarding the monitoring, management, and mitigation plan for this

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stipulation?
A. Yes, I do. I do remember those negotiations with Vidler and Lincoln County.
Q. And you were involved in those?
A. Yes, I was.
Q. And there's a trigger that set forth the action criteria under page 3 and 4 of Exhibit A to the amended stipulation.
Do you see that?
A. Yes.
Q. And under paragraph 2, do you see that the trigger for the -- for the flows is 3.2 CFS?
A. Yes, I believe that's correct.
Q. And then in paragraph 1 it indicates it's for flow measurements at the Warm Springs west flume.
Do you see that?
A. Yes.
Q. All right. Would you agree -- I think you had a question from your attorney that indicated that signatories to the MOU were compliant, I think -- I think -- I believe you said, with the Endangered Species Act.
Is that what you said?
A. Repeat your question, please.
Q. Did -- you indicate in response to a question

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from Mr. Taggart that signatories to the MOU and on the basis of the biological opinion, that those signatories were compliant with the Endangered Species Act?
Is that what you said?
A. I think Mr. Taggart's question was asking me if parties outside of the MOU did not have Endangered Species Act compliance, and I think I said yes.
I would like to correct that statement by saying that the parties of the Kane Springs agreement and stipulation, the biological opinion, are clearly covered under ESA.
MS. PETERSON: Okay. Thank you. No further questions.
HEARING OFFICER FAIRBANK: City of North Las Vegas?
MS. URE: No questions.
HEARING OFFICER FAIRBANK: Thank you.
Seeing no questions, Center for Biological Diversity.
MR. DONNELLY: Good morning. Patrick Donnelly with the Center for Biological Diversity. I'll try to be quick here because I do have a number of questions.

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CROSS-EXAMINATION
BY MR. DONNELLY:
Q. I'll start with Mr. Williams.
The definition of "Take" in Section 3 of the ESA is to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or attempt to engage in any such conduct"; is that accurate?
ANSWERS BY MR. WILLIAMS:
A. That sounds very accurate.
Q. And regulation in 50 CFR Section 17-3 defines that harm includes habitat, modification, or degradation where it kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering; is that accurate?
A. That's correct.
Q. Is it true that Section 9 of the ESA prohibits unpermitted take?
A. Yes.
Q. Might individuals or agencies taking action which result in unpermitted take be in violation of Section 9?
A. Yes.
Q. That you are aware of, are citizens able to file lawsuits to enforce the ESA, including Section 9, suits against entities responsible for an unauthorized take?

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A. Yes.
Q. We heard testimony that carbonate pumping in the Lower White River Flow System causes spring flow declines, including on reports you were apart of from the Southern Nevada Water Authority; is that correct?
A. Yes.
Q. And spring declines cause a loss in habitat, correct?
A. Yes.
Q. And a loss in habitat can cause a loss in overall Dace numbers; is that correct?
A. Yes.
Q. Therefore, can we make the connection that carbonate pumping causes take of Moapa Dace?
A. Yes.
Q. And, thus, carbonate pumping would be a violation of Section 9 of the Endangered Species Act if it was not permitted through MOA's and other agreements?
A. If it was not permitted, that's correct.
Q. Would entities authorizing water withdrawals causing take that is not permitted take be in violation of Section 9?
A. Potentially. But I'm not an attorney, nor do I do law enforcement. I've never --

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Q. So do you think that information is more reliable and more probative to the question of whether a fault in the Coyote Spring area can be impermeable?
You sounded pretty confident about a grouted 3,000-foot structure?
A. I don't see any of those.
Q. Okay. So, do you think there are any compartments in Coyote Spring Valley that can be pumped without impacting the Muddy River Springs?
A. Based on data available to date, no.
Q. Do you think carbonate pumping should be increased in the Lower White River Flow System?
A. I stated in my direct it shouldn't be increased beyond what's being pumped now.
Q. And did you state in your opinion on page 4 in your report that no new subdivision parcel maps should be approved?
Was that you, Mr. Davis, that said that?
MR. DAVIS: No, it wasn't me. I don't remember making that statement.
MR. MORRISON: Do you need your report to help?
MR. DAVIS: On what page of the report?
MR. TAGGART: Page 4. I can move on to another question.

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BY MR. TAGGART:
Q. And back to you, Mr. Lazarus. I'm sorry. Is it Dr. Lazarus?
A. Mister.
Q. Mister. Okay.
There has been discussion of water budgets and the use of water budgets in determining what the long-term quantity of groundwater that should be pumped in this area is.
Can you describe your view of the ability to use water budgets in this flow system versus the other type of empirical data you've been describing?
A. You know, I forget whether it was Rick Waddell or Ms. Braumiller who said we are past the point of relying on water budgets to do these kind of analyses. I agree with that.
MR. TAGGART: Is it -- is it possible to put up slide 26? I'm sorry. Maybe it's the one with the -- could you go up one more? Yeah. Right there.
BY MR. TAGGART:
Q. And my question again for you, Mr. Lazarus, it just involves your opinion regarding whether we're in a declining trend or a steady trend in water levels in the area, and I think you mentioned you'd like to see more data, that that would be of assistance to make a final conclusion.

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Is that a fair statement?
A. Yes, sir.
Q. Okay. When -- are you aware that in recent years, pumping at Arrow Canyon declined, and it probably fell by a third of its pumping previously to that. Are you aware of that?
A. I believe so. I'd have to look at the data. But go ahead.
Q. And if it -- if Arrow Canyon pumping had continued at the same rate, do you think that would affect your conclusion about whether there's declining trends at the Warm Springs West Gage?
A. We'd have to look at those data.
Q. Okay.
MR. TAGGART: Thank you.
HEARING OFFICER FAIRBANK: Lincoln County, Vidler.
MR. FREHNER: Dylan Frehner for the record for Lincoln County Water District and Vidler Water Company.
CROSS-EXAMINATION
BY MR. FREHNER:
Q. You just stated that your focus was on Kane Springs Valley with regards to the boundaries?
A. Not the southern portions. Yes.

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Q. Just the northern portions?
A. Correct.
Q. Now, in your report -- let's go back -- you -- you also stated that you didn't do any independent data gathering with regards to Kane Springs?
A. That is correct.
Q. So you pick and choose from other people's information and supplied that here today?
A. Well, given the limited budget we have, that's what we are allowed to work with, was what was out there.
Q. And given the slides that you've presented today and gone over, those were not submitted in the report, correct?
Those hydrographs that you referenced and the other data have not been supplied in the report?
A. That's correct, but hydro- -- the hydrographs are out there in the public record, and we've taken, like I said, information from other reports. Yes, sir.
Q. With regards to the Figure 1 from your -- or from your rebuttal report, it goes with -- I believe it's your Slide 7.
Now, the area depicted in this Figure 1, you would agree that this is a geologically complex area?
A. It's geologically complex, but the geology really

Moving on to slide eight. So this will be a very similar story that we see for KMV-1. KMV-1 again it was -- we don't have a record going back to before for this recharge event, but because it's close to CSVM-4 and it shows similar hydrographs, you would expect that this has an increase over what it was in the previous years. And then after that high recharge event you're going to have a general decline. And that's going to be supported by the drying trends that you see in the Palmer drought.

And, again, moving on to slide nine, I show the pumping effects. You don't see recovery responses in KMW-1. So it may be hard to discern drought from pumping effects from the declining curve. But you can definitely see because of a lack of recovery signal that the MX-5 is not connected to the KMW-1 well location.

And so I want to look at some of the other hydrographs in the region and put the focus on that recovery response.

So, prior to the MX-5 pumping, you have wells CSI-1 and CSVM-6 right near the pumping MX-5 well. Prior to the pumping occurring, you had a general decline in groundwater levels. There's some seasonal fluctuations probably due to the pattern of the carbonate pumping from overall in the system.

You'll see a recharge event responding to recharge and then decline from that recharge event to heavy precipitation in 2005 and a response that occurred later on in 2006.

And then during the MX-5 pumping test you see in the CSVM-6 that when the MX-5 well is temporarily turned off that you get these little bump-ups from the well. So you get these little recovery responses.

Moving on to slide 12. So, again, looking at the different wells, this is looking at the CSI wells, one through four, and CSVM-1 at the bottom. You're looking over here at the representative carbonate wells in the system. Again, when you look at wells that are near MX-5 well that are -- it all shows this characteristic bump in January 2012 when the MX-5 pumping was turned off.

Moving on to slide 13. And so if you look at the hydrographs for all of these wells, you also see a general up and down pattern of all of these wells responding to pumping in the carbonate system. So they're all responding. Not only do they respond to the MX-5 test but they're responding -- you see this characteristic seasonal response to the MX-5 pumping. I mean to the carbonate well pumping.

When you look at the hydrographs at KMW-1 and CSVM-4 and you look off at CSVM-1 -- CSVM-1 is right near

MX-5. KMW-1 and CSVM-4 are the wells near Kane Springs. You don't see that seasonal pattern from the carbonate well pumping before the MX-5 test began. And you also don't see any response when MX-5 turned off during 1169 aquifer test or when MX-5 finally stopped pumping at the end of the MX-5 test. And the water levels continued to decline for up to one and a half years after the pumping ends.

So people have postulated different lags for why maybe it just takes a long time for the signal to get up to these wells at KMW-1 and CSVM-4 for the MX-5 pumping. I'll talk later about it looks like SNWA is using maybe a three-month lag. I believe National Park Service expert testified there was a nine-month lag. When I looked at his chart I saw a ten-month lag before water levels started to decline at KMW-1 and then a ten-month lag for what he thought when water levels went up.

So people don't even agree on what's the lag period for when you might see a response at this well. But if you look overall, there's just no -- there's no response to the recovery.

And so another way of looking at this is a special --

Q. And, excuse me, you're on slide 15?
A. Slide 15. So what I'm showing here is I look at

the change in water level between the end of the MX-5 pumping, April of 2013, and January 2014. So I'm showing in blue wells that had a rise in water level. So near the MX-5 pumping you see blue locations as you would expect as they have rising and response to the end of the MX-5 pumping. But if you look up to the north you see red where you still have declining water levels.

So what this plot is showing is that you're not seeing any response to the MX-5 pumping in the vicinity of CE-VF-1 or CE-VF-2 and areas to the north of that.

So now I'm going to talk about some of the other analyses that others have done. Southern Nevada Water Authority has primarily relied on correlation analyses to support hydraulic connection. And then they also use the correlation analyses with a linear regression to estimate drawdown. That's very unusual to me to see people use linear regression to estimate drawdown. Typically you would use Theis equation or some variation of the Theis equation. Or in a system that's this complicated I would use a groundwater flow model. So I'm surprised in the years that they've been working at this that they don't have a groundwater flow model that they're relying on for this. Instead, they're relying on very simple linear regression.

And when I look through the USGS report that they cite, I don't see any support for using linear regression to estimate water level drawdown from an aquifer test.

So when you look at --

Q. You're on slide 17?

A. Slide 17. When you look at hydrographs and you do comparisons, generally in this area they're all kind of responding to similar patterns of climate. But you can also see, you can get kind of spurious correlations. So others that reported that CSVM-5 that's farther to the north in Coyote Springs Valley is not connected to the MX-5 pumping region. And so you could do a regression on that well of KMW-1 and you come up with a fairly high R-squared of .68 and is similar to the type of regression that you get using between EH-4 and KMW-1 without using any type of a lag. So you could find these types of spurious correlations. And I don't think this is enough evidence to show hydraulic connection and it's not sufficient to be used to predict drawdowns from an aquifer test.

And simply having correlation is not proof of causation. Causation is neither proved nor evaluated in a regression analysis.

Slide 18. So kind of an extreme example is you can look at does MX-4 correlate better to a well in Cave Valley as it does to CSVM-4. So if we look at the drawdown

over the MX-5 test or we look at the groundwater elevations, I can get a higher correlation with this well in Cave Valley than I do with CSVM-4. So this is just not sufficient evidence to support hydraulic connection or to estimate impacts from MX-5 pumping at the CSVM-4 location.

And also when I look at the analysis there's no justification given for this use of a three-month lag. And that lag is only applied -- Here you can see they apply it at the beginning of the test but they don't apply it to the end of the MX-5 pumping. So you would expect that to be shifted on both sides there.

And then I heard from the testimony that I guess the purpose of the three-month lag is they didn't know what the lag was. There was no other separate calculation or analysis to support what an appropriate lag was. They just tried various different lags to see what would give them the best R-squared. So this to me it's not appropriate. There's relatively simple equations they could use based on aquifer properties to be estimated from this testing or from modeling that you could use to figure out what the delay would be to reach the -- to see what pressure -- how long it would take the pressure signal to go from the MX-5 well up to KMW-1 or CSVM-4.

And so, again, this lag is used consistently in

different calculations and it's used to estimate the half foot of drawdown from the MX-5 aquifer test in their linear regression analysis. And what I see is that all that lag does is improve the R-squared analysis. And that lag does not apply in the correlation or I don't believe it was tested with any of the other correlation analysis.

Q. And you were just on slide 21?

A. That was slide 21. I've now moved on to slide 22. Looking at the multiple linear regression that was provided in the Southern Nevada Water Authority's rebuttal report. So when you do multiple linear regression, there's typically you can do it two ways. You can start with just one coefficient. Coefficients here are listed on the left. And add one at a time to see how that affects the R-squared and check the P-values. When you look for the P-values you want this probability to be less than .05, less than five percent. Because what that pretty much represents is the chance that your coefficient here is zero.

And so if you look at the P-values that came out of the multi-linear regression, for the Black Mountains area, it's nearly 70 percent. So there's a 70 percent chance that the coefficient here is zero and that this pumping in the Black Mountain area has no effect on the EH-4 water level.

And then, similarly, if you look at the Muddy

River Springs area, there's a ten percent chance that the coefficient is zero. And if you look at the certainty analysis given here for the Muddy River Springs area and the Black Mountain area, the certainty goes from negative to positive. So this multiple linear regression can't tell if the pumping in the Black Mountain area or the Muddy River Springs area will cause a decline in EH-4 water levels or might cause an increase in the EH-4 water levels.

And later on I'm going to go in to demonstrative and I'll go in to some more detail.

But, when I see values, particularly when you look at P-values, they're very small. When you look at the P-values that were published I believe by Fish and Wildlife or maybe it was by National Park Service, they were ten to minus five, ten to minus ten. They were virtually zero as you see here.

When you see P-values around one percent and you have these other high P-values, the next step is to do a step-by progression where you take out the Black Mountain area pumping and you take out the Muddy River Springs area pumping and run the regression again and see how the P-values change.

And, further, you can remove some of these others. And I'll show later on that the only one that

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remains significant is Garnet Valley.
So another issue with looking at the response at CSVM-4 is that the water level data are not very accurate. The transducer that was used during the MX-5 pumping interval during the 1169 aquifer test as was described in Southern Nevada Water Authority's report done in June 2013 had a high failure rate due to the high water temperatures in the well so that the data that they got from that transducer data could be off by a foot or less. And then the estimating that the drawdown of this well is a half foot. So the drawdown that they're calculating from the linear regression analysis at this well is less than the amount of air that they're giving in their transducer -- in their transducer measurements. And those transducer measurements will continue to be used in their correlation analysis. So they're included in the monthly average of water level, which is then used in the calculations.
And so another anomaly that I noticed --
Q. You're on slide 24?
A. Slide 24, yes. Another anomaly that I notice is that if you look at the MX-4 well and you look at the groundwater elevations during the MX-5 test, you look at the figure that was published in the June 2013 report, all the water levels are around 1,820 or less.

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If you look at the elevations that were used in all of the MX-4 correlation and linear regression analyses, they're all above 1,820. So there's been an offset here of about two feet. I'm not sure why the offset is there. I don't know if a different time interval was selected that was different from the period of time used for the MX-5 test or there was a survey error. But, ultimately, I think what this shows is that there's errors and uncertainty in these groundwater elevations here of two feet. So, again, if we're looking and trying to estimate a half foot of drawdown to CSVM-4 and there's errors in these data of one to two feet, the data themselves are not sufficient to be used to estimate the drawdown and the estimated impact at KMW-1 or CSVM-4.
So if you look at -- This is out of the June report from Southern Nevada Water Authority for the groundwater elevations. Now with this new water level for MX-4 it's much higher than you see than the water elevations that you get from wells around it. So that's really anomaly. That's typically your contour that that would be a source of recharge there.
So this well elevation is off now. I don't know what's the status of the other elevation to wells around it. Do they need adjustment or there's something in the MX-4 that needs to be adjusted back down. So there's a lot of

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uncertainty at least within the range of groundwater elevations that were considered in this case and the region of the MX-5 aquifer test. And so it may not be appropriate to use the MX-4 well for any kind of a correlation analysis or a linear regression prediction of drawdown.
So another thing is looking at barriers. We've looked at -- We've generally looked at CSVM-4, KMW-1, and the offset in this region versus the offset in groundwater elevations to the south. I'm on slide 27 now. But you can see if you look here at region CE-VF-2 and CSI-4 that there's a big drop in groundwater elevations just between those two locations.
And so I'm showing on the right I plotted -- I pulled both of these figures from Southern Nevada Water Authority, but I've added the red polygons and the red text and the blue polygons and the blue test and I've incorrectly plotted here CE-VF-W2. It should be just to the east of the highway and more south here. And this red line that I've added should be between CSI-4 and the corrected location of CE-VF-2.
Q. And you were just pointing at the right plot?
A. I was pointing at the right plot. The right plot needs to have location for CE-VF-2 corrected and moved to the east.

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But, anyways, you see there's most faults even though they go north-south, you do see evidence of slight slip faults that have more of an east to west direction. We were at the end of a ridge here. Why that ridge terminates near the location of the offset between these two wells is unknown. But that might be an indication that there's some sort of hydraulic barrier, in addition to the hydraulic barrier indicated by the geophysics up to the north.
So, if you look at the hydrographs, moving on to slide 28, these wells that are two miles apart, CE-VF-2, that plot in the top is to the north. CSI-4 is the plot in the bottom is the well to the south. There is an anomaly that happens at CE-VF-2 that I believe there's a hole in the casing or something where the groundwater elevation increased. But if you look at the hydrograph even before that, the groundwater elevation was around 1,856, whereas the groundwater elevation of CSI-4 is around 1,822. So there's a change in head here of over 30 feet over for this area a relatively short distance.
And others have testified that this is more of a bathtub with fairly flat gradient. You wouldn't expect to see this much offset from these two locations that are only two miles apart.
And then you also see -- I do think you see a

A. I do.
Q. Okay. And do you agree that the -- well -- well, let me strike that, please.
You had some criticism of the MLR analysis at SNWA; correct?
A. Yes.
Q. Okay. And you also are aware that SNWA did an analysis of how much groundwater can be pumped from the carbonate system while maintaining a 3.2 flow at the Warm Springs West Gage; correct?
A. I recall that testimony.
Q. Okay. Do you recognize that that analysis and the MLR analysis are two distinctly separate analyses?
A. Yes.
Q. Okay. So your critique of the MLR approach does not apply to the approach that SNWA used to determine the control in order to protect 3.2 CFS in the Warm Springs West Gage; is that true?
A. That's true.
Q. Okay. And most -- your -- your testimony indicated that the -- the conclusions and analysis that you conclude -- that you prepared were based upon the idea that additional carbonate pumping in Garnet Valley by the City of North Las Vegas would be temporary until a pipeline is built

to bring water to North Las Vegas from the Las Vegas Valley; is that correct?
A. I would say initially. I think ultimately, through additional stress testing, whether it's pumping or injection testing, will arrive at the proper amount to perpetuate from the carbonate aquifer from Garnet Valley. I don't think we've established that yet.
Q. Is the City of North Las Vegas prepared to pay for the costs of those types of stress testing that you have described?
A. I can't answer that.
Q. Okay.
MR. TAGGART: Thank you.
HEARING OFFICER FAIRBANK: The Moapa Valley Water District.
CROSS-EXAMINATION
BY MR. MORRISON:
Q. Greg Morrison for Moapa Valley Water District for the record.
Good morning, Mr. Smith. How are you?
ANSWERS BY MR. SMITH:
A. Good morning.
Q. I just got a couple questions about you spoke about the City's long-term strategy, and one of those

strategies was bringing in senior groundwater rights.
A. Correct.
Q. Does -- has the City identified or targeted any specific senior water rights to date?
A. Yes. The senior -- excuse me. The City has entered into a Memorandum of Understanding with the Church of Jesus Christ of Latter-Day Saints, the LDS Church, to initiate discussions on leasing with possible long-term option to purchase water rights from -- that are utilized along the alluvium in the Muddy River Springs area.
Q. And are those -- are those rights currently being pumped?
A. Since the decommissioning of the Reid Gardner Station power plant in 2017, these water rights were under lease for the past few decades to the power company for -- to Nevada Energy for that -- that facility.
So since the decommissioning in 2017, I do not believe they've been pumped, or if they have been, they have not been pumped to a great amount.
Q. Okay. And you said those were alluvial rights?
A. The -- they are water rights at wells that have historically pumped from the alluvium.
Q. Okay. The City's Kapex and Playa wells, are those alluvial rights or are those carbonate right -- or

wells, excuse me?
A. The wells are completed in the carbonate aquifer.
Q. Okay. So would it be fair to say that the movement of the senior permit rights that the City currently has targeted for acquisition, beginning to pump those would increase pumping in the carbonate aquifer?
A. That's correct.
MR. MOORE: Okay. Thanks.
HEARING OFFICER FAIRBANK: Lincoln County-Vidler Water Company.
CROSS-EXAMINATION
BY MS. PETERSON:
Q. Hi, Mr. Smith. Karen Peterson --
ANSWERS BY MR. SMITH:
A. Good morning.
Q. -- representing Lincoln County Water District and Vidler Water Company. I just had a couple questions for you.
Is there any recommendation by your client to include Kane Springs Valley into the Lower White River Flow System?
A. No. Again, we have not done any assessment on the other regions of the flow system.
Q. But in this proceeding, there is no recommendation by your client based on the work that they've

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its customers entirely using groundwater from the Arrow Canyon wells?
A. Yeah, I think I know that.
Q. So I guess my question for you is what should those 8500 people do for water?
MR. DONNELLY: Objection. That's not relevant to the facts and data and interpretation that Dr. Myers prepared.
HEARING OFFICER FAIRBANK: Can you relate your question to the four critical issues, the boundary, the flow of --
MR. MORRISON: We're talking --
HEARING OFFICER FAIRBANK: I understand that this is a policy issue as far as I'm understanding your question, so if you can relate it to those four questions or how within that five catch-all it relates back to those four specific questions, then --
MR. MORRISON: I'll try.
Q. (By Mr. Morrison) Dr. Myers, did you see Dr. Schwemm's presentation for the Fish and Wildlife Service?
A. Yeah, yes, I did.
Q. Do you recall seeing his slides detailing the number of Moapa dace month over month and year over year?
A. Yes.

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Q. Do you remember seeing month over month and/or year over year increases in dace numbers during certain months and years?
A. Yes.
Q. Was carbonate pumping occurring during those months of increase?
A. There was -- I mean, those increases -- there were increases that occurred during the last 15 years. And, yes, there was carbonate pumping, so yes.
MR. MORRISON: All right. Thank you.
HEARING OFFICER FAIRBANK: Lincoln County, Vidler Water Company?
CROSS-EXAMINATION
By Ms. Peterson:
Q. Hi, Dr. Myers.
A. Good morning.
Q. Good morning. Karen Peterson representing Lincoln County Water District and Vidler Water Company. Did you calculate drawdown to the Muddy River Spring area from pumping Kane Spring Valley wells?
A. No.
Q. You indicate on page 19 of your original report that Kane Springs Valley pumping will reverse the gradient and draw water from Coyote Springs Valley. Do you recall

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that?
A. Can you refer me to a section? I've got my report right in front of me.
Q. It's on page 19.
A. Okay.
Q. Middle paragraph.
A. Okay. And what was the statement again? I'm sorry.
Q. That Kane Springs Valley pumping will reverse the gradient and draw water from Coyote Spring Valley.
A. I say pumping in Kane Springs Valley that decreases that gradient would decrease flow in the CSV. Do I then say --
Q. About middle of the way, middle of the way down.
A. Well, I would say -- I would say that pumping in Kane Springs Valley, considering it's only five feet higher than in Coyote Spring Valley, if it pumped enough could reverse the gradient, yes.
Q. And did you -- how much pumping?
A. I don't know.
Q. So you didn't run any kind of model or do any kind of analysis to support that conclusion; is that correct?
A. There is not sufficient transmissivity data with which to run a model of that.

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Q. Did you look at the information that Lincoln County and Vidler have supplied with regard to their pump test?
A. I don't recall looking at that, no.
Q. Do you have the URS report from 2006?
A. I didn't review the URS report.
Q. And then going to slide 23. The conclusion that Kane Spring Valley should be managed as part of the Lower White River Flow System. And you conclude with there the high likelihood that water pumped from Kane Springs Valley would quickly contribute to the depletion of the carbonate aquifer in Coyote Spring Valley in the Muddy River Springs area. Do you see that?
A. Yes.
Q. And, again, did you run any kind of model or do any kind of analysis to support that conclusion?
A. The analysis I did was qualitative because we are talking -- I mean, the overall results of the Order 1169 pump test were that we were removing water from a carbonate well that showed a drawdown of over about a five-basin area and thus my analysis of what -- of Kane Springs Valley affecting that is that -- is just another way of removing or preventing water from being in that five -- in that really high transmissive zone in the Lower White River Flow System.

Service, SNWA, CBD, the City of North Las Vegas, all of their analysis was not available in 2013; right?
A. That's correct.
Q. And are you also familiar with the statistical analysis that SNWA performed and specifically the linear regression between MX-4 and other monitor locations in Coyote Spring Valley and the Lower White River Flow System during the 1169 pump test?
A. I'm aware of -- Yes, I am aware of the linear regressions.
Q. Okay. Well, do you know if that statistical analysis of the relationship during the pump test of certain water levels in monitor wells, I should say, that analysis was not available in 2013 either; correct?
A. Not the analysis that you presented or that SNWA presents that includes data to date, to 2019, no.
Q. Well, and the recovery of the system to the pump test, what's your view on the importance of the additional six years of data to analyzing the recovery of the system to that pump test?
A. Well, in addition to just being additional data for the regression analysis, I mean, I would think in terms of it being -- I mean, recovery data in a relationship like this can be a little different than the initial drawdown. I

mean, there can be a bit of a hysteresis effect, meaning that a lag in -- which I think actually explains -- I mean, there's a bit of a scatter around all the plots that SNWA present. And I've thought about that. Some of it is when water is going up and some of it is when it's going down. It makes a site difference and it adds to the scatter, but it doesn't take away from your overall linear regression results.

MR. TAGGART: Thank you.

HEARING OFFICER FAIRBANK: Thank you. Moapa Valley Water District? Seeing no further questions.

Lincoln County, Vidler.

CROSS-EXAMINATION

By Ms. Peterson:
Q. Hi, Dr. Myers. Karen Peterson again.
A. Good morning.
Q. Did you consider including Lower Meadow Valley Wash in to the boundaries of the Lower White River Flow System?
A. Very briefly. And I don't think I reached a conclusion. I just failed -- I just stopped considering it because there's not much data. There wasn't much reaction from the -- I think, overall, if you were to ask me I would

probably not include it.
Q. And you testified earlier today that your client's purpose was to protect the dace. Do you recall that?
A. That's correct.
Q. Would you agree that the US Fish and Wildlife Service is also the agency responsible for protecting the dace?

MR. DONNELLY: Objection.

HEARING OFFICER FAIRBANK: And what's the basis for your objection, Mr. Donnelly?

MR. DONNELLY: A hydrologist may or may not be familiar with the purpose of federal agencies.

HEARING OFFICER FAIRBANK: I think it's a fair question to the extent of his knowledge.

THE WITNESS: I'm aware that Fish and Wildlife is responsible for managing the dace.

Q. (By Ms. Peterson) And you are aware that the Kane Springs Valley project received a biological opinion from Fish and Wildlife? Are you aware?
A. I'm not aware. Though it doesn't surprise me.
Q. Okay. All right. That the service found that the project was not likely to jeopardize the continued existence of the endangered dace?

A. I'm sure that's what it said. Although I'll point out that it was prior to the pump test.
Q. And you agree that there was a stipulation that was entered in to with Lincoln County, Vidler, and US Fish and Wildlife on the Kane Springs applications that had triggers, the 3.2 trigger, action trigger?
A. I'm familiar with the 3.2 action trigger. I don't recall exactly what you just -- I'm sorry. I don't recall exactly that description.
Q. Okay. So I'll represent to you that for the Kane Springs pumping for the applications that have been approved and for future applications there is an amended stipulation and the triggers are included in that stipulation, all right.
A. Okay.
Q. So did you also hear the testimony of Mr. Williams that with the biological opinion and the triggers in place that Lincoln and Vidler are in compliance with the Endangered Species Act?
A. I believe Mr. Williams was on Monday when I wasn't here.
Q. All right. Well, I'll represent to you that's his testimony, all right.
A. Okay.
Q. So we're in compliance with the law; right?

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MR. TAGGART: Objection. This is all outside the scope of any direct that was asked of this witness.
MS. PETERSON: It goes --
HEARING OFFICER FAIRBANK: I tend to agree with Mr. Taggart's objection on the basis that this is outside the scope of his original testimony today. And I don't know that it is contemplated within the reports proffered by Center for Biological Diversity. So if you could relate the questions to those particular issues then I may entertain the questions.
Q. (By Ms. Peterson) Your recommendation to the State Engineer today on behalf of your client is that there is no further carbonate pumping; is that correct?
A. That is correct.
Q. And I'm telling you that Mr. Williams testified on Monday -- Sorry. The day that you weren't here -- that with the biological opinion and the amended stipulation and the triggers in place, Lincoln and Vidler are in compliance with the Endangered Species Act. I'll give you that premise. Is that correct? I'll give you the premise. Sorry.
A. Okay.
Q. So I'm giving you that premise and your position is that they're in compliance with the law but they should not be able to pump their water rights?

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A. My hydrologic analysis is that continued pumping of the carbonate will continue a drawdown and that will cause it to go below 3.2 and will cause it to go below further trigger points in the MOA. And I believe in the stipulated agreement you were referring to.
Q. And you haven't done any kind of modeling or any kind of Theis equation or any kind of hydrologic analysis like that to support your conclusion that Kane Springs carbonate pumping is going to impact the dace?
A. Well, a Theis analysis would be inappropriate for these conditions. But what I have done is a water balance analysis that takes in to account -- I mean, I've done a qualitative water balance under assessment that shows we have not yet captured all of the spring -- I mean, pumping has not captured spring flow. I mean, it has to eventually capture spring flow. It's the first principle. And so -- And it's continuing to go downward and, thus, eventually pumping. And I do think continuing in Kane Springs Valley will contribute to that, yes.
MS. PETERSON: Thank you.
HEARING OFFICER FAIRBANK: City of North Las Vegas?
MS. URE: No questions.
HEARING OFFICER FAIRBANK: Seeing no questions.

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Georgia Pacific Republic?
MS. HARRISON: No questions.
HEARING OFFICER FAIRBANK: Seeing no questions. Nevada Cogeneration and Associates? Seeing no questions.
Muddy Valley Irrigation Company?
MR. KING: No questions.
HEARING OFFICER FAIRBANK: No further questions. Bedroc?
MS. URE: No questions.
HEARING OFFICER FAIRBANK: No questions. And Nevada Energy?
MS. CAVIGLIA: No questions.
HEARING OFFICER FAIRBANK: Seeing no questions, I'll open it back up to Division of Water Resources staff. All right. We'll open it up one last time. Coyote Springs Investments, do you have any further questions?
MR. HERREMA: No.
HEARING OFFICER FAIRBANK: US Fish and Wildlife? National Park Service?
MS. GLASGOW: No questions.
HEARING OFFICER FAIRBANK: No further questions. Moapa Tribe? No further questions.

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Southern Nevada Water Authority? Seeing no further questions.
Muddy -- or excuse me. Moapa Valley Water District? No questions.
Lincoln County Vidler? No further questions.
All right. I'm assuming that then everyone else who hasn't asked any questions doesn't have any questions. So I'm not going to go through the list name by name unless anybody really expects me to do so.
All right. Now, let's go ahead and take about a five-minute break and then we'll transition -- Oh, I'm sorry. Mr. Donnelly, do you have any redirect?
MR. DONNELLY: Just a minute or two.

REDIRECT EXAMINATION

By Mr. Donnelly:
Q. Thank you. Patrick Donnelly for the record. I will not be using our full 46 minutes. Just a couple of quick questions.
Would you say that, Dr. Myers, that the pump test, Order 1169 pump test, presented substantial new information to our understanding of the hydrology of the Lower White River Flow System?
A. Yes.
Q. You were evaluating this system prior to the pump

I believe this was in SNWA's presentation. But this is a simple scatter graph with a correlation coefficient between CSVM-4 and the one I was talking about in EH-4 with the R-squared value of .82.
Q. (By Mr. Flangas) That was also contained at page 15 of our NCA Exhibit 1; correct, Mr. Coache?
A. Yes, sir.
Going to slide 33. SNWA did not calculate a correlation between EH-4 and KMW-1, therefore a direct visual comparison of the hydrograph of CSVM-4 and KMW-1 wasn't done. The visual comparison was done because at the time I could not locate the data to actually do the actual analysis. And I'll talk about that a little bit later also.
But the visual comparison found that the hydrographs for CSVM-4 and KMW-1 are virtually identical with an estimated R-squared value greater than .9, which indicates a high correlation between KMW-1 and carbonate wells in the Lower White River Flow System with a high level of hydrologic connectivity across all of the basins within the Lower White River Flow System.
34. Lincoln-Vidler also claims that there was no effect ascribable to the start and stop of the Order 1169 aquifer test. NCA believes that the contrary is true and that there is a high correlation between KMW-1 and carbonate

wells in the Lower White River Flow System with a high level of hydraulic connectivity across all of the basins within the Lower White River Flow System including Kane Springs Valley.
Below is statements from the following agencies which all make various references that are supportive to the inclusion of Kane Springs Valley within the Lower White River Flow System.
And I want to make it clear that not every one of these agencies specifically state that Kane Springs Valley should be in the Lower White River Flow System. But they do make statements that indicate that there is a connectivity between Kane Springs Valley and the Lower White River Flow System.
The purpose of this slide is to discuss -- We've been discussing item A in the State Engineer's questions. And this is also going to go in to item E a little bit with other things that are of interest. And the reason that this is important is that in the event that Lincoln-Vidler develops water from KPW-1 and the State Engineer excludes pumpage from that well, from the management of the Lower White River Flow System, there would be detrimental impacts to existing senior right owned and controlled by NCA and other senior water right holders, users within the Lower White River Flow System.

The Lincoln-Vidler groundwater rights are junior in priority to approximately 98 percent of the groundwater rights within the Lower White River Flow System and during any curtailment of pumpage within the Lower White River Flow System. Assuming that Kane Springs Valley was included, the Lincoln-Vidler rights would be among the first in the subject to curtailment.
HEARING OFFICER FAIRBANK: And excuse me really quick. Just to let you know, Mr. Flangas, you're at 40 minutes.
MR. COACHE: We're at 40?
HEARING OFFICER FAIRBANK: Yes.
MR. FLANGAS: This is the next slide. Hold on, Bob.
MS. PETERSON: So we objected to slide 36, which is all new analysis as to why the inclusion of KSV is important.
HEARING OFFICER FAIRBANK: So, based on my review of the report, it appears that the first bullet point is contained within the report. But based upon my review of the substance of the analysis relating to the inclusion of Kane Springs Valley, the second two bullet points don't appear to be directly contained within the report. Mr. Flangas.
MR. FLANGAS: They're not essentially contained

within the report. They're an analysis. I mean, to the extent that they're -- They are essentially just analysis. They're not really contained in the report. They're just an analysis --
HEARING OFFICER FAIRBANK: Can you explain to me? Because this appears to me to go beyond the scope of the Order 1303 limitations, which is really the scientific analysis, and this seems to extend more in to the policy analysis.
MR. FLANGAS: It's a little bit of the other matters.
HEARING OFFICER FAIRBANK: So on that basis, on the basis that both it's not contained within the rebuttal report doesn't necessarily seem directly related and outside of the scope, I'm going to go ahead and sustain the objection as to the second two bullet points but overrule the objection as to the first bullet point.
Q. (By Mr. Flangas) Okay. Just limit it, if you would, Mr. Coache, to the very first bullet point.
A. And we apologize. There was a little bit of a different interpretation of E on your key points that you're interested in.
So sticking with the first bullet point, assuming that the Nevada State Engineer determines that the maximum

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CROSS-EXAMINATION
By Ms. Peterson:
ANSWERS BY MR. RICCI:
Q. Gentlemen, Karen Peterson here representing Lincoln County and Vidler Water Company.
So, Mr. Ricci, just following up on that last statement that you made. Mr. Coache indicated that I guess it was his recommendation that Kane not be included right now in terms of the boundary at this stage. So you disagree with that?
A. Hugh Ricci. No. What I said had I -- if I were to issue Order 1169 again and had the information that I had available then as there is enough information today I would have included it.
Q. Right. But is it your testimony today that the boundary should not be changed? As we are now in this proceeding, the last bullet point on slide 40, says that the recommendation is, I assumed of Nevada Cogen, that the boundaries not be changed.
A. You know, when we -- Hugh Ricci again. When we did this, this was a collaboration among the three of us, and there were certain things that we thought of and two to one or whatever, however it was ruled, we put it in it. But the answer to my question originally that you asked is what I

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would do then if I knew what I do know today.
Q. So do you support that bullet point or not?
A. Since my name is on the report I would say yes.
Q. Did any of the three of you calculate drawdown to the Muddy River Springs area from pumping Kane Spring Valley wells?
MR. COACHE: I first want to clarify the bullet point, the previous bullet point. My position hasn't changed in that I believe Kane Springs Valley should be included. I don't believe this is the venue for which to discuss that. And that's why that bullet point says what it does in relation to the next phase.
The answer to your question is that I did not calculate drawdowns of the Muddy River Springs area from Kane Springs pumpage.
MS. PETERSON: Mr. Dixon?
MR. DIXON: So.
MS. PETERSON: Did you calculate drawdown to the Muddy River Spring area from pumping Kane Spring Valley wells?
MR. DIXON: No. And that wasn't the purpose of that regression analysis.
MS. PETERSON: Mr. Ricci?
MR. RICCI: No.

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MS. PETERSON: All right. Did any of the three of you calculate drawdown to the wells owned or controlled by NCA from pumping Kane Spring Valley wells?
MR. DIXON: No.
MR. RICCI: You're asking each us of us again, Ms. Peterson?
MS. PETERSON: Yes.
MR. RICCI: No. The answer to that question is no.
MR. COACHE: I'm sorry. I didn't follow that question.
ANSWERS BY MR. COACHE:
Q. Mr. Coache, did you calculate drawdown to the wells owned or controlled by NCA from pumping Kane Spring Valley wells?
A. No, I did not.
Q. Mr. Coache, did you review the hydrograph of the KSVM during the Kane Springs pump test? KSVM-4, sorry, well.
A. I'm sorry. What did you ask?
Q. Sorry. It was bad. Did you review the hydrograph of the KSVM-4 well during the Kane Springs pump test, the aquifer test?
A. I did.
Q. And do you agree that the pump test was for 1800

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gallons per minute?
A. I can't -- I believe that's the number but I can't say for sure.
Q. And do you agree that from that well where the pump test was conducted that Lincoln-Vidler was awarded 500 acre-feet which when pumped would be much less than the 1800 gallons per minute?
A. Well, it depends on over what time you pump the water.
Q. Well, do you understand that 1800 gallons per minute that was a continuous pump test?
A. Yeah, absolutely. But if you want to take your water out over a one-month period it might be 1800 gallons a minute.
Q. Right. But you would have no idea what the plan is for the development of the water out of that well, the 500 acre-feet, do you?
A. But you didn't ask me that.
Q. Do you have any idea?
(The court reporter interrupts)
THE WITNESS: No.
Q. (By Ms. Peterson) And you indicate on pages -- page 18, I think, Mr. Coache, you wrote this section of the report, NCA number one. The last sentence there right before

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subsequent to the -- not subsequent to, but after the protest period is expired, have been excluded all the time.
Q. (By Mr. Flangas)
ANSWERS BY MR. DIXON:
Q. Mr. Dixon, have you ever experienced a situation where folks who do not have water rights in the area in the basin that is subject to hearings have been excluded on the basis of standing?
A. Not beyond the situation that Mr. Coache just mentioned. You know, our process is transparent. It gives people a right to protest, right. And it doesn't matter who you are, you have that right.
Q. But isn't that the reason why we had .1 in our rebuttal report?
A. Right. We feel that the stakeholders who have the most on the line here are the people who have invested to resources, the people who rely on that water to run their business or to -- The 8500 people in Overton and Logandale, the Moapa Valley Water District is required by law to deliver water. Those are stakeholders. The public interest is by law protected by the Fish and Wildlife and the Park Service. That's their job. And it's also the job of the State Engineer.
Q. Okay. And that is the reason for the inclusion

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of the .1 in the rebuttal report?
A. It was.
Q. Okay. We don't have any -- We don't have anything -- We're not out to get the NGOs in any particular reason. And I say we meaning Nevada Cogeneration Associates.
A. That's correct.
MR. FLANGAS: Okay. Thank you. I have no further questions.
HEARING OFFICER FAIRBANK: Thank you. So we will go ahead and take a ten-minute break. We'll get started around, make it 2:45-ish, a little bit thereafter. And we'll get started with the Muddy Valley Irrigation Company.
(Break was taken)
HEARING OFFICER FAIRBANK: We will continue with the Muddy Valley Irrigation Company.
MR. KING: Thank you. Good afternoon. Steve King here for Muddy Valley Irrigation Company. This afternoon I'm going to present for the hearing Mr. Todd Robison, who is the chairman/president of the Muddy Valley Irrigation Company.
The company filed one exhibit in its August 15th, 2019, rebuttal report. And Mr. Robison will be going over that for the proceeding this afternoon.
So, in order to begin, if the witness may be

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sworn in.
HEARING OFFICER FAIRBANK: Thank you, Mr. King.
(The witness was sworn in)

TODD ROBISON
Called as a witness on behalf of Muddy Valley Irrigation Company, having been first duly sworn Was examined and testified as follows:

DIRECT EXAMINATION
By Mr. King:
Q. Good afternoon, Mr. Robison. Can you please state and spell your name for the record.
A. Todd Robison, T-o-d-d R-o-b-i-s-o-n. I'm the president of the Muddy Valley Irrigation Company here representing the shareholders.
Q. Thank you, Mr. Robison. And did you prepare or direct the preparation of the Muddy Valley Irrigation Company Exhibit Number 1?
A. I did.
Q. Are there any changes to that exhibit that you would like me to identify for the record?
A. There is. There's a couple of typographical errors.

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MR. KING: And, if it please the hearing officer, I would be prepared to identify those specifically. On page one, paragraph two, at line six, there is a missing word, specifically after the words State Engineer's options in view of, the word that is missing should then be inserted and that word is what. And that will then complete that sentence.
And then there is another clerical error, typographical error, that the company is aware of. And that would be on page three. And that is in Roman numeral section two at sub three. The first line, which reads, the long-term annual quantity of groundwater that may be purged from the Lower White River Flow System. The word should be pumped, not purged.
So with the permission of the hearing officer, we would like those to be entered in to the record. Are there any other corrections that you're aware of, Mr. Robison?
THE WITNESS: Those are the corrections, yes.
MR. KING: Okay. Thank you.
HEARING OFFICER FAIRBANK: Those exhibits -- Those exhibits will be admitted.
Q. (By Mr. King) And was Muddy Valley Irrigation Company's rebuttal report filed pursuant to State Engineer Interim Order 1303?
A. Yes.

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valley. The geologic map indicates that many of them also have left lateral strike-slip fault like the Kane Springs Wash fault.

The basin boundary is down here just at the edge of this last outcrop on the southwest part of Kane Springs Valley. And that's where Vidler-Lincoln County's production well is.

So the question is, is this recharge in Kane Spring Valley flows from northeast to southwest. And however much flow that is, it ultimately makes it in to Coyote Spring Valley where it joins the regional flow and heads southward towards the Muddy River Springs.

And this cross-structure here, it may impede flow, but it's not a barrier to flow. Whatever the recharge is in Kane Springs Valley is going to make it over, around, or through that fault. There's no other option. It doesn't go anywhere else. No one is suggesting that it goes anywhere else. So that water ultimately makes it in to the Lower White River Flow System.

So in terms of pros and cons, can Kane Springs Valley -- can it be managed without including it in to the Lower White River Flow System joint management area? And in our rebuttal report, I suggest that yes, it could be.

Alternatively, we've heard a lot of evidence this

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week that is, you know, fairly compelling evidence to include it in to the White River Flow System joint management area, considering that it's in a shared carbonate aquifer, it responded to the 1169 aquifer test, it's right on the boundary, and pumping there would in fact, we could argue, ultimately capture water that flows south in the Lower White River Flow System. So there's some compelling arguments both ways.

I want to talk about the Lower Meadow Valley Wash. Now, this figure is from the base map that I got off of NDWR's website. And I just -- I needed to have something that had basin boundaries on it and kind of showed where things were. So this is Lower Meadow Valley Wash is this basin here bounded by this green line. This big spring symbol is the headwaters at the Muddy River springs area. And water flows from north to south.

And in the water budget that the State Engineer accepted for the Delamar, Dry Lake, and Cave Valley hearing, it was recognized that there is some flow from Lower Meadow Valley Wash that flow south and ultimately probably contributes to the Muddy River above Glendale to the extent that that water contributes to the Muddy River, capture of that water might conflict with existing rights.

There was also discussion about whether or not

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there was flow in the carbonate. And although it's hard to see on this slide, this area here from where I have this blue area and my laser, to the west is carbonate. And it has been suggested that there might be flow from north to south in the carbonate in the Lower Meadow Valley Wash and that might contribute to discharge of the Muddy River.

Now, there is a monitoring well north of the Muddy River Springs. That is CSV-2. And water levels there are about 18 feet lower than at Pederson Spring. But still those water levels are higher than the Big Muddy Springs. So is there a potential for a flow? Yes. Are we certain that flow exists? There's really nothing close to enough evidence.

But if one of the parties that owned the water rights in the Lower Meadow Valley Wash wanted to go up on the carbonate and pump water, then the State Engineer would have to then consider would that be conflicting with existing rights.

These are very old groundwater rights relative to the Lower White River Flow System, as the expert for Nevada Cogen pointed out, including the joint management area could bring about some issues.

Finally, the Black Mountains area and the Las Vegas Valley shear zone. So this is the same basin map. I

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got it from the State Engineer's website. And it shows in blue, carbonate rocks. In tan, sedimentary rocks. And then in very light color, alluvial rocks.

I also drafted on, liberally, the basin boundaries. So the north center part of the slide, and this is slide ten, that's Garnet Valley. To the southwest Las Vegas Valley. To the east is California Wash. And to the southeast is the Black Mountains area. And then I also drafted on the Dry Lake thrust fault and the Las Vegas Valley share zone, which isn't exposed because it's covered by alluvium.

I have shown on here BM-DL-2 and that's the monitoring well near Nevada Cogen's pumping center. BM-DL-2 tracks very well with the rest of the carbonate. Many of the other carbonate wells, including EH-4, clearly shows that at BM-DL-2 you're part of the Lower White River Flow System.

KBN-4, that data it's difficult to determine really what they're measuring. I would not recommend that you separate that pumping center from the Lower White River Flow System unless somebody could prove to you that it was not connected. And that evidence doesn't exist.

As far as the carbonate rocks in Las Vegas Valley, I'm not recommending that you extend the system down to Las Vegas Valley shear zone, but there really is no data

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area. They had a transmissivity estimate, not so much from the local wells because they didn't really have that data. So they brought in estimates from elsewhere. So they had transmissivity, they had width, they had a thickness, and they had a gradient. And that's all you need to estimate flux. And they estimated 9900 acre-feet.

Andrew Burns testified last week and I think he kind of walked it back a little bit and said he wasn't that confident with the transmissivity estimates. I don't disagree. But the state accepted that discharge. And this discharge was then in the recharge estimate spread out through the Lower White River Flow System.

Ironically, to the west of that segment, there is a section of carbonate rock with a lot of north/south structure. And I thought, and I think now, that if subsurface flow occurred, it would have occurred through the carbonate rock. But there's no data there, so there's nothing to support how much flow that might have been. So, anyway, that was the number was 9900 acre-feet.

I just want to look here at -- this is the south and eastern boundary of the Lower White River Flow System. I drew this red line in on top of the Harrill boundary fluxes. That red line -- There's a scale bar. That scale bar is 30 miles. That red line is 35 or 40 miles long. There's a head

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difference from the Lower White River Flow System carbonate to Lake Mead. Heads in the Lower White River Flow System carbonate are about 1800 feet above sea level. Lake Mead is about 1100 feet above sea level and dropping. Nobody has -- So that's 700 feet of head differential.

MR. TAGGART: We're just going to lodge an objection that none of this information is in the report. This exhibit is not in his report. The line that he's drawn on it is not on the report. The section on Harrill is not in the report. None of this information is coming from his report. It's all been generated for this power point. So on this particular slide we object to testimony being offered with respect to opinions that are opined in the report.

HEARING OFFICER FAIRBANK: Thank you, Mr. Taggart. So your objection is that the slide and the testimony associated with the slide is beyond the scope of the report that was submitted. And your objection is noted. And the State Engineer will assign the weight of the testimony when the totality of the evidence is considered in this matter.

THE WITNESS: Okay. I'll continue. Anyway, there's 700 feet of head differential. There's no evidence that the rocks around the periphery of the Lower White River Flow System are impermeable. There's no reason to believe

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that there wouldn't be some subsurface outflow. We don't know how much it is. Nobody knows how much it is. But there is likely some. And I think that our water level and flow data are telling us that perhaps there is -- at least there's something else that's being captured.

So, again, these were the figures. This is capture. Currently, we're still losing water from storage in the Lower White River Flow System. As we lose more and more water from storage, we capture more and more subsurface outflow. That's -- That's what these hydrographs tell us.

We have -- This upper figure, it doesn't match our observations. Our water levels -- Our water level trend in EH-4, we're down here, we're down here, which tells us we should have captured most of our pumping from discharge but we don't. What we see is that the discharge capture is leveling or even decreasing. We've seen an increase in flow of the Muddy River. That's not the way the system should behave, according to these rules.

What I am suggesting is that we're perhaps out in -- I'm showing the lower right figure. We're showing water levels at least in the Muddy River area leveling out but our capture of the river isn't up here at this high number. It's somewhere else. It's something less.

So this is the hydrograph. This is EH-4. It

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shows that our capture, at least in the Muddy River Springs area, which is our area of primary concern, is leveling out. Our river flow of the Muddy River at Glendale, we're not seeing that -- Our pumpage is seven or 8,000 acre-feet a year. We're not seeing that capture. In the Muddy River our waters levels are leveling out, but we're not seeing the capture and we should be seeing it. Something else is being captured.

There is a time factor here. But we do see that the system has responded relatively quickly. And I don't think that we're seeing something happening in one area and not seeing it in another area.

Other areas are still -- Our other areas are still losing storage. So in the top we've got Coyote Spring Valley. In the top figure we see -- we are seeing continued decline. The next line down, that's EH-4. We can argue about that forever. The middle line of that is TH-2. Then we see Garnet Valley and then BM-DL-2 in the Black Mountains area. And we still see a bit of a decline. We're still losing storage in those areas.

These are two figures from SNWA's report and I'll just touch on them real quickly. The bottom one is a computed capture of the Muddy River based on Warm Springs West discharge. So they use their regression analysis to try

That 3.2 CFS trigger may not be appropriate if pumping occurs from less well-connected areas. Some of the parties have various that are probably less well-connected. If your trigger is at your discharge point, by the time you reach that trigger and your pumping has taken a long -- your signal has taken a long time to get there, that trigger is not properly placed. It's too late.

Finally, the memorandum of agreement probably needs to include all water users to be of real benefit in the future.

So I'll just go to my summary. There are pros and cons to adding the various basins to the joint management in the Lower White River Flow System. There has been a lot of evidence on Kane Springs Valley. We put in our report that the State Engineer could manage Kane Springs Valley without including it in the Lower White River Flow System. There has been an abundance of very compelling evidence. And we now say that we should include Kane Springs Valley in the joint management area.

As far as the Lower Meadow Valley Wash, that evidence is less compelling. Recovery from the Order 1169 aquifer test was complete within two or three years after pumping. Water levels continue to decline every where except perhaps in the Muddy River Springs area, where that water

level decline is imperceptible, we'll call it, over the last two years.

Flow at Warm Springs West and the Muddy River appear at the time being to be stabilized under this current pumping regime. There have been changes. But for the most part it's been fairly steady at about 8,000 acre-feet of carbonate pumping.

We agree that more time is needed to make sure. Pumping from the carbonate anywhere in the Lower White River Flow System will capture Muddy River flows. With that, we also agree.

Subsurface outflow is likely, given the vast extent of the southern and eastern perimeter of the flow system.

No evidence has been put forward that rocks bounding the Lower White River Flow System are impermeable. The subsurface flows exist. It is possible to capture a portion of this outflow resulting in less than a drop-for-drop capture of the Muddy River.

And I think our data is actually showing us that. We have many lines of evidence. And I think they're showing us that maybe that drop-for-drop capture of the Muddy River is not occurring.

Observed water levels in the Muddy River Spring

area and flow data are telling us that we're not having one-to-one capture. But I want to put it in to context of the big picture. SNWA has made an argument that perhaps the most that you could pump is 6,000 acre-feet and keep the trigger level at Warm Springs West about -- above 3.2 CFS. Our current pumping is rate is whatever, 7500 to 8,000 acre-feet of carbonate pumping. That's not a lot more. I don't think that these data disagree with SNWA's conclusion all that much. But I do think that we need a little more time to know for sure.

If future pumping occurs in less well-connected areas along the periphery of the main carbonate aquifer, pumping effects, drawdown, and stream capture will be delayed in the Muddy River Spring area as will recovery.

We need to continue to monitor flows and water levels during under the current pumping regime for at least a year or more. Warm Springs West flows are just over 3.2 CFS. There is no room for additional stresses in the system at this time.

Lastly, it is in the state's interest, contrary to the opinion of an expert for US Fish and Wildlife Service, it is absolutely in the state's interest and all of the water users to protect the Moapa dace. I think it's very important to honor that 3.2 CFS trigger at Warm Springs West. And it

is very much like the Devil's Hole issue. Water levels in Devil's Hole dropped. The habitat of the Devil's Hole pup fish was imperiled. And a federal district court judge decided how much water needs to be in Devil's Hole. We could very easily have the same situation in the Muddy River Springs area if flows in the Muddy River Springs dropped and imperiled the Moapa dace. And then we would have a federal district judge managing water in Nevada and not the state. And I think it's for the benefit of all of the users that the state continue to manage these water resources and not a federal court judge. And that's all I have. Thank you.

MS. CAVIGLIA: We would request that Nevada Energy Exhibit 1 be admitted in to evidence.

HEARING OFFICER FAIRBANK: Exhibit 1 is so admitted.

MS. CAVIGLIA: And we would also echo SNWA's request for additional briefing. As Mr. Felling indicated, one of our opinions has changed through the course of this hearing.

HEARING OFFICER FAIRBANK: Excellent. Thank you. All right. We'll go ahead and commence cross-examination, starting with Coyote Spring Investments. You have seven minutes.

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your view on whether the State Engineer needs a groundwater model constructed now in order to make the determinations that are required or that are asked under Order 1303? Can the 1303 increase be answered without a groundwater model and just based upon the stress data from the Order 1169 pumping test and the recovery data from that pumping test?
A. So there is a groundwater flow model that was constructed by federal agencies. And, try as they might, they really weren't able to replicate the system very well. They underestimated a lot of the effects. And it wasn't because they didn't try. I just think it's a very difficult system to model. I think at this stage our observations are enough to make future decisions. And so, no, I don't agree that a model is necessary.
Q. Okay. Could you turn to slide number 32, please. And just quickly, you made a comment during your testimony that the -- And I don't remember exactly what it was. But I wanted -- it had to do with the difference between these two charts and the values depicted on the charts. Do you recognize that in the lower pane, which is Figure 6-3, there's a symbology there that indicates MRSA discharge capture. And so this is showing discharge, which is more than just stream flow. And then do you notice that up in the top panel that that is just showing stream flow? Does that

make sense?
A. I see that.
Q. One last question at least for now is on the slide before that. Do I get to ask it?
HEARING OFFICER FAIRBANK: Ask your question.
MR. TAGGART: Okay.
You testified about slide number 15 and I want to ask you, you indicated that a trend line should be based upon a -- using the same value from each month if you want to develop a trend line. And so I have two questions, I guess. Well, I can't have two questions. Did you do that and did -- and would it be appropriate in your view if the high point in the hydrograph in a given year were used as the recovery point, if you will, in that year and then the trend line based upon that high point in the data set in a given year?
THE WITNESS: So, I'll answer the first question first, did I do it. I drew the line in general through the middle of the data. Perhaps I should have angled it up more I think to match that data.
And your second question, could you draw a line across the high point is no more valid than drawing a line across the low point, in which case you would have opposing trend lines. So you can draw the line anywhere you want. When you have a short period of record and a high period of

estimates like this, I think the actual data are somewhat ambiguous and then you need a longer period of record.
MR. TAGGART: Thank you.
HEARING OFFICER FAIRBANK: Moapa Valley Water District? Seeing no questions.
Lincoln County, Vidler?
CROSS-EXAMINATION
By Ms. Peterson:
Q. Thank you. Mr. Felling, Karen Peterson representing Lincoln County Water District and Vidler Water Company. Did you calculate drawdown to the Muddy River Spring area from pumping Kane Spring Valley wells?
A. No, I did not.
MS. PETERSON: Thank you. That's all the questions I have.
HEARING OFFICER FAIRBANK: Center for Biological Diversity?
MR. DONNELLY: Thank you.
CROSS-EXAMINATION
By Mr. Donnelly:
Q. Patrick Donnelly, Center for Biological Diversity. Mr. Felling, is there a commonly-accepted definition of steady state?
A. I have never really thought about it in those

terms of whether there's a commonly-accepted definition or not.
Q. Is there any definition that you use to define steady state?
A. Well, I would use the definition of that things are steady, that they are neither increasing nor decreasing.
Q. What things would be neither increasing or decreasing?
A. Whatever is -- Whatever you're trying to assign that term to.
Q. So, in this case in your usage of it, in your presentation, what did you mean?
A. That in this particular case of the Warm Springs West area that we were no longer seeing the change in water levels, we were no longer seeing a change in Warm Springs West discharge, and we were no longer seeing a appreciable change in flows of the Muddy River over the last two or three years.
Q. How long of a steady measurement would be necessary to qualify as steady state?
A. I don't know.
Q. But it is less than three years worth of data? Let me rephrase the question. You were using less than three years worth of data to say this system is in a steady state?

Appendix 15 cont.

BASIN NAME	BASIN NUMBER	BASIN REGION	ALFALFA NIWR (ft)	HIGHLY MANAGED PASTURE GRASS NIWR (ft)	LOW MANAGED PASTURE GRASS NIWR (ft)	GRASS HAY NIWR (ft)	TURF GRASS NIWR (ft)	SHALLOW OPEN WATER NIWR (ft)
Buena Vista Valley*	129	Central Region	3.4	3.4	2.7	3.3	3.3	4.1
Buffalo Valley	131	Central Region	2.8	2.8	2.2	2.7	2.8	3.0
Butte Valley*	178A	Central Region	2.6	2.6	2.0	2.5	2.4	3.6
Butte Valley*	178B	Central Region	2.8	2.7	2.1	2.6	2.5	3.7
Cactus Flat*	148	Central Region	3.9	3.8	3.1	3.7	3.9	4.8
California Wash*	218	Colorado River Basin	4.8	4.1	3.3	3.1	4.9	5.3
Carico Lake Valley*	55	Humboldt River Basin	3.0	3.0	2.3	2.8	2.9	3.7
Carson Desert	101	Carson River Basin	3.3	3.2	2.6	3.1	3.3	3.9
Carson Desert*	101A	Carson River Basin	3.5	3.5	2.8	3.4	3.4	4.2
Carson Valley	105	Carson River Basin	3.0	3.0	2.4	2.9	3.0	3.7
Cave Valley*	180	Central Region	3.2	3.1	2.4	3.0	2.9	4.0
Churchill Valley	102	Carson River Basin	3.3	3.2	2.6	3.1	3.3	3.9
Clayton Valley	143	Central Region	4.4	4.3	3.4	3.9	4.4	5.3
Clover Valley	177	Central Region	2.5	2.6	2.1	2.5	2.5	3.1
Clover Valley	204	Colorado River Basin	3.8	3.7	2.9	3.4	3.6	4.4
Clovers Area	64	Humboldt River Basin	3.2	3.2	2.6	3.1	3.1	4.0
Coal Valley*	171	Central Region	3.8	3.7	2.9	3.5	3.7	4.6
Cold Spring Valley*	100A	Western Region	3.0	3.0	2.4	2.9	3.0	3.6
Cold Spring Valley*	100	Western Region	3.1	3.1	2.5	3.0	3.1	3.6
Coleman Valley*	11	Northwest Region	3.1	3.1	2.4	3.0	3.0	3.9
Colorado Valley	213	Colorado River Basin	5.8	5.0	3.9	3.6	5.8	6.4
Columbus Salt Marsh Valley	118	Central Region	4.4	4.2	3.3	4.1	4.1	5.4
Continental Lake Valley*	2	Northwest Region	3.0	3.0	2.4	2.9	2.9	3.8
Cowkick Valley	126	Central Region	3.4	3.2	2.5	3.1	3.0	4.5
Coyote spring Valley*	210	Colorado River Basin	4.6	4.1	3.2	3.4	4.6	5.1

Appendix 15 cont.

BASIN NAME	BASIN NUMBER	BASIN REGION	ALFALFA NIWR (ft)	HIGHLY MANAGED PASTURE GRASS NIWR (ft)	LOW MANAGED PASTURE GRASS NIWR (ft)	GRASS HAY NIWR (ft)	TURF GRASS NIWR (ft)	SHALLOW OPEN WATER NIWR (ft)
Kings River Valley*	30B	Black Rock Desert Region	3.1	3.1	2.5	3.0	3.0	3.8
Kobeh Valley*	139	Central Region	2.7	2.7	2.1	2.6	2.6	3.6
Kumiva Valley*	79	West Central Region	3.4	3.4	2.7	3.3	3.4	4.1
Lake Tahoe Basin	90	Truckee River Basin	2.3	2.3	1.8	2.1	2.2	2.4
Lake Valley	183	Central Region	3.0	2.9	2.3	2.7	2.7	4.0
Lamoille Valley	45	Humboldt River Basin	2.3	2.3	1.8	2.2	2.1	2.9
Las Vegas Valley	212	Colorado River Basin	5.6	4.8	3.9	3.7	5.7	6.1
Lemmon Valley	92B	Western Region	3.1	3.1	2.5	3.0	3.1	3.4
Lemmon Valley*	92A	Western Region	3.1	3.1	2.5	3.0	3.1	3.6
Lida Valley*	144	Central Region	4.3	4.1	3.3	3.8	4.2	5.2
Little Fish Lake Valley*	150	Central Region	3.2	3.2	2.5	3.1	3.1	4.2
Little Humboldt Valley*	67	Humboldt River Basin	2.8	2.8	2.2	2.6	2.6	3.7
Little Owyhee River Area*	34	Snake River Basin	2.5	2.5	2.0	2.4	2.4	3.5
Little Smoky Valley	155A	Central Region	2.8	2.8	2.2	2.6	2.6	4.4
Little Smoky Valley*	155C	Central Region	3.3	3.3	2.6	3.2	3.2	4.2
Little Smoky Valley*	155B	Central Region	3.2	3.2	2.5	3.1	3.1	4.2
Long Valley*	9	Northwest Region	3.2	3.2	2.5	3.1	3.1	3.9
Long Valley*	175	Central Region	2.7	2.7	2.1	2.6	2.5	3.7
Lovelock Valley	73	Humboldt River Basin	3.7	3.7	3.0	3.6	3.6	4.5
Lovelock Valley*	73A	Humboldt River Basin	3.5	3.4	2.8	3.3	3.4	4.2
Lower Meadow Valley Wash	205	Colorado River Basin	4.2	3.7	2.9	3.0	4.3	4.6
Lower Moapa Valley	220	Colorado River Basin	4.5	1.8	1.5	1.4	2.2	2.4
Lower Reese River Valley	59	Humboldt River Basin	3.2	3.2	2.6	3.1	3.1	4.0
Macy Flat*	10	Northwest Region	3.1	3.1	2.4	3.0	2.9	3.9
Maggie Creek Area*	51	Humboldt River Basin	2.4	2.4	1.9	2.3	2.3	3.3

Appendix 15 cont.

BASIN NAME	BASIN NUMBER	BASIN REGION	ALFALFA NIWR (ft)	HIGHLY MANAGED PASTURE GRASS NIWR (ft)	LOW MANAGED PASTURE GRASS NIWR (ft)	GRASS HAY NIWR (ft)	TURF GRASS NIWR (ft)	SHALLOW OPEN WATER NIWR (ft)
Marys Creek Area*	52	Humboldt River Basin	2.7	2.7	2.2	2.6	2.6	3.6
Marys River Area	42	Humboldt River Basin	2.4	2.4	1.8	2.3	2.2	3.2
Mason Valley	108	Walker River Basin	3.1	3.0	2.4	2.9	3.0	3.9
Massacre Lake Valley*	8	Northwest Region	3.1	3.1	2.5	3.0	3.0	3.9
Mercury Valley*	225	Death Valley Basin	5.2	4.6	3.6	3.8	5.2	5.8
Mesquite Valley*	163	Central Region	5.3	4.5	3.6	3.7	5.3	5.7
Middle Reese River Valley*	58	Humboldt River Basin	3.1	3.1	2.4	2.9	3.0	3.8
Monitor Valley*	140A	Central Region	2.9	2.9	2.3	2.8	2.7	4.0
Monitor Valley*	140B	Central Region	3.3	3.3	2.6	3.2	3.1	4.3
Mono Valley*	112	Central Region	3.8	3.6	2.8	3.5	3.6	4.5
Monte Cristo Valley*	136	Central Region	4.0	3.8	3.0	3.7	3.7	4.9
Mosquito Valley*	12	Northwest Region	3.1	3.1	2.5	3.0	3.0	3.9
Mud Meadow*	26	Black Rock Desert Region	3.2	3.2	2.6	3.2	3.2	3.9
Muddy River Springs Area*	219	Colorado River Basin	4.7	4.0	3.2	3.1	4.7	5.1
Newark Valley*	154	Central Region	2.7	2.7	2.1	2.6	2.6	3.8
Newcomb Lake Valley*	96	Western Region	3.0	3.0	2.4	2.9	2.9	3.7
North Fork Area	44	Humboldt River Basin	2.2	2.2	1.7	2.1	2.0	3.2
Oasis Valley	228	Death Valley Basin	4.7	4.1	3.3	3.9	4.7	5.3
Oriental Wash*	232	Death Valley Basin	4.3	4.1	3.3	3.8	4.2	5.2
Owyhee River Area	37	Snake River Basin	2.1	2.1	1.6	2.0	1.9	3.1
Pahranagat Valley	209	Colorado River Basin	4.4	4.0	3.1	3.6	4.2	5.0
Pahroc Valley*	208	Colorado River Basin	3.8	3.6	2.8	3.4	3.6	4.4
Pahrump Valley	162	Central Region	5.0	4.4	3.6	3.8	5.1	5.6
Painter Flat*	18	Black Rock Desert Region	3.5	3.4	2.7	3.4	3.4	4.1
Panaca Valley	203	Colorado River Basin	3.8	3.6	2.9	3.4	3.6	4.4

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STEVEN D. KING
Nevada State Bar No. 4304
227 River Road
Dayton, NV 89403
Tel: (775) 427-5821
Email: kingmont@charter.net

ROBERT A. DOTSON
Nevada State Bar No. 5285
JUSTIN C. VANCE
Nevada State Bar No. 11306
DOTSON LAW
5355 Reno Corporate Drive
Suite #100ve
Reno, Nevada 89511
Tel: (775) 501-9400
Email: rdotson@dotsonlaw.legal
jvance@dotsonlaw.legal
Attorneys for Petitioner MVIC

DISTRICT COURT

CLARK COUNTY, NEVADA

LAS VEGAS VALLEY WATER DISTRICT and SOUTHERN NEVADA WATER AUTHORITY, Petitioners, vs. ADAM SULLIVAN, P.E., Nevada State Engineer, DIVISION OF WATER RESOURCES, DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, Respondent.	Case No.: A-20-816761-C (Lead Case) Dept. No.: 1 **MUDDY VALLEY IRRIGATION COMPANY'S REPLY BRIEF** Consolidated With:
IN THE MATTER OF THE PETITION OF COYOTE SPRINGS INVESTMENT, LLC	Case No.: A-20-817765-P (Sub Case) Dept. No.: 1
IN THE MATTER OF THE PETITION OF APEX HOLDING COMPANY, LLC	Case No.: A-20-817840-P (Sub Case) Dept. No.: 1

IN THE MATTER OF THE PETITION OF CENTER FOR BIOLOGICAL DIVERSITY	Case No.: A-20-817876-P (Sub Case) Dept. No.: 1
IN THE MATTER OF THE PETITION OF MUDDY VALLEY IRRIGATION COMPANY	Case No.: A-20-817977-P (Sub Case) Dept. No.: 1
IN THE MATTER OF THE PETITION OF NEVADA COGENERATION ASSOCIATES NOS. 1 AND 2	Case No.: A-20-818015-P (Sub Case) Dept. No.: 1
IN THE MATTER OF THE PETITION OF GEORGIA-PACIFIC GYPSUM, LLC AND REPUBLIC ENVIRONMENTAL TECHNOLOGIES, INC.	Case No.: A-20-818069-P (Sub Case) Dept. No. 1
IN THE MATTER OF THE PETITION OF LINCOLN COUNTY WATER DISTRICT AND VIDLER WATER COMPANY, INC.	Case No.: A-21-833572-J (Sub Case) Dept. No 1

DOTSON LAW
5355 RENO CORPORATE DR.
SUITE #100
RENO, NEVADA 89511

PETITIONER MUDDY VALLEY IRRIGATION COMPANY'S REPLY BRIEF

MUDDY VALLEY IRRIGATION COMPANY ("MVIC"), by and through its counsel, STEVEN D. KING and DOTSON LAW, hereby files its Reply Brief following its Petition for Judicial Review of Order 1309 issued by the Nevada State Engineer on June 15, 2020 pursuant to EDCR 2.15. This Reply Brief is based on all papers and pleadings that are on file with this Court relating to this matter.

NRAP RULE 26.1 DISCLOSURE

The undersigned counsel of record hereby certifies that MUDDY VALLEY IRRIGATION COMPANY is a Nevada Corporation. It has no parent corporations and no public company owns 10% or more of its stock.

Dated this 11 day of January, 2022.

STEVEN D. KING
Nevada State Bar No. 4304
227 River Road
Dayton, Nevada 89403
(775) 427-5821

ROBERT A. DOTSON
Nevada State Bar No. 5285
JUSTIN C. VANCE
Nevada State Bar No. 11306
DOTSON LAW
5355 Reno Corporate Dr., Suite 100
Reno, Nevada 89511
(775) 501-9400
Attorneys for Petitioner MVIC

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DOTSON LAW
5355 RENO CORPORATE DR.
SUITE #100
RENO, NEVADA 89511

DOTSON LAW
5355 RENO CORPORATE DR.
SUITE #100
RENO, NEVADA 89511

TABLE OF AUTHORITIES

Cases

Statutes

Other Authorities

ARGUMENT

Throughout the briefing in this matter, it has become apparent that all parties are primarily focused on the same issues. While some parties have addressed all issues and some parties only some of the issues, the parties have generally agreed that the applicable issues are (1) the delineation of the LWRFS, including discussing the authority of the Nevada State Engineer to create it; (2) the criteria for the inclusion of the various sub-basins, including Kane Springs and Black Mountain; (3) the adequacy of due process regarding those issues involving the designation of the LWRFS; and (4) the determination that 8,000 afa can be pumped from the LWRFS. To be sure, there are various sub-issues related to each of the above-named issues, and the list is not to be considered exclusive or preclude a party from restating the issue.

Thus far, MVIC has primarily addressed the first and fourth issues mentioned above, whether in its Opening Brief or Answering Brief. It has taken no strong position regarding the second and third issues, however it has raised due process concerns related to what it views as a conflict determination in allowing the 8,000 afa to be pumped, while acknowledging that such pumping will likely not result in the return to predevelopment flows in the Muddy River. As the argument regarding the State Engineer's authority to create the LWRFS was fully addressed in MVIC's Answering Brief, this brief will focus almost solely on the fourth issue and its sub-parts; that is, the propriety of the determination by the State Engineer that 8,000 afa can be pumped from the LWRFS, as well as replying to the arguments of other parties.

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DOTSON LAW
5355 RENO CORPORATE DR.
SUITE #100
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I. **<u>The Nevada State Engineer committed reversable error in determining that up to 8,000 afa could be pumped from the LWRFS while acknowledging that the current flow is below the amount decreed.</u>**

The Nevada State Engineer ("NSE") committed prejudicial legal error in making certain findings in Order 1309 in violation of the Muddy River Decree and MVIC's due process rights. Rather than protect MVIC's senior decreed water rights as it is statutorily obligated to do,[1] the NSE, through Order 1309, effectively repudiated and curtailed MVIC's decreed rights which the Muddy River Decree had previously determined had been appropriated and put to beneficial use prior to March 1, 1905.[2] The NSE did this by finding that up to 8,000 afa could be pumped from the LWRFS without conflicting with those decreed rights. This was done without notice that there would be a finding related to conflicts, thus violating MVIC's due process rights, and in clear violation of applicable law. The determination also was not based upon substantial evidence and even conflicts with his other findings.

A. **<u>The rights provided to MVIC through the Muddy River Decree are expansive and go beyond the specific and limited allotment some parties refer to.</u>**

The NSE acknowledges the Muddy River Decree of 1920 ("the Decree") as establishing water rights to the Muddy River and does not dispute that these decreed rights are the oldest and most senior rights in the LWRFS.[3] The NSE further recognizes that MVIC owns most of the decreed rights in the Muddy River.[4]

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[1] *See* NRS 533.0245.

[2] *See* Judgment and Decree, *Muddy Valley Irrigation Company v. Moapa and Salt Lake Produce Company et al* ("Muddy River Decree" or "Decree") (March 11, 1920) (SE ROA 33770-33816) at p. 7, ¶ 7 (SE ROA 33777).

[3] *See, e.g.,* NSE Answering Brief at 4:22-24.

[4] NSE Answering Brief at 5:20-22. It should be noted that the NSE mistakenly refers to MVIC as "Moapa" Valley rather than "Muddy" Valley.

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Moreover, it does not appear that any other party has disputed these facts. However, despite this recognition, it is clear after reviewing the various parties' answering briefs as well as briefs by intervenors that the parties have an incorrect understanding, or at least advance an incorrect interpretation, of MVIC's rights under the Muddy River Decree and, as a result, fail to recognize MVIC's unique position and the impact it has and continues to experience.

CSI undertakes a long and complicated analysis regarding diversion rates and ultimately contends that the Decree limits the total amount of water that users can divert from the River.[5] This conclusion is inconsistent with the plain language of the Decree. Lincoln County/Vidler (sometimes herein "Vidler") disputes that MVIC is entitled to any additional flow from the Muddy River from what it is currently receiving and seems to argue that the flow of the river can be reduced even further without violation of the Decree which awarded all of the predevelopment water in the river.[6] Vidler contends that MVIC has no right to any water that is not specifically delineated in and related to acreage identified in the Decree, disputing the right to put to beneficial use any water not otherwise allocated by specific awards to others in the Decree and suggesting that MVIC's allotment is limited to 36.2588 cfs of water as set forth in the determination tables provided in the Decree.[7]

What the parties refuse to acknowledge is that while MVIC does in fact have a specific diversion rate associated with its rights as set forth in part 1 of the Decree,[8] the Decree further provides that MVIC has the rights to and is directed to put to beneficial

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[5] CSI Answering Brief at 16:19-20.
[6] Lincoln County/Vidler Answering Brief to SNWA/MVIC at pp 9-16.
[7] Lincoln County/Vidler Answering Brief to SNWA/MVIC at pp. 9-11.
[8] *See* Decree (SE ROA 33770 – 33816) at SE ROA 33798.

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use any water that exists, even if that water is in excess of the specific sum decreed to MVIC. This sum of water, which is awarded to MVIC, is in addition to those specific sums and would be all water flowing in the Muddy River which is in excess of the quantity of water utilized through specific diversion rates of MVIC and all others which existed in the river at the time of the Decree, as well as any water which might not be utilized by others who hold decreed rights. In opposing the arguments of MVIC the parties simply seek to discount or ignore the language of the Decree awarding these rights, which is very specific and clear. It provides:

> [T]he Muddy Valley Irrigation Company is declared and decreed to have acquired by valid appropriate and beneficial use and to be entitled to divert and use upon the lands…all waters of said Muddy River, its head waters, sources of supply and tributaries save and except the several amounts and rights hereinbefore specified…[9]

The Decree goes on to confirm that "the total aggregate volume of the several amounts and quantities of water awarded and allotted…is the total available flow of said Muddy River and consumes and exhausts all of the available flow of the said Muddy Valley River…"[10] How the parties can gloss over or minimize that language as general and non-specific is transparently self-serving. The "bottom line" is that MVIC is entitled to its specific allotment, as well as any additional flows beyond the specific allotments particularly provided for in the Decree which would have otherwise have occurred in the past and the future and would and could have been put to beneficial use, in the past and the future.[11] The premise from which the NSE was understood to be approaching

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[9] Decree (SE ROA 33770 – 33816) at 20:1-8 (SE ROA 33790) (emphasis added).
[10] *Id.* at 22:28-23:1 (emphasis added).
[11] There is no suggestion here by any party that all of water that should come to be possessed by MVIC will not be put to beneficial use, indeed it all will.

the Order 1309 hearing was to determine/quantify the sum of water that otherwise would be flowing in the Muddy River but for its interception by pumping and a determination of the pumping which could occur while allowing the river to return to those flows. The predevelopment flows as they existed at the time of the Decree and upon which the Decree was based (33,900 afa) are the "Decreed Flows."[12] If there is a reduction in the Decreed Flows it is axiomatic that there is a conflict with senior rights and a curtailment of MVIC's rights which needs to be addressed in the subsequent conflict hearings.[13] The appropriate conclusion should be that any pumping which keeps the flow of the Muddy River from being anything less than the Decreed Flows conflicts with MVIC's decreed rights. Instead, the NSE determined that the flow has been reduced by approximately 3,000 afa yet he determined what pumping could be allowed so that the situation would not worsen rather than what needed to occur to reestablish those flows.

B. Consideration of Muddy River conflicts was explicitly outside the scope of the hearing and should not have been included in Order 1309.

In its Opening Brief, MVIC argues that its due process rights were violated because a conflicts analysis was outside of the noticed scope of the hearing. There is agreement and no party disputes that water rights are property rights subject to due process protection, that MVIC is a "person" whose due process rights must be protected, or the basic principles of notice and opportunity to be heard. However, the

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[12] *See* SNWA Report (June 2019) (SE ROA 41930 – 42072) at § 3.4.1 (SE ROA 41962) describing the predevelopment flows as measured in 1946 as 33,900 afa and the average flow measured from July 1, 1913 to June 30, 1915 and October 1, 1916 to September 30, 1917 as 34,000 afa. The NSE further recognizes 33,900 afa as the predevelopment flow. *See* Order 1309 (SE ROA 2-69) at p. 61 (SE ROA 62).

[13] See SNWA Report (June 2019) (SE ROA 41930 – 42072) at § 3.4.1 (SE ROA 41996-41997).

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NSE and Vidler both contend that MVIC did in fact have the required notice and an opportunity to present evidence on conflicts.

The NSE points out that one of the stated purposes of the hearing was to determine the amount of water that could be sustainably pumped in the LWRFS without conflicting with senior decreed rights, but acknowledges the hearing was not intended to resolve conflicts.[14] Indeed, the hearing officer stated:

> [T]he purpose of the hearing is <u>not to resolve or address allegations of conflict between groundwater pumping within the LWRFS and Muddy River decreed rights</u>. That is <u>not</u> the purpose of this hearing and that's <u>not what we are going to be deciding at this point in time</u>.
>
> The purpose of the hearing is to determine what the sustainability is, <u>what the impact is on decreed rights</u>,[15] and then addressing and <u>resolving allegations of conflict should that be a determination that will be addressed in, at a **future** point in time</u>.[16]

The NSE's statements at the Prehearing Conference assured MVIC conflicts would not be discussed or, at best, create an ambiguity with respect to what the scope of the hearing would be. Order 1309 makes a specific finding regarding conflicts as it states that "capture or potential capture of flows of the waters of a decreed system does not constitute a conflict."[17] This is not only a clear conflict determination which reaches a conclusion and resolves the allegation of conflict between groundwater pumping and decreed rights, finding capture of those waters to be no conflict, but also a clearly

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[14] NSE Answering Brief at 11:19-22, citing Transcript from Prehearing Conference at SE ROA 522.
[15] Although MVIC interpreted this as language indicative of an intent to protect the decreed rights, some would suggest this was an indication to address conflicts. If so, that is in direct opposition to the other statements of the NSE.
[16] *See* Transcript of Proceedings, Public Hearing, Prehearing Conference, August 8, 2019 (SE ROA 519-552) at 12:6-15 (SE ROA 522) (emphasis added).
[17] *See* Order 1309 (SE ROA 2 – 69) at p. 60 (SE ROA at 61).

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erroneous legal conclusion in light of the language of the Decree in place governing this "system." The NSE further stated that "there is no conflict as long as the senior water rights are served."[18] This is similarly a clearly erroneous holding. Regardless of the legality of the determination, it is undisputable that the NSE made a conflicts determination despite having said he would not do so. Before making the blanket and unsupported determination that capture of Muddy River flows governed by the Decree somehow does not conflict with senior decreed rights to Muddy River flows, the NSE should have specified that he would be considering that issue and might make that determination. Such a notice would have allowed MVIC to address that possible ruling at the hearing, which may have resulted in it retaining and presenting an expert and providing testimony and evidence on that particular issue, and at the very least examining witnesses and presenting its own views on that topic.

Lincoln County/Vidler is the other party who specifically tries to refute MVIC's due process arguments. They state that "SNWA and MVIC were properly provided notice and an opportunity to participate in the Order 1309 proceedings."[19] However, the issue is not whether they were provided *any* notice at all regarding the hearing and had an opportunity to and even did participate; rather, it is whether they had *proper* notice of the issues to be determined. In this case, *proper* notice would have been notifying MVIC that a determination of whether reduction in receipt of the quantity of water awarded to it under the Decree is a conflict and that such a determination was, in fact, going to be made. This would have significantly altered the level of and strategy surrounding MVIC's participation. It would have changed what MVIC understood to

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[18] *Id.*
[19] Lincoln County/Vidler Answering Brief to SNWA/MVIC at 28:18-19.

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be at stake in the hearing. Though it participated, it did so as if conflicts were not going to be addressed and with the belief that the NSE was intending to protect its decreed rights in a sum equal to the amounts awarded in the Decree. As a result, it did not have the opportunity to evaluate its position in that regard, determine whether to retain an expert to address conflicts, or otherwise submit evidence to address that supremely important issue.

Lincoln County/Vidler also argues that "SNWA and MVIC presented all evidence they desired at the Order 1309 hearings" and that they in fact brought up the issue of conflicts themselves.[20] While the apparent ability to clairvoyantly ascertain MVIC's desired evidence would be amazing, it is clear that Lincoln County/Vidler really does not know what MVIC "desired" at the hearing. In reality, those desires were shaped by the type of notice MVIC received and therefore the type of evidence it believed needed to be presented. Unfortunately, MVIC incorrectly assumed that the NSE would follow the law and limit the pumping so as to protect the Decreed Flows of the Muddy River.

The NSE also used a consumptive use analysis to determine what MVIC's supposed "requirement" of water would be.[21] This issue is clearly related to the conflicts analysis eventually undertaken and there was absolutely no notice that the NSE would be reviewing and calculating MVIC's water use needs, let alone undertaking a consumptive use analysis using hypothetical crops to determine MVIC's supposed "requirement," and as a result MVIC did not have the opportunity to be

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[20] Lincoln County/Vidler Answering Brief to SNWA/MVIC at 28:22-26.
[21] *See* Order 1309 (Se ROA 2-69) at p. 61 (SE ROA 62).

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heard on that issue from a factual or a legal basis. Accordingly, due process was indisputably violated in that regard as well.

C. **<u>The determination that 8,000 afa can be pumped from the LWRFS violates Nevada law, including the prior appropriation doctrine, and is effectively a curtailment of MVIC's decreed rights.</u>**

The NSE recognizes his "legislative prescribed duty to protect senior decreed rights in the Muddy River" and contends that Order 1309 is a basic exercise of that duty.[22] He further claims that the determination that 8,000 afa can be pumped from the LWRFS is "not legitimately challenged by SNWA and MVIC" and that MVIC instead is attacking an "incidental finding" that the current flow is sufficient to serve all decreed rights and that reductions in flow do not conflict with decreed rights.[23] Thus, in one breath the NSE concedes that a conflict exists and then proceeds to dismiss that conflict as insignificant or non-actionable. However, this "incidental" finding based on a legally and factually faulty consumptive use analysis operates to reduce the allotment of Muddy River decreed rights of 33,933.63 afa set forth in the Decree a hundred years ago to 28,300 afa today, which is a reduction of nearly 6,000 afa.[24] This reduction is not insignificant and there is nothing "incidental" about such an action. Order 1309 acknowledges that the predevelopment baseflow of the river was about 33,900 afa but that flow has averaged only 30,600 afa since 2015.[25] Given that MVIC's water rights are based upon predevelopment flows, pumping which keeps the river at anywhere less than that amount, 33,900 afa, is a curtailment. Further, as its shareholder Vidler has noted in its briefing, MVIC, as the senior decreed holder of

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[22] NSE Answering Brief at 18:27-19:2.
[23] NSE Answering Brief at 36:19-24.
[24] *See* Order 1309 (SE ROA 2-69) at p. 61 (SE ROA 62).
[25] *See* Order 1309 (SE ROA 2-69) at p. 61 (SE ROA 62).

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those rights and the last to be served on the river, is the only party that is bearing the harm of whatever groundwater pumping is capturing. Based upon Order 1309 that harm is currently approximately 3,300 afa.

With regard to the flows of the Muddy River it is important to note that no party, including CSI, Vidler or the NSE, is actually arguing that the Muddy River will at some point return to predevelopment flows if the pumping currently occurring and allowed under Order 1309 continues. In fact, the NSE describes the "remarkably consistent and widespread" detrimental effects of pumping in the LWRFS, acknowledging it is the pumping rather than drought that has led to a decline in groundwater flows, and further acknowledges that the groundwater has not returned to pre-pumping levels but is instead reaching an equilibrium where levels are no longer declining, but they are not recovering further either.[26] If that premise is believed by the NSE it does not require a degree in hydrology to determine that continued pumping at that level will not result in a return to prior flows. Indeed, a high school physics course provides the adequate education to reach the conclusion that any level of pumping which continues to lower water levels and fails to allow further recovery will not be sufficient to correct the condition. In order to protect decreed rights the pumping allowed must be such that leads to the recovery of the river to predevelopment Decreed Flows. Order 1309 retreats from that as even a possibility and therefore cannot stand.

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[26] NSE Answering Brief at 7:25-8:25. This is consistent with the evidence in the record, including evidence that over the last 27 years about 47% of the water pumped is captured from MRSA discharge and the rest from aquifer storage and that once capture of aquifer storage is reduced to zero all of the water pumped will be captured MRSA discharge. *See*, SNWA Report (June 2019) (SE ROA 41930 – 42029) at § 3.4.1 (SE ROA 42003-42004).

1. NRS 533.3703 prohibits the NSE from undertaking a consumptive use analysis of MVIC's "requirements."

The NSE contends that he used a "standard accepted method" in looking to "the consumptive use rate for a high-water use crop, alfalfa, based on a full cover, well-watered field."[27] At the outset, it is important to note it would only be appropriate for such an analysis to be done *before* a right is perfected, but these rights were perfected over 100 years ago through the Decree and that analysis should not be undertaken now. It is only because the NSE did in fact engage in this improper analysis that MVIC is forced to address it now.

While MVIC in its Opening Brief criticized this method and noted the lack of evidence upon which it is based, it is critical to point out that use of this method by the NSE is illegal under Nevada law. Nevada statutes allow the NSE to consider consumptive use in some instances; however, this allowance "[does] not apply to any decreed, certified or permitted right to appropriate water which originates in the Virgin River or the Muddy River."[28] The NSE acknowledged that he used this method to *estimate* the actual water needed to satisfy the vested rights in the Decree.[29] In doing so, he clearly violated the law, making his findings that 8,000 afa can be pumped from the LWRFS contrary to law and serving as a basis for remand.

2. Order 1309 violates NRS 533.0245.

Nevada law prohibits the NSE from carrying out his duties in a manner that conflicts with any applicable portion of a decree or order issued by a state or federal court.[30] The NSE referenced this statute in arguing that Order 1309 was within his

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[27] NSE Answering Brief at 37:6-10.
[28] *See* NRS 533.3703(2)(b).
[29] NSE Answering Brief at 37:6-15.
[30] *See* NRS 533.0245.

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authority to issue.[31] He also acknowledges this statute's application to "ensure[] that the prior decrees are complied with."[32] The Nevada Supreme Court, citing this statute, has acknowledged that Nevada's water law prohibits the reallocation of adjudicated water rights.[33] The Muddy River Decree is an Order through which rights were decreed to MVIC. As set forth above, the allowance of pumping at a rate that will not allow the Muddy River to recover to its pre-development flow of 33,900 afa is a curtailment of the rights provided to MVIC under the Decree in favor of the pumping that is reducing the flow. This effectively constitutes a reallocation by a different name and, as Shakespeare correctly observed, changing the name of something does not change its essential qualities, or as he said it, "a rose by any other name would smell as sweet."[34] The NSE is essentially claiming that he is not changing MVIC's water rights, just that the amount of water available from which MVIC can attempt to satisfy its rights is now less than what was provided for in the Decree. Thus, Order 1309 is contrary to law with respect to this determination.

3. <u>Order 1309 violates NRS 533.210.</u>

No party has disputed MVIC's contention that NRS 533.210 prohibits the rights provided to MVIC in the Muddy River Decree to be altered. Rather, the arguments advanced by the NSE and Lincoln County/Vidler are generally that Order 1309 does not modify MVIC's rights under the Decree. As stated above, MVIC's decreed rights were based on the Decreed Flows of 33,900 afa. The NSE has recognized that it is pumping rather than other causes which has led to the decline in flow and that the flow

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[31] NSE Answering Brief at 30:8-14.
[32] NSE Answering Brief at 34:24-26.
[33] *Min. Cty. v. Lyon Cty.*, 136 Nev. Adv. Op. 58, 473 P.3d 418, 429 (2020).
[34] William Shakespeare, Romeo and Juliet act 2, sc. 2.

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is not expected to recover to predevelopment levels.[35] Thus Order 1309, while perhaps not intending to alter MVIC's decreed rights, has precisely that effect.

4. **<u>Order 1309 violates the non-impairment doctrine set forth in NRS 533.085.</u>**

The NSE's determination that 8,000 afa can be pumped from the LWRFS is a violation of the non-impairment doctrine, which provides:

> Nothing contained in this chapter shall impair the vested right of any person to the use of water, nor shall the right of any person to take and use water be impaired or affected by any of the provisions of this chapter where appropriations have been initiated in accordance with law prior to March 22, 1913.[36]

This doctrine has explicitly been extended to protect against changes to decreed rights.[37] Lincoln County/Vidler argue that this doctrine has not been violated based upon their belief that Order 1309 does not modify MVIC's rights under the Decree.[38] However, as explained above, the State Engineer's actions do operate as a curtailment of MVIC's senior decreed rights. Thus, the inconvenient factual truth is that Order 1309 itself is illegal as "[t]he statutory water scheme in Nevada…expressly prohibits reallocating adjudicated water rights that have not been abandoned, forfeited, or otherwise lost pursuant to an express statutory provision."[39]

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[35] NSE Answering Brief at 7:25-8:25.
[36] NRS 533.085(1).
[37] *See Andersen Fam. Assocs. v. Hugh Ricci, P.E.,* 124 Nev. 182, 192, 179 P.3d 1201, 1207 (2008) ("[a]lthough Carson City changed the use of its vested rights, those rights remained of the same character – i.e., they remained vested and did not become solely permitted rights just because the holder obtained a permit changing the use of the rights.").
[38] *See* Lincoln County/Vidler Answering Brief to SNWA/MVIC at 8:17-19.
[39] *Mineral Cty.*, 136 Nev. Adv. Op. 58, 473 P.3d at 429.

5. Order 1309 violates the Prior Appropriation Doctrine.

The NSE and Lincoln County/Vidler seem to agree that the prior appropriation doctrine means "first in time, first in right."[40] No other party seems to dispute this long-held understanding. Thus, there appears to be no dispute that "[w]ater rights are given "subject to existing rights, NRS 533.430(1), given dates of priority, NRS 533.265(2)(b), and determined based on relative rights, NRS 533.090(1)-(2)."[41] The NSE further recognizes that there is nothing which limits his "duty to protect senior rights."[42] The dispute, however, centers around the extent to which Order 1309 truly protects MVIC's senior decreed rights as set forth in the Decree rather than redistributes them. For the reasons set forth above, MVIC contends that Order 1309 modifies its century-old rights under the Decree, thus violating the prior appropriation doctrine.

D. The determination that up to 8,000 afa could be pumped from the LWRFS was not based on substantial evidence.

The NSE takes inconsistent positions in supporting Order 1309 and his determination that 8,000 afa can be pumped from the LWRFS. He recognizes his duty to protect senior rights[43] and that it is pumping rather than drought that leads to a decline in groundwater flows.[44] He acknowledged that current pumping is approaching 8,000 afa and that this pumping appears to coincide with the system reaching steady state.[45] However, he still finds that pumping up to 8,000 afa is appropriate despite the fact that the Muddy River is fully appropriated and having

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[40] NSE Answering Brief at 35:10-13, citing Lincoln County/Vidler Opening Brief at p. 19.
[41] *Mineral Cty.*, 136 Nev. Adv. Op. 58, 473 P.3d at 426.
[42] NSE Answering Brief at 35:17-18.
[43] NSE Answering Brief at 3:22-23.
[44] NSE Answering Brief at 8:22-25.
[45] See Order 1309 (SE ROA 2-69) at p. 63 (SE ROA 64).

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determined the current flows are about 3,000 afa less than at the time of the Decree. This determination is inconsistent and was clearly based on insufficient evidence.

First, the NSE tacitly recognizes that his determination was based on insufficient evidence as he acknowledges that the actual amount could be less and that future reductions may be necessary. He states that Order 1303, the precursor to Order 1309, recognized that the "'precise extent' of pumping that can continue without jeopardizing senior rights or the Moapa dace was <u>not yet determined</u>."[46] He further stated that continued monitoring of the groundwater, the springs, and the Muddy River flow is "necessary to determine whether further reductions to the maximum pumping amount are required."[47] Thus, ultimately the conclusion drawn by the NSE is that pumping cannot exceed 8,000 afa "and may be less."[48]

To be clear, MVIC does not dispute that the NSE's determination that anything *greater* than 8,000 afa cannot be pumped was correct and supported by sufficient evidence. The question is what amount *less than* 8,000 afa does the evidence support can be pumped. The fact that the NSE admits that the precise extent of pumping that can occur is not yet known, that further monitoring must occur to determine whether further reductions are required, and that the amount "may be less" show there was insufficient evidence to make a determination that up to the 8,000 afa can be pumped without jeopardizing senior rights or the habitat of the Moapa dace. One cannot meet the standard of relying on substantial evidence while at the same time recognizing that there is still insufficient evidence to make the determination at this point.

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[46] NSE Answering Brief at 10:2-4 (emphasis added).
[47] NSE Answering Brief at 17:4-6.
[48] NSE Answering Brief at 37:24-38:1.

The NSE claimed, and MVIC agrees, that if a larger sum than the 8,000 afa is pumped it would significantly interfere with senior decreed rights.[49] But again, there is nothing identified as substantial evidence that supports a finding that pumping 8,000 afa does not interfere with those rights. Given the acknowledgement that pumping in general gives rise to "remarkably consistent and widespread" detrimental effects coupled with the recognition that Muddy River flows are already 3,300 afa below predevelopment flows with no indication that they will recover to predevelopment levels, it is unclear how this conclusion can be drawn and it appears that the holding is nothing more than an attempt to compromise the desires of the various stakeholders.

While claiming to have relied on sufficient evidence to support the finding that up to 8,000 afa could be pumped without interfering with senior decreed rights,[50] the NSE does not specify in his brief what that evidence is. He simply cites to pages 58-63, 41876, 41992-93, and 53733 of the record.[51] However, pages 58-63, which are part of Order 1309, simply describe in summary the positions taken by the various parties as to how much can be pumped before the NSE states his conclusion that 8,000 afa is the maximum amount that can be pumped.[52] There is no analysis to support the conclusion that was made. In fact, immediately before stating that conclusion, the NSE states:

> **WHEREAS**, there is an almost unanimous agreement among the experts that data collection is needed to further refine with certainty the extent of groundwater development that can be continually pumped over the long term. The State Engineer finds that the current data are

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[49] NSE Answering Brief at 26:16-20.
[50] *See* NSE Answering Brief at 27:9-11.
[51] *Id.*
[52] *See* Order 1309 (SE ROA 2-69) at SE ROA 58-63.

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> adequate to establish an approximate limit on the amount of pumping that can occur within the system, but that continued monitoring of pumping, water levels, and spring flow is essential to refine and validate this limit.[53]

In other words, the "substantial evidence" which should have been relied on before making this determination must still be gathered and analyzed, and therefore the necessary evidence was not relied upon in reaching this determination.

The NSE eventually notes in a parenthetical that the evidence found in 41876, 41992-93, and 53733 is "evidence indicating that the LWRFS's groundwater and spring flow are approaching equilibrium."[54] That is it. That is apparently the full extent of the "substantial evidence" to support the finding that 8,000 afa could be pumped. The reference to 41876 is a reference to NV Energy's Order 1303 Rebuttal Report, which is found at SE ROA 41875-41886. The portion the NSE seems to be referring to provides:

> <u>Full recovery to the pre-test levels did not occur, and could not occur, because water levels regionally were still declining due to existing pumping</u> as noted by SNWA. Contrary to the arguments made by SNWA and MBOP, NV Energy argues that there is significant data to support the conclusion that the system is approaching steady state in the Muddy River Springs Area (MRSA) and other locations, and that water levels, spring flow, and the Muddy River are <u>*nearly* equilibrated with the current carbonate pumping rate of 7,000 to 8,000 acre-feet annually</u>.[55]

This is not substantial evidence in support of the holding, but rather evidence that full recovery has not occurred, levels were still declining, but pumping 7,000 to 8,000 afa

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[53] *See* Order 1309 (SE ROA 2-69) at p. 62 (SE ROA 63).
[54] NSE Answering Brief at 27:28-28:2.
[55] See NV Energy's Order 1303 Rebuttal Report (SE ROA 41875 – 41886) at p. 2 (SE ROA 41876) (emphasis added).

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is *almost* bringing us back to level. This evidence simply does not explain or adequately support the finding that 8,000 can continue to be pumped without perpetuating the loss of flow that was acknowledged by the NSE. If anything, it would seem to perhaps support a finding that the sum of 7,000 afa will maintain the status quo; however, maintaining the status quo is insufficient since it does not allow recovery to the Decreed Flows. Indeed, the evidence does not even describe what might be required to address the reduced flows.

41992-93 is found within SNWA's Assessment of the Lower White River Flow System Water Resource Conditions and Aquifer Response that was presented to the NSE.[56] It is unclear how this provides substantial evidence to support 8,000 afa of pumping as it also provides that "[r]ecovery from the pumping stresses imposed during the aquifer test was less than expected, <u>and never reached pre-test levels</u>."[57] The failure of the system to recover does not provide evidence that pumping at those levels that have failed to result in recovery can continue – quite the contrary. Interestingly, the SNWA experts did offer an opinion that 4,000-6,000 might be appropriate so long as conflicts with senior water-right holders are addressed.[58] This was clearly not adopted by the NSE and based upon the caveat it contained, even that pumping level might not allow recovery of the flows.

Finally, the NSE refers to 53733, which is found within the transcript of the hearing from October 4, 2019, Vol. X.[59] The referenced pages come in the midst of

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[56] *See* SNWA's Assessment of the LWRFS Water Resource Conditions and Aquifer Response (SE ROA 41930 – 42072).
[57] *Id.* at SE ROA 41992 (emphasis added).
[58] See SNWA Report (June 2019) (SE ROA 41930 – 42029) at § 3.4.1 (SE ROA 41941)
[59] *See* Transcript of Proceedings, Vol. X (Oct. 4, 2019) (SE ROA 53709 – 53758).

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questioning of NV Energy's expert witness, Richard Felling, regarding what constitutes a "steady state," which he defined as a state where things are neither increasing or decreasing.[60] Mr. Felling testified:

> I am saying that a system appears to be reaching steady state over – and over the last two or three years is roughly at steady state. But that is not to say that it will continue that way in the future. And that's why I say I think we actually need to observe the system for a bit longer.
>
> *****   *****   *****
>
> I'm saying that if we want to be certain that steady state conditions are in fact occurring now and forever in to the future under the current pumping regime, <u>two or three years of observations aren't enough</u>.[61]

This also does not lend any evidentiary support to the NSE's conclusion that 8,000 afa can be pumped without interfering with senior decreed rights. If anything, it simply supports the conclusion that there is not enough evidence at this time to draw the conclusion that even the current water level, and with it presumably the current flows of the river, can be maintained if the current pumping continues forever into the future.

In sum, the NSE has been unable to point to substantial evidence he relied on to support the finding that 8,000 afa can be pumped without interfering with senior decreed rights. The evidence regarding "steady state" and "equilibrium does nothing to support this finding. The critical thing about equilibrium is that is still does not represent a recovery to pre-development flows; rather, it simply means that the water

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[60] *Id.* at 1803-1804 (SE ROA 53732).
[61] *Id.* at 1805:1-15 (SE ROA 53733) (emphasis added).

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levels are no longer declining. The NSE recognizes this.[62] As the only evidence upon which the NSE relies makes it clear that additional monitoring and analysis is necessary before determining how much water can be pumped, substantial evidence did not exist for the NSE to rely on in finding that up to 8,000 afa could be pumped from the LWRFS. Rather, the evidence he cites to leads to the conclusion that the sum that can be pumped must be some amount less than 8,000 afa.

E. **The arguments that more than 8,000 afa can be pumped without impacting the Muddy River defy Nevada law, the Decree, and the natural world.**

In their answering briefs both Vidler and CSI suggest that more than 8,000 afa can be pumped without interference with the Muddy River.[63] This makes no sense given that the evidence clearly shows that even pumping at 8,000 afa does not allow a return to the Decreed Flows. In this round of briefing Vidler makes the argument in the course of countering the SNWA criticism of the consumptive use hypothetical applied by the NSE in Order 1309 to reach the conclusion that all of the decreed rights could be served so long as the flow is 28,300 afa.[64] Vidler consumes approximately 7 pages to eventually come to a mathematical conclusion that all that the holders of rights under the Decree need is 17,771.59 afa so therefore there is "significantly more water than 8,000 afa [that] can be withdrawn from the LWRFS without impacting the Muddy River."[65] This mathematical exercise doubles down on the improper and illegal analysis used by the NSE and for all of the reasons discussed above in section

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[62] *See* NSE Answering Brief at 8:17-19.
[63] *See* Lincoln County/Vidler Answering Brief at 16:17-18; CSI Brief in Intervention at 8:2-9.
[64] *See* Vidler Answering Brief to SNWA/MVIC at pp. 11-19; Order 1309 (SE ROA 2-69) at p. 62 (SE ROA 63).
[65] *See* Vidler Answering Brief to SNWA/MVIC at 16:17-18.

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RENO, NEVADA 89511

"C" it is equally improper. Those arguments are incorporated herein by reference. What is more, Vidler's mathematical exercise fails to prove that any water would actually flow from the critical headwaters of the Muddy River in the actual world if pumping at the levels implied by that exercise were to be allowed. In the real world it is very possible that flows would stop at some locations and no decreed right would be served.

Vidler's latest submission also contains a number of arguments that appear to run to the issues of damage quantification and corporate governance of MVIC and appear irrelevant to the issues currently before this Court. While MVIC disputes that it has treated SNWA, Vidler or any shareholder different from another and further disputes the mechanical contentions raised by Vidler in those sections, they have no bearing on the issues to be determined and, like Vidler's multiple misstatements of the MVIC position, the corporate governance allegations appear to be included here simply to distract from the genuine issues before the Court at this time.[66]

CSI takes a slightly different approach. It seems to suggest that the quantity of water in the Decree is limited to the use of the water on the lands described in the

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[66] Vidler misstates MVIC's position in significant and insignificant ways. For example, Vidler states that it is the position of MVIC that no ground water pumping can occur. *See* Lincoln County/Vidler Answering Brief to SNWA/MVIC at 4:25; 7:14; 7:19-23; 7:25-8:2; 31:19-21. In reality, the MVIC position has been and continues to be that the NSE should preserve the flows of the Muddy River, a fully appropriated system and MVIC has not taken the position that no pumping can occur. (*See* MVIC Opening Brief at 19:17, acknowledging the possibility that 8,000 afa *could be* appropriate; MVIC Opening Brief at 19:23-20:2 (asking that allowed pumping protect the predevelopment flow levels; MVIC Opening Brief at 29:6-9 (asking that pumping in the LWRFS be regulated so as to prevent interference with predevelopment flows). To do that will require a limit to the pumping that restores and then maintains those flows. The NSE must make the determination of that quantity based upon substantial evidence. Vidler claims that MVIC has made arguments based upon acreage statements or the requirements to farm the lands. *See for example*, Lincoln County/Vidler Answering Brief to SNWA/MVIC at 14:1-4 and 17:19-21. In actuality, MVIC's position is that the consumptive use and acres is at this point irrelevant as is the use so long as it is a permitted beneficial use. The diversion rates and the grant of additional flows define the MVIC decreed water rights.

Decree, implying some circumstance in support of the NSE hypothetical while simultaneously criticizing it to suggest reasonableness. The implication seems to be that, if the water cannot or is not used on those lands described its use is improper and the result, presumably, is there is additional water not used and available for pumping which allows for decreases in the flow of the Muddy River.[67] For all of the reasons described herein above such an argument is inconsistent with the operation of the Decree which, as recognized in *Andersen Fam. Assocs. v. Hugh Ricci, P.E.*, allows for a change of the use of a right without loss of priority or character.[68] Consequently, the water rights of MVIC or any other holder of Decreed rights can be diverted and used in a fashion that has a greater or lesser consumption than the use one hundred years ago without sacrificing the right. This is consistent with the statement of CSI that "[t]he Decree therefore allows Users to grow any crop---not just alfalfa as arbitrarily referenced by the NSE in Order 1309 – and it does not limit the consumptive use for a User. Rather, the Decree limits the total water that Users can divert from the river."[69] Although not precisely adopting the NSE consumptive use hypothesis, CSI does, like Vidler, engage in a discussion of it, refashioning it for its purpose, and like Vidler and the NSE the application of any such analysis is legally and factual improper here and should be rejected as a means to modify the decreed rights of MVIC.

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[67] *See* CSI Brief in Intervention at pp. 10-19.

[68] *See Andersen Fam. Assocs. v. Hugh Ricci, P.E.,* 124 Nev. 182, 192, 179 P.3d 1201, 1207 (2008) ("[a]lthough Carson City changed the use of its vested rights, those rights remained of the same character – i.e., they remained vested and did not become solely permitted rights just because the holder obtained a permit changing the use of the rights.")

[69] See CSI Brief in Intervention at 16:17-20.

DOTSON LAW
5355 RENO CORPORATE DR.
SUITE #100
RENO, NEVADA 89511

CONCLUSION

For the reasons set forth above, MVIC respectfully requests that the Court reverse and remand Order 1309 and direct the State Engineer to ensure that the Muddy River predevelopment baseflow of 33,900 afa is not intercepted by any junior right holders and that pumping in the LWRFS be likewise regulated so as to allow the flow to return to predevelopment levels and thereafter be regulated to prevent future interception of Muddy River water sources or interference with those decreed surface water flows.

Affirmation Pursuant to NRS 239B.030

The undersigned does hereby affirm that the preceding document does not contain the social security number of any person.

DATED this 11 day of January, 2022.

STEVEN D. KING
Nevada State Bar No. 4304
227 River Road
Dayton, Nevada 89403
(775) 427-5821

ROBERT A. DOTSON
Nevada State Bar No. 5285
JUSTIN C. VANCE
Nevada State Bar No. 11306
DOTSON LAW
5355 Reno Corporate Dr., Suite 100
Reno, Nevada 89511
(775) 501-9400
Attorneys for Petitioner MVIC

ATTORNEY CERTIFICATE

Pursuant to NRAP 28.2, undersigned counsel certifies that:

1. I have read this entire reply brief.

2. To the best of my knowledge, information, and belief, it is not frivolous or interposed for any improper purpose.

3. This reply brief complies with all applicable Nevada Rules of Appellate Procedure, in particular NRAP 28(e)(1), which requires every assertion in the brief regarding matters in the record to be supported by a reference to the page and volume number, if any, of the transcript or appendix where the matter relied on is to be found.

4. This reply brief complies with the formatting requirements of NRAP 32(a)(4), the typeface requirements of NRAP 32(a)(5), and the type style requirements of NRAP 32(a)(6) because this reply brief has been prepared in a proportionally spaced font using Microsoft Word in 14-point Times New Roman font.

5. I further certify that this reply brief complies with the page-volume limitations of NRAP 32(a)(7) because, excluding the parts exempted by NRAP 32(a)(7)(C), it is proportionately spaced, has a typeface of 14 points, and is 23 pages long and contains 7,198 words.

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DOTSON LAW
5355 RENO CORPORATE DR.
SUITE #100
RENO, NEVADA 89511

I understand that I may be subject to sanctions in the event that the accompanying reply brief is not in conformity with the requirements of the Nevada Rules of Appellate Procedure.

DATED this 11 day of January, 2022.

STEVEN D. KING
Nevada State Bar No. 4304
227 River Road
Dayton, Nevada 89403
(775) 427-5821

ROBERT A. DOTSON
Nevada State Bar No. 5285
JUSTIN C. VANCE
Nevada State Bar No. 11306
DOTSON LAW
5355 Reno Corporate Dr., Suite 100
Reno, Nevada 89511
(775) 501-9400
Attorneys for Petitioner MVIC

CERTIFICATE OF SERVICE

Pursuant to NRCP 5(b), I hereby certify that I am an employee of DOTSON LAW and that on this date I caused to be served a true and correct copy of the foregoing by electronic service to the participants in this case who are registered with the Eight Judicial District Court's Odyssey eFileNV File & Serve system to this matter.

DATED this 11 day of January, 2022.

L. Morgan Bogumil

L. MORGAN BOGUMIL

DOTSON LAW
5355 RENO CORPORATE DR.
SUITE #100
RENO, NEVADA 89511

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Steven D. Grierson
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STEVEN D. KING
Nevada State Bar No. 4304
227 River Road
Dayton, NV 89403
Tel: (775) 427-5821
Email: kingmont@charter.net

ROBERT A. DOTSON
Nevada State Bar No. 5285
JUSTIN C. VANCE
Nevada State Bar No. 11306
DOTSON LAW
5355 Reno Corporate Drive
Suite #100
Reno, Nevada 89511
Tel: (775) 501-9400
Email: rdotson@dotsonlaw.legal
jvance@dotsonlaw.legal
Attorneys for Petitioner MVIC

DISTRICT COURT

CLARK COUNTY, NEVADA

LAS VEGAS VALLEY WATER DISTRICT and SOUTHERN NEVADA WATER AUTHORITY, Petitioners, vs. ADAM SULLIVAN, P.E., Nevada State Engineer, DIVISION OF WATER RESOURCES, DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, Respondent.	Case No.: A-20-816761-C (Lead Case) Dept. No.: 1 **MUDDY VALLEY IRRIGATION COMPANY'S NOTICE OF RECORD CITATIONS IN REPLY BRIEF** Consolidated With: Case No.: A-20-817765-P (Sub Case) Dept. No.: 1
IN THE MATTER OF THE PETITION OF COYOTE SPRINGS INVESTMENT, LLC	
IN THE MATTER OF THE PETITION OF APEX HOLDING COMPANY, LLC	Case No.: A-20-817840-P (Sub Case) Dept. No.: 1

IN THE MATTER OF THE PETITION OF CENTER FOR BIOLOGICAL DIVERSITY	Case No.: A-20-817876-P (Sub Case) Dept. No.: 1
IN THE MATTER OF THE PETITION OF MUDDY VALLEY IRRIGATION COMPANY	Case No.: A-20-817977-P (Sub Case) Dept. No.: 1
IN THE MATTER OF THE PETITION OF NEVADA COGENERATION ASSOCIATES NOS. 1 AND 2	Case No.: A-20-818015-P (Sub Case) Dept. No.: 1
IN THE MATTER OF THE PETITION OF GEORGIA-PACIFIC GYPSUM, LLC AND REPUBLIC ENVIRONMENTAL TECHNOLOGIES, INC.	Case No.: A-20-818069-P (Sub Case) Dept. No. 1
IN THE MATTER OF THE PETITION OF LINCOLN COUNTY WATER DISTRICT AND VIDLER WATER COMPANY, INC.	Case No.: A-21-833572-J (Sub Case) Dept. No 1

PETITIONER MUDDY VALLEY IRRIGATION COMPANY'S NOTICE OF RECORD CITATIONS IN REPLY BRIEF

For the convenience of the Court, MUDDY VALLEY IRRIGATION COMPANY, by and through its counsel, STEVEN D. KING and DOTSON LAW, attaches hereto the following documents found within the Record which are cited to within its Reply Brief filed on January 11, 2022:

EXHIBIT	DESCRIPTION	SE ROA
1	Order 1309	2-69
2	Transcript of Proceedings, Public Hearing, Prehearing Conference, August 8, 2019	519-552
3	Muddy River Decree	33770-33816
4	NV Energy's Order 1303 Rebuttal Report	41875 – 41886
5	SNWA Report (June 2019)	41930 – 42072
6	Transcript of Proceedings, Vol. X (Oct. 4, 2019)	53709 – 53758

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Affirmation Pursuant to NRS 239B.030

The undersigned does hereby affirm that the preceding document does not contain the social security number of any person.

DATED this 11 day of January 2022.

STEVEN D. KING
Nevada State Bar No. 4304
227 River Road
Dayton, Nevada 89403
(775) 427-5821

ROBERT A. DOTSON
Nevada State Bar No. 5285
JUSTIN C. VANCE
Nevada State Bar No. 11306
DOTSON LAW
5355 Reno Corporate Dr., Suite 100
Reno, Nevada 89511
(775) 501-9400
Attorneys for Petitioner MVIC

CERTIFICATE OF SERVICE

Pursuant to NRCP 5(b), I hereby certify that I am an employee of DOTSON LAW and that on this date I caused to be served a true and correct copy of the foregoing by electronic service to the participants in this case who are registered with the Eight Judicial District Court's Odyssey eFileNV File & Serve system to this matter.

DATED this 11 day of January 2022.

L. Morgan Bogumil

L. MORGAN BOGUMIL

DOTSON LAW
5355 RENO CORPORATE DR
SUITE #100
RENO, NEVADA 89511

TABLE OF JA LOCATION TO AVOID DUPLICATES

EXHIBIT	DESCRIPTION	SE ROA	JA VOL	JA BATES	
1	Order 1309	2-69	2	JA_326	JA_393
2	Transcript of Proceedings, Public Hearing, Prehearing Conference, August 8, 2019	519-552	2	JA_703	JA_736
3	Muddy River Decree	33770-33816	13	JA_6634	JA_6680
4	NV Energy's Order 1303 Rebuttal Report	41875 - 41886	27	JA_11786	JA_11797
5	SNW A Report (June 2019)	41930-42072	27	JA_11813	JA_11955
6	Transcript of Proceedings, Vol. X (Oct. 4, 2019)	53709-53758	44	JA_18106	JA_18155

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Francis C. Flaherty
Nevada Bar No. 5303
DYER LAWRENCE, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896
fflaherty@dyerlawrence.com

Attorneys for Nevada Cogeneration Associates Nos. 1 and 2

DISTRICT COURT

CLARK COUNTY, NEVADA

LAS VEGAS VALLEY WATTER DISTRICT, and SOUTHERN NEVADA WATER AUTHORITY, Petitioners, vs. TIM WILSON, P.E., Nevada State Engineer, DIVISION OF WATER RESOURCES, DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, Respondent. _______________________________ And All Consolidated Cases _______________________________	Case No.: A-20-816761-C (Lead Case) Dept. No.: 1 Consolidated With: A-20-817765-P A-20-818015-P A-20-817977-P A-20-818069-P A-20-817840-P A-20-817876-P A-21-833572-J **PETITIONERS' NEVADA COGENERATION ASSOCIATES NO. 1 AND 2 REPLY BRIEF**

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

I. NRAP 26.1 DISCLOSURE

The undersigned counsel of record certifies that the following are persons and entities as described in NRAP 26.1(a) and must be disclosed:

1. Petitioners Nevada Cogeneration Associates Nos. 1 and 2 ("NCA") are businesses located in Clark County, Nevada. NCA may considered affiliates, or subsidiaries, of Northern Star Generation, LLC and Panamint Capital, LLC.
2. Dyer Lawrence, LLP, by and through Francis C. Flaherty, is the law firm that represents NCA before this Court.

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

II. TABLE OF CONTENTS

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

III. ARGUMENT

A. The State Engineer's Decision was Arbitrary and Capricious Because he Lacks Authority to Create a "Superbasin."

The State Engineer's authority is limited to that "which the legislature expressly or implicitly delegates." *Wilson v. Pahrump Fair Water, LLC*, 481 P.3d 853, 137 Nev. Adv. Rep. 2 (2021) (quoting *Clark Cty. v. State, Equal Rights Comm'n*, 107 Nev. 489, 492, 813 P.2d 1006, 1007 (1991); *see Howell v. Ricci*, 124 Nev. 1222, 1230, 197 P.3d 1044, 1050 (2008) (noting that the State Engineer cannot act beyond statutory authority). Although the State Engineer's view of his own authority may be persuasive in some circumstances, it is never "controlling." *See Town of Eureka v. Office of State Eng'r*, 108 Nev. 163, 165-66, 826 P.2d 948, 949-50 (1992) (noting that the State Engineer's interpretation of his authority may be persuasive but is not controlling). The State Engineer has acknowledged this. State Engineer's Answering Brief ("SE AB") at 31:14-17. The limitations of the persuasive value of the State Engineer's view of his own authority, or any rote references to "peak deference," are amply illustrated in this case.

The State Engineer leans heavily on NRS 533.024(1)(e) in which the Legislature declared conjunctive management of all the waters of this State as a statement of policy, but despite the adoption of that policy declaration by the Legislature in 2017, the State Engineer appeared before the Legislature in 2019 and stated ***on the record*** that

> [w]hile the 2017 Legislative declaration [(NRS 533.024(1))(e))] helpfully recognizes the hydrological connection that often exists between groundwater and surface water sources, existing statute does not provide the framework necessary to effectively implement the Legislature's policy direction. <u>Assembly Bill 51</u> seeks to incorporate conjunctive management into Nevada water law while balancing the interests of these formerly separately administered water sources in a ***legally defensible*** manner.

Minutes of the Meeting of the Assembly Comm. on Nat. Res., Agric., and Mining, Feb. 27, 2019, 2019 Leg., 80th Sess. (Nev. 2019) (testimony of Tim Wilson, Acting State Engineer) (bold italics added). NCA's Appendix of Exhibits for Reply Brief, Exhibit ("App. Ex.") 1 at 30, 31-32. Note that present with the State Engineer for the hearing on AB 51 was Micheline Fairbank, a Deputy Administrator at the Division of Water Resources. App. Ex. 1 at 2, 3, 30, 35-36, 48-49. Aside from being a Deputy Administrator at the Division of Water Resources, Ms. Fairbank is an active member

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

of the State Bar of Nevada, admitted in 2002.[1] Ms. Fairbank did not in any way intervene, or "set the record straight," in the wake of the State Engineer's statement that essentially, without passage of AB 51, any efforts he made to engage in conjunctive management would be legally indefensible.

Thus, it was plain to the State Engineer in 2019 that NRS 533.024(1)(e) did ***not*** confer authority upon him to move forward with conjunctive management,2 and that lack of authority is even more acute when putatively forming a superbasin for conjunctive management. In his answering brief, the State Engineer has not provided any persuasive explanation of what has changed since he made those statements to the Legislature in 2019, which somehow gives him the authority he has already stated that he lacks. In fact, in an order he issued just a little over one month ago—Order #1329, the State Engineer again acknowledged his lack of authority to proceed in the manner he has in this case.

"Order #1329," dated December 7, 2021, is entitled "Establishing Interim Procedures for Managing Groundwater Appropriations to Prevent the Increase in Capture and Conflict with Rights Decreed Pursuant to the Humboldt River Adjudication." A copy of Order #1329 is attached hereto for the Court.[3] App. Ex. 2. As its title indicates, Order #1329 addressed one of the same issues confronting the State Engineer in Order #1309—the potential capture of senior surface water rights by pumping junior groundwater rights. In Order #1329 the State Engineer explains how he assembled a working group "to assist in developing draft regulations to resolve future conflict between surface and groundwater rights." *Id.* at 7. The State Engineer describes how over the course of three years, the working group "developed a conjunctive management approach" to protect senior water interests while maximizing beneficial use of groundwater and surface water, which

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1 https://nvbar.org/for-the-public/find-a-lawyer/?usearch=fairbank. The Court may take judicial notice of this fact pursuant to NRS 47.130. Lest there be any doubt, the State Engineer referred to Ms. Fairbank as "our attorney" during the hearing and called upon her to address recent federal water law decisions. *Minutes of the Meeting of the Assembly Comm. on Nat. Res., Agric., and Mining,* Feb. 27, 2019*,* 2019 Leg., 80th Sess. (Nev. 2019) (testimony of Tim Wilson, Acting State Engineer). App. Ex. 1 at 30, 35.

2 To the extent the Court may be "persuaded" by the State Engineer's view of his own authority, it should be persuaded by the more candid view he presented to the Legislature in 2019.

3 The Court may take judicial notice of Order #1329 pursuant to NRS 47.130 and 47.140.

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

“culminated in a set of draft regulations that relied upon a combination of mitigation plans and financial compensation to avoid future conflict. *Id.* But then, as explained by the State Engineer,

> However, in the 2019 Legislative session, ***the statutory revisions required to give the State Engineer authority to implement the draft regulation were unsuccessful.***

Id. at 7-8 (emphasis added). As noted, the draft regulations were required to actually move forward with conjunctive management of groundwater and surface water rights, but the Legislature rejected the State Engineer’s request.

Yet, in Order #1309 the State Engineer purports to rule that seven, separate hydrographic basins are now just one, single superbasin and that the “maximum quantity of groundwater that may be pumped from the [LWRFS] Hydrographic Basin on an average annual basis without causing further decline in Warm Springs area spring flow in the Muddy River cannot exceed 8,000 afa and may be less.” ROA No. 1 at 66, App. Ex.3. In his Answering Brief, the State Engineer alleges numerous items that Order #1309 putatively did not do, such as: re-prioritize any water rights; change the priority date of any water right; or, curtail groundwater pumping. SE AB at 17:27-18:11. But the State Engineer’s attempts at reassurance ring hollow, because nowhere does the State Engineer explain how NCA is not severely prejudiced and damaged when its senior groundwater rights in the Black Mountains Area (“BMA”) Hydrographic Basin are now “bumped down the line” to a yet to be determined priority position in a new superbasin that includes very senior surface water rights. Order #1309 is a per se exercise of conjunctive management, which as discussed *supra*, the State Engineer was without authority to undertake.

B. NCA was Prejudiced by the State Engineer’s Refusal to Allow Hugh Ricci to Testify Regarding the Boundary of the Lower White River Flow System, and an Offer of Proof was Not Required to Preserve the Issue.

The Lincoln County Water District and Vidler Water Company argue that because NCA failed to make an offer of proof at the hearing before the State Engineer regarding what Hugh Ricci’s testimony would have been, it has failed to perfect that argument for appeal, but this is not the case. Prior to the actual hearing, the State Engineer conducted a separate hearing wherein the parties were afforded the opportunity to present their proposed experts and their testimony. ROA No. 65 at 597-606, App. Ex. 4.

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

Mr. Ricci would have testified regarding the NCA Rebuttal Report (ROA No. 580, App. Ex. 5), which he co-signed, and his testimony would have aided the State Engineer in resolving conflicting submissions from the parties regarding the hydrology of the LWRFS, a process he had extensive experience with in his prior capacity as the State Engineer and a Deputy State Engineer. ROA No. 65 at 599-601 (93:22-94:10, 95:19-102:9); at 605 (117:20-118:9.), App. Ex. 4.

Given his unique experience, especially in the context of this hearing, Mr. Ricci would have been of great assistance to NCA and an "efficient witness," in light of the fact that NCA was only allotted 2.5 hours to present its case to the State Engineer. ROA No. 22 at 265, App. Ex. 6; ROA No. 60 at 553, App. Ex. 7. This is especially so because Mr. Ricci was the State Engineer who issued Order #1169, which was the genesis of Orders #1303 and #1309. ROA No. 65 at 601 (102:18-104:16), App. Ex. 4; ROA No. 68 at 666, App. Ex. 8.

C. The State Engineer's Decision to Include NCA's Wells in the New Superbasin was Arbitrary and Capricious and Not Supported by Substantial Evidence.

The State Engineer's decision "must be supported by substantial ***record evidence***." *Wilson v. Pahrump Fair Water, LLC*, 481 P.3d 853, 858, 137 Nev. Adv. Rep. 2 at 12 (2021) (emphasis added) (citing *King v. St. Clair*, 134 Nev. 137, 139, 414 P.3d 314, 316 (2018) (stating that "factual findings of the State Engineer should only be overturned if they are not supported by substantial evidence"). As acknowledged by the State Engineer in Order #1309, and previously in Order # 1303, "NRS 533.024(1)(c) ***directs*** the State Engineer 'to consider the best available science in rendering decisions concerning the available surface and underground sources of water in Nevada.'" ROA No. 1 at 43, App. Ex. 3; ROA No. 66 at 643, 644, 652, App. Ex. 9 (emphasis added). Taken together, the standard of review announced by the Nevada Supreme Court and NRS 533.024(1)(c) require that the State Engineer's claim of entitlement to "peak deference" notwithstanding (SE AB 19:10-23),[4] his decisions actually must be supported by substantial evidence comprised of the best available science in the record. But the State Engineer's decision in Order #1309 falls short.

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4 Indeed, taken to its illogical extreme, the State Engineer's "peak deference" argument as applied in his Answering Brief degrades the substantial evidence standard to be: "any scrap of evidence in the record that produces a desired or easy outcome." *See* SE AB at 23:12-13 ("That was an ***adequate*** basis to find the NV Cogeneration's wells should be included.") (emphasis added).

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

Indeed, the entire exercise leading up to the case *sub judice*, commencing with Order #1169, proceeding forward to Order #1303 and culminating in Order #1309, has not been merely the functions of an administrative agency, but a scientific quest. Part of that quest was to ascertain the boundaries of the LWRFS, the uncertainty of which is particularly acute in the boundary between the Garnet Valley and California Wash Hydrographic Basins on the one hand and the BMA Hydrographic Basin on the other. See ROA No. 1 at 69, App. Ex. 3.

In determining the boundaries of the LWRFS, the State Engineer indicates that he "considered [the] evidence and testimony on the basis of a common set of [six] criteria that are consistent with the original characteristics considered critical in demonstrating a close, hydrological connection requiring joint management in Rulings 6254-6261." Putatively, those criteria were:

1) Water level observations whose spatial distribution indicates a relatively uniform or flat potentiometric surface are consistent with a close hydrologic connection.

2) Water level hydrographs that, in well-to-well comparisons, demonstrate a similar temporal pattern, irrespective of whether the pattern is caused by climate, pumping or other dynamic is consistent with a close hydrologic connection.

3) Water level hydrographs that demonstrate an observable increase in drawdown that corresponds to an increase in pumping and an observable decrease in drawdown, or a recovery, that corresponds to a decrease in pumping, are consistent with direct hydraulic connection and close hydrologic connection to the pumping location(s).

4) Water level observations that demonstrate a relatively steep hydraulic gradient are consistent with a poor hydraulic connection and a potential boundary.

5) Geologic structures that have caused a juxtaposition of the carbonate rock aquifer with low permeability bedrock are consistent with a boundary.

6) When hydrogeologic information indicate a close hydraulic connection (based on criteria 1-5), but limited, poor quality, or low resolution water level data obfuscate a determination of the extent of that connection, ***a boundary should be established*** such that it extends out to the ***nearest mapped feature*** that juxtaposes the carbonate-rock aquifer with low-permeability bedrock, or in the absence of that, to the basin boundary.

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

ROA No. 1 at 48-49, App. Ex. 3 (emphasis added).[5]

The State Engineer seeks to evade accountability for the shortcomings in Order #1309 by claiming that NCA conceded in its brief that "multiple experts" testified regarding inaccuracies in the multiple linear regression ("MLR") model utilized by SNWA and cited with approval by NCA, which demonstrated a very low correlation between NCA's production wells and water levels in the LWRFS. NCA Opening Brief ("NCA OB") at 26:7-27:13. But in reality, NCA pointed out to the Court that "***two***" experts criticized the MLR analysis, but the criticism was limited to the MLR analysis conducted by SNWA in the California Wash and Garnet Valley Hydrographic Basins, not in the BMA Hydrographic Basin. *Id*. at 27:14-28:10.

And the State Engineer completely failed to respond to the fatal flaw pointed out by NCA regarding the State Engineer's reliance on the Muddy Mountain Thrust to create his putative new boundary for the LWRFS within the BMA Hydrographic Basin and the lack of substantial evidence in support of that decision. In his Answering Brief, the State Engineer failed to cite any substantial evidence in the record in support of that boundary, let alone substantial evidence comprised of the best available science in the record.

Moving beyond the due process implications of the six criteria utilized by the State Engineer, as previously discussed, the State Engineer simply did not apply those criteria as he stated, and his failure to do so was arbitrary and capricious. At the hearing before the State Engineer, one of NCA's experts—Jay Dixon—testified regarding "mapped geology" in the area of NCA's production wells near the southeast boundary of the LWRFS. ROA No. 1007 at 53663-64 (1617:9-1622:2), App. Ex. 11. Mr. Dixon presented and explained a slide to the State Engineer demonstrating the presence of the Dry Lake Regional Thrust, and thus the presence of a thrust fault just west of NCA's production wells. ROA No. 1007 at 53633 (1618:4-13), App. Ex. 11; ROA No. 973 at 52605, App. Ex. 12. Stated differently, the identified thrust fault is ***between*** NCA's production wells and the

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5 NCA was a party to Ruling 6260 (ROA No. 85, App. Ex. 10), but nowhere in that ruling, or in Order #1303 (ROA No. 66, App. Ex. 9), did the State Engineer provide notice that these six criteria were to be utilized, thus depriving NCA of a meaningful opportunity to be heard regarding these criteria and application of those criteria to the BMA Hydrographic Basin. *See also* NCA OB at 29:5-20.

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2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

LWRFS. Mr. Dixon also ***briefly*** mentioned the Muddy Mountains Thrust and the fact that it was east of NCA's production wells. ROA No. 1007 at 53633 (1618:13-16), App. Ex. 11. Thus, in terms of mapped geologic features, Mr. Dixon's testimony illustrated that the Muddy Mountain Thrust was further away from the LWRFS than the Dry Lake Regional Thrust, and thus it is the Dry Lake Regional Thrust, not the Muddy Mountain Thrust, that is the "nearest mapped [geologic] feature" to the LWRFS.

Mr. Dixon explained to the State Engineer that NCA's production wells had been deliberately sited by NCA's consultant, Marty Mifflin, "right in the middle of those slip-strike faults." *Id*. (1618:17-1619:7). Mr. Dixon walked the State Engineer through the geologic data that was obtained when various wells in the immediate area, including failed wells, were drilled. *Id*. at 53663-64 (1619:14-1622:2). Mr. Dixon highlighted features such as a "high angle fault," "a series of high angle fractures," "collapsing blocks," "large open solution structure[s]" and "abundant limestone fractures," and Mr. Dixon stated, "And this is really important. Confirmation that [Marty Mifflin] was in the fault." *Id*. at 53664 (1621:3-14). Mr. Dixon also showed the State Engineer pictures from actual well boreholes showing that Mr. Mifflin had drilled through "large caverns, right in that strike-slip fault area." ROA no. 1007 at 53634 (1621:11-22), App. Ex. 11; ROA No. 973 at 52609, App. Ex. 12.

Yet despite the detailed testimony from Mr. Dixon supporting a conclusion that the strike-slip faults in the area of NCA's production wells are "a mapped feature that juxtaposes the carbonate-rock aquifer with low-permeability bedrock," and despite "find[ing] logic in NCA's position," the State Engineer ignored that feature, continued east and relied on the Muddy Mountain Thrust as a mapped feature to form a boundary, claiming "a more inclusive approach was required." ROA No. 1 at 52, App. Ex. 3. A "more inclusive approach" is ***not*** enumerated or indicated in the six criteria quoted above. To the contrary, criterion number six plainly states that when there is "obfuscation" (ambiguity) in the data, the "nearest mapped feature" should be relied upon to establish a boundary. *Id*.

The State Engineer's utilization of the Muddy Mountains Thrust as the southeastern boundary of the LWRFS at the expense of NCA's senior water rights in the BMA Hydrographic

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

Basin is even more egregious in light of the fact that there was no meaningful discussion or presentation at the hearing that the Muddy Mountains Thrust should be used to that effect. Thus, NCA was deprived of the opportunity to probe and test whether such an assumption was the best possible science in the record available to the State Engineer. Stated differently, and bluntly, the State Engineer sandbagged NCA by utilizing the Muddy Mountains Thrust as the southeastern boundary of the LWRFS, and his decision to do so was arbitrary and capricious and not supported by the substantial evidence required in this case—the best possible science in the record available to the State Engineer.

IV. CONCLUSION

Order #1309 is arbitrary and capricious, and key elements of the Order are not supported by substantial evidence. As an initial matter, the State Engineer is simply without authority to engage in conjunctive management in any basin, let alone create a "superbasin" and impose conjunctive management thereon. Despite the Legislature's expression of a policy preference for conjunctive management (not superbasins) in NRS 533.024(1)(e), the State Engineer himself understood that he was lacking authority to actually move forward with conjunctive management in the absence of a grant of additional, express authority from the Legislature.

For that reason, the State Engineer went to the Legislature in 2019 seeking such authority in Assembly Bill 51, but his efforts were unsuccessful. The State Engineer acknowledged that failure in Order #1329, which he issued just a little over one month ago. In that Order, the State Engineer explained that he could not move forward with regulations implementing conjunctive management in the Humboldt River Basin because the Legislature had ***failed*** to enact AB 51. Yet by designating the Lower White River Flow System a superbasin and stating that only 8,000 afa can be withdrawn from groundwater sources in the superbasin without impairing spring flow and senior surface water rights and in the Muddy River, the State Engineer ***did*** in Order #1309 what he conceded he was ***without authority to do*** in Order #1329. That is plainly and simply arbitrary and capricious.

With regard to substantial evidence, specifically for NCA, that portion of the Order that establishes the Muddy Mountains Thrust as the southeast boundary of the LWRFS is ***not*** supported by substantial evidence. The Muddy Mountain Thrust is ***not*** the nearest mapped feature establishing

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

a boundary for the LWRFS, one of the boundary criteria enunciated by the State Engineer in Order #1309. To the contrary, the slip-strike faults near NCA's production wells, related to the Dry Lake Regional Thrust, are the nearest mapped feature, and NCA presented ample evidence of that to the State Engineer through the testimony of Jay Dixon. In contrast, the administrative record in this matter contains only passing references to the Muddy Mountains Thrust, and the State Engineer has adduced no substantial evidence to this Court from the record that supports utilization of the Muddy Mountains Thrust as the southeast boundary of the LWRFS, rather than the slip-strike faults identified by Mr. Dixon.

For all of the reasons stated herein and in NCA's Petition for Judicial Review, Opening Brief and Answering Brief and Joinder in Certain Arguments, NCA urges this Court to reverse the decision of the State Engineer in its entirety, or in the alternative, remand this matter to the State Engineer for further findings regarding the appropriate southeast boundary of the LWRFS, thereby allowing NCA to fully address the contention that the Muddy Mountains Thrust, rather than the slip-strike faults identified by NCA, are the nearest "mapped" feature and the appropriate boundary for the LWRFS.

RESPECTFULLY SUBMITTED this 11th day of January, 2022.

DYER LAWRENCE, LLP

/s/ Francis C. Flaherty
Francis C. Flaherty
2805 Mountain Street
Carson City, Nevada 89703

Attorneys for Nevada Cogeneration Associates Nos. 1 and 2

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

CERTIFICATE OF SERVICE

I hereby certify pursuant to NRCP 5(b), EDCR 8.05(a) and EDCR 8.05(f) that I am an employee of DYER LAWRENCE, LLP and that on the 11th day of January 2022, I caused a true and correct copy of the foregoing Petitioners' Nevada Cogeneration Associates No. 1 and 2 Reply Brief to be sent electronically to each of the following counsel of record and/or parties by electronic transmission through the Eighth Judicial District Court's electronic filing system to all parties appearing on the electronic service list in Odyssey E-File:

James N. Bolotin
Laena St-Jules
Kiel B. Ireland
Office of the Attorney General
100 North Carson Street
Carson City, Nevada 89701-4717
Attorneys for Tim Wilson, P.E., Nevada State Engineer
jbolotin@ag.nv.gov
lstjules@ag.nv.gov
kireland@ag.nv.gov
keaston@ag.nv.gov
dwright@ag.nv.gov
mpizzariello@ag.nv.gov
tplotnick@ag.nv.gov
erueda@ag.nv.gov

Bradley J. Herrema
Brownstein Hyatt Farber Schreck
100 North City Parkway, Suite 1600
Las Vegas, Nevada 89106
Attorneys for Coyote Springs Investment, LLC
bherrema@bhfs.com

Christian T. Balducci
Marquis Aurbach Coffing
10001 Park Run Drive
Las Vegas, Nevada 89145
Attorneys for Apex Holding Company, LLC And Dry Lake Water LLC
cbalducci@maclaw.com

Kent R. Robison
Hannah E. Winston
Robison, Sharp, Sullivan and Brust
71 Washington Street
Reno, Nevada 89503
Attorneys for Coyote Springs Investment, LLC
krobison@rssblaw.com
hwinston@rssblaw.com
tshanks@rssblaw.com

Emilia K. Cargill
COO, Senior Vice President-General Counsel
Coyote Springs Investment, LLC
P.O. Box 37010
Coyote Springs, Nevada 89037
Attorneys for Coyote Springs Investment, LLC
Emilia.cargill@wingfieldnevadagroup.com
Emilia.cargill@coyotesprings.com

William L. Coulthard
Coulthard Law
840 South Rancho Drive, #4-627
Las Vegas, Nevada 89106
Attorneys for Coyote Springs Investment, LLC
WLC@coulthardlaw.com

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

Greg H. Morrison
Parsons Behle & Latimer
50 West Liberty Street, Suite 750
Reno, Nevada 89501
Attorneys for Moapa Valley Water District
gmorrison@parsonbehle.com

Paul G. Taggart
Thomas P. Duensing
Taggart & Taggart
108 North Minnesota Street
Carson City, Nevada 89703
Attorneys for Southern Nevada Water Authority and Las Vegas Valley Water District
paul@legaltnt.com
tom@legaltnt.com

Robert A. Dotson
Justin C. Vance
Dotson Law
5355 Reno Corporate Drive, Suite 100
Reno, Nevada 89511
Attorneys for Muddy Valley Irrigation Company
rdotson@dotsonlaw.legal
jvance@dotsonlaw.legal

Lisa T. Belenky
Center for Biological Diversity
1212 Broadway, Suite 800
Oakland, California 94612
Attorneys for Center for Biological Diversity
lbelenky@biologicaldiversity.org

Steven C. Anderson
Las Vegas Valley Water District
1001 South Valley View Boulevard
Las Vegas, Nevada 89153
Attorneys for Southern Nevada Water Authority and Las Vegas Valley Water District
Sc.anderson@lvvwd.com

Steve D. King
227 River Road
Dayton, Nevada 89403
Attorneys for Muddy Valley Irrigation Company
kingmont@charter.net

Severin A. Carlson
Kaempfer Crowell
50 West Liberty Street, Suite 700
Reno, Nevada 89501
Attorneys for Church of Jesus Christ of the Latter Day Saints
scarlson@kcnvlaw.com
sstice@kcnvlaw.com
mmarsh@kcnvlaw.com

Scott Lake #15765
Center for Biological Diversity
P.O. Box 6205
Reno, Nevada 89513
Attorneys for Center for Biological Diversity
slake@biologicaldiversity.org

Andy Moore
City Attorney's Office
City of North Las Vegas
2250 North Las Vegas Blvd., Suite 810
North Las Vegas, NV 89030
Attorneys for City of North Las Vegas
moorea@cityofnorthvegas.com
moorea@cityofnorthlasvegas.com

Derek Muaina,
General Counsel Western Elite
2745 North Nellis Boulevard.
Las Vegas, Nevada 89115
Attorneys for Bedroc
DerekM@WesternElite.com

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

Sylvia Harrison
Lucas Foletta
Sarah Ferguson
McDonald Carano
100 West Liberty Street, 10th Floor
Reno, Nevada 89501
Attorneys for Georgia Pacific Corporation and Republic Environmental Technologies, Inc.
sharrison@mcdonaldcarano.com
lfoletta@mcdonaldcarano.com
sferguson@mcdonaldcarano.com
nhoy@mcdonaldcarano.com
jsusskind@mcdonaldcarano.com
cdavis@mcdonaldcarano.com

Laura A. Schroeder
Therese A. Ure Stix
Schroeder Law Offices, P.C.
10615 Double R Boulevard, Suite 100
Reno, Nevada 89521
Attorneys for City of North Las Vegas and Bedroc Limited, LLC
counsel@water-law.com

Justina A. Caviglia
Michael Knox
6100 Neil Road
Reno, Nevada 89511
Attorneys for Sierra Pacific Power Company dba NV Energy and Nevada Power Company dba NV Energy
jcaviglia@nvenergy.com
mknox@nvenergy.com

Wayne O. Klomp
Great Basin Law
1783 Trek Trail
Reno, Nevada 89521
Attorneys for Lincoln County Water District
wayne@greatbasinlawyer.com

Karen A. Peterson
Allison MacKenzie, Ltd.
P.O. Box 646
Carson City, Nevada 89702
Attorneys for Lincoln County Water District and Vidler Water Company, Inc.
kpeterson@allisonmackenzie.com

Dylan V. Frehner
Lincoln County District Attorney
P.O. Box 60
Pioche, Nevada 89043
Attorneys for Lincoln County Water District and Vidler Water Company, Inc.
dfrehner@lincolncountynv.gov

<u>/s/ Kelly Gilbert</u>
Kelly Gilbert

Electronically Filed
1/11/2022 4:32 PM
Steven D. Grierson
CLERK OF THE COURT

APEN
Francis C. Flaherty
Nevada Bar No. 5303
DYER LAWRENCE, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896
fflaherty@dyerlawrence.com
smatuska@dyerlawrence.com

Attorneys for Nevada Cogeneration Associates Nos. 1 and 2

DISTRICT COURT

CLARK COUNTY, NEVADA

LAS VEGAS VALLEY WATTER DISTRICT, and SOUTHERN NEVADA WATER AUTHORITY, Petitioners, vs. TIM WILSON, P.E., Nevada State Engineer, DIVISION OF WATER RESOURCES, DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, Respondent. And All Consolidated Cases	Case No.: A-20-816761-C (Lead Case) Dept. No.: 1 Consolidated With: A-20-817765-P A-20-818015-P A-20-817977-P A-20-818069-P A-20-817840-P A-20-817876-P A-21-833572-J **APPENDIX OF EXHIBITS IN SUPPORT OF PETITIONERS' NEVADA COGENERATION ASSOCIATES NO. 1 AND NO. 2 REPLY BRIEF**

Nevada Cogeneration Associates No. 1 and 2 hereby submit the Appendix of Exhibits in support of their Reply Brief.

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Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

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Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

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Dated January 11, 2022

DYER LAWRENCE, LLP

/s/ Francis C. Flaherty

Francis C. Flaherty
2805 Mountain Street
Carson City, Nevada 89703
Telephone: 775-885-1896
fflaherty@dyerlawrence.com

Attorneys for Nevada Cogeneration Associates Nos. 1 and 2

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

CERTIFICATE OF SERVICE

I hereby certify pursuant to NRCP 5(b), EDCR 8.05(a) and EDCR 8.05(f) that I am an employee of DYER LAWRENCE, LLP and that on the 11th day of January 2022, I caused a true and correct copy of the foregoing Appendix in Support of Petitioners' Nevada Cogeneration Associates Nos. 1 and No. 2 Reply Brief to be sent electronically to each of the following counsel of record and/or parties by electronic transmission through the Eighth Judicial District Court's electronic filing system to all parties appearing on the electronic service list in Odyssey E-File:

James N. Bolotin
Laena St-Jules
Kiel B. Ireland
Office of the Attorney General
100 North Carson Street
Carson City, Nevada 89701-4717
Attorneys for Tim Wilson, P.E., Nevada State Engineer
jbolotin@ag.nv.gov
lstjules@ag.nv.gov
kireland@ag.nv.gov
keaston@ag.nv.gov
dwright@ag.nv.gov
mpizzariello@ag.nv.gov
tplotnick@ag.nv.gov
erueda@ag.nv.gov

Bradley J. Herrema
Brownstein Hyatt Farber Schreck
100 North City Parkway, Suite 1600
Las Vegas, Nevada 89106
Attorneys for Coyote Springs Investment, LLC
bherrema@bhfs.com

Christian T. Balducci
Marquis Aurbach Coffing
10001 Park Run Drive
Las Vegas, Nevada 89145
Attorneys for Apex Holding Company, LLC And Dry Lake Water LLC
cbalducci@maclaw.com

Kent R. Robison
Hannah E. Winston
Robison, Sharp, Sullivan and Brust
71 Washington Street
Reno, Nevada 89503
Attorneys for Coyote Springs Investment, LLC
krobison@rssblaw.com
hwinston@rssblaw.com
tshanks@rssblaw.com

Emilia K. Cargill
COO, Senior Vice President-General Counsel
Coyote Springs Investment, LLC
P.O. Box 37010
Coyote Springs, Nevada 89037
Attorneys for Coyote Springs Investment, LLC
Emilia.cargill@wingfieldnevadagroup.com
Emilia.cargill@coyotesprings.com

William L. Coulthard
Coulthard Law
840 South Rancho Drive, #4-627
Las Vegas, Nevada 89106
Attorneys for Coyote Springs Investment, LLC
WLC@coulthardlaw.com

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

Greg H. Morrison
Parsons Behle & Latimer
50 West Liberty Street, Suite 750
Reno, Nevada 89501
Attorneys for Moapa Valley Water District
gmorrison@parsonbehle.com

Paul G. Taggart
Thomas P. Duensing
Taggart & Taggart
108 North Minnesota Street
Carson City, Nevada 89703
Attorneys for Southern Nevada Water Authority and Las Vegas Valley Water District
paul@legaltnt.com
tom@legaltnt.com

Robert A. Dotson
Justin C. Vance
Dotson Law
5355 Reno Corporate Drive, Suite 100
Reno, Nevada 89511
Attorneys for Muddy Valley Irrigation Company
rdotson@dotsonlaw.legal
jvance@dotsonlaw.legal

Lisa T. Belenky
Center for Biological Diversity
1212 Broadway, Suite 800
Oakland, California 94612
Attorneys for Center for Biological Diversity
lbelenky@biologicaldiversity.org

Steven C. Anderson
Las Vegas Valley Water District
1001 South Valley View Boulevard
Las Vegas, Nevada 89153
Attorneys for Southern Nevada Water Authority and Las Vegas Valley Water District
Sc.anderson@lvvwd.com

Steve D. King
227 River Road
Dayton, Nevada 89403
Attorneys for Muddy Valley Irrigation Company
kingmont@charter.net

Severin A. Carlson
Kaempfer Crowell
50 West Liberty Street, Suite 700
Reno, Nevada 89501
Attorneys for Church of Jesus Christ of the Latter Day Saints
scarlson@kcnvlaw.com
sstice@kcnvlaw.com
mmarsh@kcnvlaw.com

Scott Lake #15765
Center for Biological Diversity
P.O. Box 6205
Reno, Nevada 89513
Attorneys for Center for Biological Diversity
slake@biologicaldiversity.org

Andy Moore
City Attorney's Office
City of North Las Vegas
2250 North Las Vegas Blvd., Suite 810
North Las Vegas, NV 89030
Attorneys for City of North Las Vegas
moorea@cityofnorthvegas.com
moorea@cityofnorthlasvegas.com

Derek Muaina,
General Counsel Western Elite
2745 North Nellis Bloulvard.
Las Vegas, Nevada 89115
Attorneys for Bedroc
DerekM@WesternElite.com

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

Sylvia Harrison
Lucas Foletta
Sarah Ferguson
McDonald Carano
100 West Liberty Street, 10th Floor
Reno, Nevada 89501
Attorneys for Georgia Pacific Corporation and Republic Environmental Technologies, Inc.
sharrison@mcdonaldcarano.com
lfoletta@mcdonaldcarano.com
sferguson@mcdonaldcarano.com
nhoy@mcdonaldcarano.com
jsusskind@mcdonaldcarano.com
cdavis@mcdonaldcarano.com

Laura A. Schroeder
Therese A. Ure Stix
Schroeder Law Offices, P.C.
10615 Double R Boulevard, Suite 100
Reno, Nevada 89521
Attorneys for City of North Las Vegas and Bedroc Limited, LLC
counsel@water-law.com

Justina A. Caviglia
Michael Knox
6100 Neil Road
Reno, Nevada 89511
Attorneys for Sierra Pacific Power Company dba NV Energy and Nevada Power Company dba NV Energy
jcaviglia@nvenergy.com
mknox@nvenergy.com

Wayne O. Klomp
Great Basin Law
1783 Trek Trail
Reno, Nevada 89521
Attorneys for Lincoln County Water District
wayne@greatbasinlawyer.com

Karen A. Peterson
Allison MacKenzie, Ltd.
P.O. Box 646
Carson City, Nevada 89702
Attorneys for Lincoln County Water District and Vidler Water Company, Inc.
kpeterson@allisonmackenzie.com

Dylan V. Frehner
Lincoln County District Attorney
P.O. Box 60
Pioche, Nevada 89043
Attorneys for Lincoln County Water District and Vidler Water Company, Inc.
dfrehner@lincolncountynv.gov

/s/ Kelly Gilbert
Kelly Gilbert

Dyer Lawrence, LLP
2805 Mountain Street
Carson City, Nevada 89703
(775) 885-1896

TABLE OF JA LOCATION TO AVOID DUPLICATES

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7	Order 1303 Hearing Schedule Matrix (undated)	60	ROA 553	2	JA_737	JA_737

8	Order #1169, Holding in Abeyance Carbonate-Rock Aquifer System Groundwater Applications Pending or to be Filed in Coyote Spring Valley (Basin 210), Black Mountains Area (Basin 215), Garnet Valley (Basin 216), Hidden Valley (Basin 217), Muddy River Springs Area aka Upper Moapa Valley (Basin 219), Lower Moapa Valley (Basin 220), and for Further Study of the Appropriation of Water from the Carbonate-Rock Aquifer System, Lincoln and Clark Counties, Nevada. March 8, 2002.	68	ROA 659-669	3	JA_824	JA_834
9	Interim Order #1303 (and Addendum), Designating the Administration of All Water Rights within Coyote Spring Valley Hydrographic Basin (210), a Portion of Black Mountains Area Basin (215), Garnet Valley Basin (216), Hidden Valley Basin (217), California Wash Basin (218), and Muddy River Springs Area (aka Upper Moapa Valley) Basin (219) as a Joint Administrative Unit, Holding in Abeyance Applications to Change Existing Groundwater Rights, and Establishing a Temporary Moratorium on the Review of Final Subdivision Maps. January 11, 2019 (May 13, 2019).	66	ROA 635-653	2	JA_394	JA_412

10	Ruling #6260, In the Matter of Applications 58592, 58593, 58594, 64041 and 67893 Filed to Appropriate the Underground Waters of the Black Mountains Area Hydrographic Basin (215), Clark County, Nevada. January 29, 2014.	85	ROA 906-928	3	JA_1071	JA_1093
11	Reporter's Hearing Transcript, Vol. IX, State of Nevada, Department of Conservation and Natural Resources, In the Matter of the Administration and Management of the Lower White River Flow System within Coyote Spring Valley Hydrographic Basin (210), a Portion of Black Mountains Area Hydrographic Basin (215), Garnet Valley Hydrographic Basin (216), Hidden Valley Hydrographic Basin (217), California Wash Hydrographic Basin (218), and Muddy River Springs Area (aka Upper Moapa Valley) Hydrographic Basin (219). October 3, 2019.	1007	ROA 53657-53708	44	JA_18054	JA_18105
12	NCA's Slide Presentation for Testimony Before the State Engineer on October 3, 2019.	973	ROA 52599-52642	attached		

EXHIBIT 1

EXHIBIT 1

**MINUTES OF THE MEETING
OF THE
ASSEMBLY COMMITTEE ON NATURAL RESOURCES, AGRICULTURE,
AND MINING**

**Eightieth Session
February 27, 2019**

The Committee on Natural Resources, Agriculture, and Mining was called to order by Chair Heidi Swank at 4 p.m. on Wednesday, February 27, 2019, in Room 3138 of the Legislative Building, 401 South Carson Street, Carson City, Nevada. The meeting was videoconferenced to Room 4401 of the Grant Sawyer State Office Building, 555 East Washington Avenue, Las Vegas, Nevada and to Room 203, Carl Diekhans Center Industrial Tech Bldg., Great Basin College, 1500 College Parkway, Elko, Nevada. Copies of the minutes, including the Agenda (Exhibit A), the Attendance Roster (Exhibit B), and other substantive exhibits, are available and on file in the Research Library of the Legislative Counsel Bureau and on the Nevada Legislature's website at www.leg.state.nv.us/App/NELIS/REL/80th2019.

COMMITTEE MEMBERS PRESENT:

Assemblywoman Heidi Swank, Chair
Assemblywoman Shannon Bilbray-Axelrod, Vice Chair
Assemblyman Alex Assefa
Assemblywoman Maggie Carlton
Assemblywoman Lesley E. Cohen
Assemblyman John Ellison
Assemblyman Ozzie Fumo
Assemblywoman Alexis Hansen
Assemblywoman Sarah Peters
Assemblywoman Robin L. Titus
Assemblyman Howard Watts
Assemblyman Jim Wheeler

COMMITTEE MEMBERS ABSENT:

None

GUEST LEGISLATORS PRESENT:

None

Minutes ID: 309

STAFF MEMBERS PRESENT:

Jann Stinnesbeck, Committee Policy Analyst
Allan Amburn, Committee Counsel
Nancy Davis, Committee Secretary
Alejandra Medina, Committee Assistant

OTHERS PRESENT:

Bradley R. Crowell, Director, State Department of Conservation and Natural Resources
Tim Wilson, Acting State Engineer and Administrator, Division of Water Resources, State Department of Conservation and Natural Resources
Micheline Fairbank, Deputy Administrator, Division of Water Resources, State Department of Conservation and Natural Resources
Rupert Steele, Chairman, Confederated Tribes of the Goshute Reservation, Ibapah, Utah
Robert McDougal, Commissioner, Board of Commissioners, Pershing County
Norman Harry, Environmental Director, Environmental Protection Department, Washoe Tribe of Nevada and California
Norman Frey, Private Citizen, Fallon, Nevada
Jeff Fontaine, Executive Director, Central Nevada Regional Water Authority and Humboldt River Basin Water Authority
Jake Tibbitts, Natural Resources Manager, Department of Natural Resources, Eureka County
Kyle Roerink, Executive Director, Great Basin Water Network
Doug Busselman, Executive Vice President, Nevada Farm Bureau Federation
Patrick Donnelly, Nevada State Director, Center for Biological Diversity
Tobi Tyler, Executive Committee Member, Toiyabe Chapter, Sierra Club
Laurel Saito, Nevada Water Program Director, The Nature Conservancy
Mark Butler, Executive Council Member, Coalition to Protect America's National Parks
Susan Juetten, Private Citizen, Reno, Nevada
Kenny Bent, Private Citizen, Pahrump, Nevada
John Hiatt, Conservation Chair – Press Liaison, Red Rock Audubon Society
Patti Jesinoski, Private Citizen, Henderson, Nevada
Ed James, General Manager, Carson Water Subconservancy District
Andrew M. Belanger, Director of Public Services, Southern Nevada Water Authority
Adam Sullivan, Deputy Administrator, Division of Water Resources, State Department of Conservation and Natural Resources
David G. Hillis, Jr., Principal Engineer, Turnipseed Engineering, LTD, Carson City, Nevada
Steve Walker, representing Douglas County; and Storey County
Bennie B. Hodges, Manager, Pershing County Water Conservation District
Rebekah Stetson, Private Citizen, Reno, Nevada

Anthony Sampson, Tribal Chairman, Pyramid Lake Paiute Tribe
Will Adler, representing Pyramid Lake Paiute Tribe

Chair Swank:
[Roll was called. Committee rules and protocol were reviewed.] Assembly Bill 62 will be heard on another day, in order to allow enough time for public participation. I will begin with a presentation by the Division of Water Resources, State Department of Conservation and Natural Resources.

Bradley R. Crowell, Director, State Department of Conservation and Natural Resources:
Thank you for holding this hearing today to discuss the important topic of how best to manage Nevada's most precious resource, our water. Before we provide some background for the Committee on Nevada's water statutes and the manner in which those statutes are implemented, I would like to introduce the leadership of our Division of Water Resources and then take a moment to offer the big picture of the challenges Nevada faces today in managing our limited water supply. I am joined by Mr. Tim Wilson, Acting State Engineer and Administrator of the Division of Water Resources as well as the two deputy administrators, Adam Sullivan and Micheline Fairbank. We are happy to answer any and all questions you have today.

To help set the stage for this hearing, I would like to highlight three indisputable facts: One, Nevada is the driest state in the nation. Two, Nevada has been one of the fastest growing states in the nation for the past two decades and is continuing to grow and diversify its economy. Three, climate change is real. The impacts are being felt in Nevada and it is our responsibility to take the impacts into account in managing Nevada's water resources. These three facts demand we take a proactive approach to responsibly manage our water in every corner of Nevada. It is imperative that we recognize these fundamental truths and exercise our collective responsibilities to protect the best interests of all Nevadans.

There is a fourth potential reality lurking just around the corner, which is the very real and growing possibility that the federal government will enact mandatory curtailment of our water supply from the Colorado River. If this reality comes to pass, our water challenges in Nevada will become magnified exponentially.

We are here today not to ignore these challenges, but to recognize them and to take action. Taking action will require both courage and shared sacrifice. There can be no winners and losers when there is a collective understanding of the challenges we face and the willingness to ensure a sustainable water future for all Nevadans. I am optimistic that we can and will rise to this challenge.

With regard to the bills we will discuss today, these are our neutral and good-faith attempts to address complex issues based on years of experience and expertise within the Office of the State Engineer which is within the Division of Water Resources. We have not cornered the market on the best ideas, and we welcome the informed views and suggestions of this

Committee and the many stakeholders who are here today. One thing is without question, the status quo is not an option. We look forward to your questions and discussing the legislation that is before us today.

Tim Wilson, Acting State Engineer and Administrator, Division of Water Resources, State Department of Conservation and Natural Resources:
I would like to provide an overview of Nevada water law, our agency, and some of our water issues. Most people know that our mission statement is to conserve, protect, manage and enhance the state's water resources for Nevada's citizens through the appropriation and reallocation of the public waters [page 2, (Exhibit C)].

What we do is quite a bit more than that. Page 3 shows a short list of some of the many activities we perform—many are very important, such as well drilling, dam safety, innovative solutions like aquifer storage and recovery, and many others.

In recent years, the Division has also made a concerted effort to use advanced technology to improve our services to the public. We are utilizing modeling techniques in processing power, in cooperation with other agencies and the University of Nevada to better understand basin-scale hydrology. We are utilizing unmanned aerial vehicles for dam safety inspections and for mapping to complement, but not replace, boots on the ground for inspections. We use geographical information systems to improve mapping, public accessibility, and historic and current data. We have some really good Truckee-Carson Irrigation District mapping, Smith Valley and Mason Valley interactive monthly pumpage reports, and historic hydrologic data that was formerly only in paper records and is now all on interactive databases.

Page 5 shows a few quick facts about Nevada. We sometimes argue with New Mexico over who is the driest, but we think we still hold the moniker as the driest in the nation, averaging approximately 11 inches of precipitation annually. When I started with the state of Nevada, it does not seem very long ago but it was 1995, there were about 1.5 million people in this state. Our population is now over 3 million. I point that out because the amount of water we have is the same, obviously, about 4 million to 5 million acre-feet of surface water and about 2 million acre-feet of groundwater. We manage our water resources that are available through 14 hydrographic regions divided into 256 groundwater basins. We group those basins and assign them to water resource specialists. Any time you contact our office, if you tell us what groundwater basin you are in, you will be directed to a water resource specialist who is assigned to that basin and can personally assist you.

Page 6 shows who uses our water. Most of it is irrigation. Irrigation for surface water takes up about 64.9 percent. The second largest user of surface water is recreation and wildlife at almost 19 percent; this amount represents instream flow rights, recreational rights, and evaporation off of terminal lakes. Municipal use is third at about 16 percent; this includes Las Vegas' use of the Colorado River water and the Reno and Sparks use of the Truckee River water.

Page 7 shows groundwater use; irrigation use is the dominant use at about 67 percent, mining is at about 10 percent, and municipal use at about 9 percent.

Our water rights are committed through permits and vested claims. Page 8 is a chart comparing groundwater pumpage to the water that is actually committed for each manner of use in the state. If you were to add up both columns, the actual usage is about 50 percent of the committed rights for all manners of use.

Page 9 (Exhibit C) is a simple illustration showing that on a statewide scale, even though we use less than 50 percent of our total committed supply, we do exceed our committed resources in many localized areas. This map shows the ratio of committed groundwater resources—that is the addition of permits, certificates, claims, and domestic wells versus the amount of water we estimate is available through perennial yield. We estimate about 106 basins are over our estimated perennial yield. I would also like to point out that there are about 54 of the 256 basins for which commitments are more than double their perennial yield. These are some very serious issues.

Page 10 gives you an even better picture where actual groundwater pumpage exceeds the perennial yield on about 51 of our 256 basins. These are the basins that are most likely to be experiencing significant water level drawdown and conflict amongst users. In some cases, we have worked with local management very actively to prevent harmful effects: notably, Las Vegas Valley, Truckee Meadows area, and Diamond Valley.

I would like to discuss Nevada water law. We have three basic tenets of Nevada water law: the prior appropriation doctrine, which means if you are first in time—you are the senior user—you get your water first. Beneficial use is an expectation that you place your water to beneficial use, that is the limit of the right to use of water. Related to the beneficial use is that if you are not using your water, you can lose it to cancellation, abandonment, or forfeiture.

Page 12 describes a very important concept that comes up that some people do not realize. It is by statute that the public owns the water in the state of Nevada, above and below the ground. What people have through the statutory permitting process is the right to the use of the water. That is considered a type of property right. It is appurtenance to the property, it can pass from seller to buyer, it can be sold and leased, but it is still a permit.

Page 14 makes it look like it is very easy to obtain a permit. It can be a very complex process to file an application. If you meet all of those statutory criteria, you can be issued a water rights permit. As part of the permit terms, you will be required to do a proof of completion of work and proof of beneficial use. If you do so, then you will be allowed to have a water rights certificate, which is the last step in the process. If you were using your water prior to the enactment of Nevada water law, you can make a vested claim to water as well. We have an entire section that does the adjudication process to make a determination on those claims—prior to 1905 for surface water, 1913 for artesian wells, and 1939 for groundwater.

There is not a lot we can do when someone files an application. We are either going to approve it, approve it with conditions, or we are going to deny it [page 15]. Many times, in addition to the regular permit terms, we will condition permits on monitoring. We have conditioned permits on mitigation, pumpage reporting, the depth of the well as far as limitation, and reducing the rate of flow and volume that were requested in the application. Or we can deny the application. Any of our decisions in that regard can be appealed to district court.

Page 16 (Exhibit C) shows four basic conditions of approval. The ones we will be looking at today are part of *Nevada Revised Statutes* (NRS) 533.370, which deals with conflicting with existing rights. We also consider whether the use of the water will prove detrimental to public interest, whether there will be a conflict with existing domestic wells, and whether there is unappropriated water available.

We also consider legislative directives, which are in NRS 533.024. "Conjunctive use" was recently added. We will discuss Assembly Bill 51 later, which attempts to address this part of the legislative declaration. "Conjunctive use" means managing the surface water and groundwater as a single source and recognizing the interaction between the two. Previously, under Nevada water law, we have treated surface water and groundwater separately, and we will talk about that when we discuss our bills.

We have another bill that is not going to be heard today. It really helps add to the antispeculation doctrines we have in statute. If you apply for a permit, you cannot just hold the spot, you have to actually diligently apply yourself to place your water to beneficial use—construct the works necessary, drill your well, construct your ditches, and actually use the water beneficially and in accordance with the terms of your permit. We have a lot of antispeculation doctrines to keep people from grabbing a spot. If they do not intend to use the water, they need to move aside and let the next person in line have that water.

Page 19 shows that we have a tenet that you can lose a water right permit through cancellation, forfeiture for five years of nonuse of certificated groundwater, and also abandonment.

We have many significant water management challenges. In 2017, the Legislature directed the Division to conjunctively manage all waters, regardless of their source. Since the water laws traditionally treated surface water and groundwater as separate sources, there is a lot of room for statutory changes to allow our office to fulfill this mandate. Concentrated areas of domestic wells are a continuing concern in dealing with conflicts, along with overappropriated basins and litigation are our largest challenges.

To tie this all together, the Division would like to have additional statutory authority. We have three bills this session and I look forward to explaining the bills and addressing any misconceptions about the intent of our bills that may be out there. We are all in this together and I hope we can all come together and work toward solutions. As Mr. Crowell mentioned, we may not have all the ideas, but we are willing to listen to everyone's ideas and bring everyone together to work toward bringing some statutory structure and correcting some mistakes from our past, as you can see by the overappropriated basins.

Chair Swank:
Thank you for the presentation. We will now move to the bill hearings. I will open the hearing on Assembly Bill 30.

Assembly Bill 30: **Revises provisions governing the appropriation of water. (BDR 48-214)**

Tim Wilson, Acting State Engineer and Administrator, Division of Water Resources, State Department of Conservation and Natural Resources:
I am here today to present testimony in support of Assembly Bill 30. As I enter my testimony, it is imperative to stress that this—and every bill the Division of Water Resources, State Department of Conservation and Natural Resources has offered this session—is the product of extensive experience managing Nevada's limited water resources (Exhibit D). To adapt to today's water resource challenges, the Division of Water Resources needs opportunities for flexibility to best manage Nevada's limited water resources and to fulfill its legal duties and responsibilities. As Nevada's population grows, there will be an ever-increasing demand on our water resources. These demands will inevitably create conflicts, and therefore the responsibility to manage those conflicts is imperative.

Nevada's water resources belong to all Nevadans, and it is the responsibility of the State Engineer through the Division of Water Resources to manage our shared water resources with consistency, in accordance with the law, and using the best available science. And to preemptively dispel any rumors that I have heard and to put to rest any perception that this, or any Division bill, is intended to, or is for the purpose of facilitating large water development projects, let me be clear: This is absolutely untrue. These bills are the Division's best effort to address real challenges and issues the Division grapples with regularly in all parts of the state. The Division of Water Resources has heard an abundance of criticism of A.B. 30, much of which we believe misinterprets the bill, and we are open to an ongoing dialogue as to how to best achieve the purpose of this bill.

The intent of this bill is to bring needed consistency and clarity to Nevada's water law. Assembly Bill 30 seeks to harmonize existing provisions of Nevada's water law under *Nevada Revised Statutes* (NRS) Chapters 533 and 534. Specifically, the mandate within NRS 533.370 subsection 2 that applications conflicting with existing rights be denied in contrast with the express authority under NRS 533.024 subsection 1, paragraph (b) to mitigate conflicts with domestic wells and the additional express authorities under NRS 534.110 subsection 4, permitting the use of monitoring, management and mitigation plans (3M plans) as a condition on approval of water rights, and the allowance for the reasonable lowering of the groundwater table. These provisions currently provide conflicting guidance to the Division of Water Resources regarding the issuance of water rights and the ability to resolve potential conflicts among water rights holders. Assembly Bill 30 is intended to help resolve this discrepancy by providing the Division clear legislative direction to help avoid or eliminate a potential conflict when deciding whether or not to grant a water rights application.

Nevada water law anticipates that any water appropriation may result in some degree of foreseen or unforeseen conflict or impact to existing water rights. And, while the terms "mitigation" and "3M plans" have been somewhat villainized due to conflict over a particular groundwater development project, the fact of the matter is that current law authorizes the State Engineer to resolve a conflict based on the principle that any impacted senior water rights holders are made whole and the overreaching public interest remains balanced.

This bill merely seeks to provide needed clarity and consistency in Nevada water law. The commitment of the Division of Water Resources is that harmonization of the law will be applied in a balanced, responsible manner through consultation with and contribution by affected water rights holders and domestic well owners, and based on the most current and best available hydrologic and engineering data.

In offering additional context within Nevada water law as to why this bill is both permissible and necessary, Nevada's water resources are owned by all Nevadans, as enshrined in state law under NRS 533.025 since 1913. Whereas, a water right does not confer ownership, but merely the right to the use of water in a specified quantity and manner as allowed for under the terms of a water rights permit. For the purpose of this bill and today's testimony, there are two important principles to keep in mind regarding the right to use water: Every new water rights permit is conditioned on and subject to existing water rights. If a new junior right is determined to impair a senior right in a manner that cannot be resolved, the junior right holder must cede to the senior right holder; any water right in Nevada, whether it is a prestatutory vested claim, a decreed right, or a statutory appropriation, carries with it the requirement that all water rights must be put to beneficial use. A water rights holder neither holds ownership nor title to the water itself, but only the particular beneficial use as approved according to the underlying water rights.

This is important because Nevada water law accounts for the fact that certain water rights appropriations may result in an adverse impact to existing rights. The Nevada Division of Water Resources has applied this statutory provision by seeking to minimize, avoid, or eliminate any existing or reasonably foreseeable impacts on all impacted water users. This basic principle is the foundation for managing Nevada's limited water resources without undermining the responsible development of water to provide for the continued economic growth of our state.

Before I walk through the specific provisions of A.B. 30, I want to address certain perceptions and concerns regarding the Division's water management practices. First, the Division routinely conducts, or requires holders of water rights to conduct, water monitoring to better understand local groundwater conditions and the effects of a particular project on the sustainability of groundwater development in a particular basin or region. Currently, the Division of Water Resources has approximately 90 groundwater monitoring plans in place as a condition of existing water right permits within one or more of Nevada's 256 groundwater basins. Monitoring is necessary because we cannot predict with absolute accuracy what the impacts of pumping will be, even utilizing the best available science. Accurate monitoring data improves the science, which in turn leads to better management. Second, 3M plans are not the panacea to achieving balanced water development in Nevada, and we recognize that. In fact, very few water rights permits have been granted with a requirement for a 3M plan, only one of which was developed by the applicant, accepted by the State Engineer, and implemented. In short, 3M plans may be applicable or useful in the future, and may be an appropriate proposal for the elimination or avoidance of a conflict, but 3M plans should not and will not be used to push through any questionable water development projects. With that, please allow me to provide a summary of A.B. 30.

Section 1 proposes to add a new section to NRS Chapter 533. This new statutory section would harmonize and bring consistency to Nevada's water statutes by clearly identifying the conditions under which the State Engineer may consider a proposal to avoid or eliminate a conflict. A proposal may only be considered if water is available for appropriation.

Section 1, subsection 1, paragraph (a) grants the State Engineer discretion to consider a proposal that would avoid or eliminate a conflict, and sets forth the criteria the State Engineer may consider within such a proposal. This includes an agreement between the water right applicant and the owner of an existing water right or domestic well, if there is concern that a conflict may manifest. An example could include the deepening of an existing well where the anticipated reasonable lowering of the groundwater level would interfere with the well's use. These types of agreements are only limited by the needs of the individual water rights holders.

Section 1, subsection 1, paragraph (b) allows for the development of a 3M plan. These plans should be viewed in their proper light as contingency plans, not as forgone conclusions to address conflicts that cannot be avoided. Depending on the known and unknown conditions of a groundwater aquifer and the inherent degree of uncertain response by a particular groundwater project, a 3M plan may be the most appropriate option. The Division of Water Resources will continue to use its technical expertise to require stringent standards, primarily focused on the first two "Ms" of monitoring and proactive project management, to be the mechanism to avoid conflicts. But because the exact effects of pumping are never certain, and environmental conditions will always be variable, a comprehensive and in-depth analysis of the possibilities with flexible responses aimed to avoid or eliminate conflicts is an important tool needed to facilitate the management of Nevada's water resources. Therefore, responsible management of our water resources requires this type of upfront, proactive management rather than after-the-fact conflict resolution.

The third option outlined in section 1, subsection 1, paragraph (c) is, "Any other plan to avoid or eliminate the conflict or replenish the source of supply impacted or depleted by the conflict." Again, providing the Division of Water Resources flexibility to consider alternative proposals and solutions that may be "out of the box" or creative alternatives is imperative as water conflicts become more prevalent, particularly when these solutions are proposed and agreed to by the impacted users themselves, which is always the Division's preferred scenario. The concept of mitigation should not be universally maligned, and the Division welcomes any and all creative solutions to best manage our shared water resources in a manner consistent with the fundamental tenets of Nevada's water law.

Section 1, subsection 2 expressly authorizes the State Engineer to grant a water rights application if the proposal is found to avoid or eliminate the conflict, and to condition the appropriation on the applicant's performance of the measures or actions in the proposal determined to be necessary to avoid and eliminate the conflict.

The remainder of Assembly Bill 30, sections 2 through 10, contains conforming changes.

The Division of Water Resources recognizes and appreciates extensive feedback to A.B. 30; however, resolving the existing statutory conflict is imperative. Furthermore, despite many misplaced concerns regarding 3M plans, particularly the concept of mitigation, this effort is the Division's attempt to implement the direction of the Legislature to utilize tools such as 3M plans as a condition to appropriations. The Division believes there is, at some level, consensus that proposals to avoid or eliminate conflicts is good water policy in instances where water is available to appropriate. The Division is open to, and welcomes, alternative ideas as to how to address these issues. A constructive dialogue should be a priority for every stakeholder because the status quo is not, in the end, serving the interest of the public who owns Nevada's water. At this time, I am happy to take any questions from the members of the Committee.

Assemblywoman Cohen:
Looking at section 1, subsection 1, paragraph (c), can you give an example of what one of those agreements might look like?

Tim Wilson:
We have one approved 3M plan within our office. It is quite extensive. It lays out all of the monitoring requirements that will be necessary, it lays out pumping management, and it follows up with mitigation measures that could be used if conflicts arise. It is not a simple plan, it is very complex and it took a lot of effort to bring everyone together as much as possible to come to some type of consensus. It is difficult to get a consensus amongst everyone, but we thought we had the best plan we possibly could to set the applicant up front to have to be responsible for mitigation as a final contingency. That is the significant point to the 3M plan. When you have an applicant that only has to do monitoring and management, we can tell them to stop using the water. If they do not have a specific up-front responsibility for mitigation, then they are not on the hook for mitigation. We do not want them to walk away, we want them to be up front and responsible.

Assemblywoman Cohen:
Are you already able to develop a 3M plan?

Tim Wilson:
That is correct. In statute, we have a mention of monitoring, management, and mitigation plans and a requirement to consult with local counties as part of issuing those plans, and we have conditioned permits on the 3M plan. We have lesser versions of 3M plans also. As I mentioned, we have a significant number of conditioned permits on monitoring and management of pumping.

Bradley R. Crowell, Director, State Department of Conservation and Natural Resources:
The issue with the authorization of the 3M plans is that we have authorization to do 3M plans in instances where water is available. The 3M plan would be to mitigate a conflict, but there is also statute that says, when there is a conflict, you have to deny the application. Those two provisions are inconsistent. If we take one route, we get sued by people who think we should have taken the other route. If we take the "no" route, we get sued by people who think we should take the mitigation route. We are stuck in a lose-lose situation from a management perspective.

Chair Swank:
Will you please repeat the two pieces that conflict for me?

Bradley Crowell:
I would like to have Ms. Fairbank repeat that in a more articulate way.

Micheline Fairbank, Deputy Administrator, Division of Water Resources, State Department of Conservation and Natural Resources:
We have two statutory provisions under NRS 533.353: We have an allowance in which our office is authorized to approve an application to appropriate water, contingent on a monitoring, management, and mitigation plan. Yet, under NRS 533.370 subsection 2, as was spoken to earlier, we also have the requirement that if there is water available to appropriate and/or whether that new appropriation would conflict with existing rights. Inherent in the 3M plan is an anticipation of conflict, and we have a requirement to deny that application; on the other hand, we are guided by the Legislature to consider these plans in determining whether to appropriate water.

Chair Swank:
Would this bill, should it pass, solve that conflict currently in Nevada water law?

Micheline Fairbank:
Yes, this bill would resolve that conflict or at least bring harmonization to these different provisions with the state. We also have provisions that allow for our office to mitigate conflicts with domestic wells under certain conditions and to allow for reasonable lowering of the groundwater table in NRS Chapter 534. Again, in each of those is the inherent idea that there is conflict. We have provisions that allow us to mitigate conflict. We are trying to provide that harmonization so that we have a clear direction as to when and under what conditions that we proceed with applications.

Chair Swank:
Is it fair to say that there is not a lot in this bill that is new, and this bill is mostly a harmonization of things that we already have in statute?

Micheline Fairbank:
Yes, that is correct.

Assemblyman Watts:
Do you see the 3M plan as applying to mitigating the public interests, or in the case of interbasin groundwater transfers, environmental soundness? Or do you see this only applying to conflicts with water rights holders or interest in domestic wells?

Micheline Fairbank:
The idea behind 3M plans is not necessarily to mitigate conflicts to the public interest. Certainly, the idea of the public interest is out there in terms of the balancing of development of water and balancing that as to what those interests are with that particular project. To the extent that it talks about the interbasin transfers, within the statute we also have to have environmental soundness when it comes to interbasin transfers. It is a very in-depth and complex analysis that has to take place based upon each individual application and project. That is one of the challenges; there is not a universal one-size-fits-all solution. We have to look at each project, each application, the hydrographic basin, and the conditions within that basin on an individualized basis to provide the balance. Our office has denied applications on the basis that it is not in the public interest due to multiple considerations. We take great care, and we try to strive to do that balancing within the confines of the statute.

Assemblyman Watts:
Would a 3M plan apply to monitoring, management, and mitigation in those areas, or is it geared toward monitoring, managing, and mitigating conflict between water rights, only?

Bradley Crowell:
What we are seeking in this bill is the expressed authorization to build regulations governing 3M plans. Part of that process of building regulations is the stakeholder or public process. With that interaction, we hope to strike a balance between various interests, including the environmental concerns and the public interest. Instead of being overly prescriptive in the legislation, or having the State Engineer do it without the utmost transparency, we are asking for direction to undertake the regulatory process with stakeholders to strike that balance.

Assemblyman Watts:
I know that sometimes we have legislation that asks for regulations to be promulgated, so I appreciate the clarification of the intent. I want to make clear where my question was coming from and my concern. If we were to set the foundation in legislation, I am concerned that we can have a situation where conflict between water rights is being mitigated, but that the mitigation measures—which I know this legislative framework leaves wide open—could potentially result in harm to the public interest or to environmental soundness. I am concerned if this is focused on mitigating conflicts for water rights, we could end up with

things like aquifer decline, groundwater mining, or other things that have negative impacts in those other areas that would not be considered under the policy framework.

Bradley Crowell:
There are some environmental concerns and public interest determinations that cannot be either fully or partially mitigated.

Assemblywoman Titus:
I have an observation: using "harmony" and "water law" in the same sentence is a little bit of an oxymoron. In your presentation prior to the bill, you gave us a review on water law in the state. You mentioned that one of your tenets—one of the things you do not want to do—is upend decades of decisions. Then, looking at A.B. 30, section 1, begins, "If there is water available for appropriation in the proposed source of supply, before rejecting an application because the proposed use or change set forth in an application conflicts with existing rights." It seems that very first line upends the very tenet of our Nevada water law since its inception—the first in time is the first in rights.

Tim Wilson:
We feel that instead of an outright rejection of the application, there should be an opportunity to bring the parties together to resolve the conflict. We might even have an ability to avoid the conflict through management of the project. That management could be staged development, altering points of diversion, or reducing pumpage from certain wells. We think that in order to maximize our available water resources, and again, we are talking about when water is available for appropriation, that we need to have the opportunity to try to avoid conflict through a 3M plan and not outright reject an application.

Assemblywoman Titus:
Frankly, you did not answer my question. What I asked was this: Because you want to take permittees to arbitration or discussion, you are saying that the person with the senior right—which is the one this protects—you are forcing him into a negotiation or a conflict. By nature of doing that, it takes away his right to say, "I am the senior water rights holder, and this interferes with me." Is that not what this is trying to change?

Tim Wilson:
I think Ms. Fairbank might be able to assist me.

Micheline Fairbank:
I think the direct answer to your question is, the right to the use of water is merely to the use. It is not the actual ownership to the particles of the water; it is not even necessarily the place of diversion or the source of the water, so long as the senior water rights holder is made whole in some manner. Again, there are a lot of variables and different types of scenarios. That is why it is difficult because what might be an appropriate resolution to avoid or eliminate the conflict may be through the reasonable lowering of the groundwater table if someone has a shallow well. That well is no longer going to be functional, or the draw may not be sufficient based upon the lowering of the groundwater; therefore, that alternate plan

could be simply something as simple as deepening the well. You are still providing access and respecting the prior appropriation because you are ensuring that the senior water rights holder is being made whole in an appropriate manner which satisfies their manner of use and their beneficial use. You are also balancing the development of the available water without allowing a particular water rights holder to hold hostage available water that could be used for the development and economic growth of a particular area where water is available. It is a balancing of interest. There is not an easy dialogue because you must look at each one on a case-by-case basis. Overall, that fundamental tenet in the Nevada water law is that you have the right to the use of the water.

Assemblywoman Titus:
Would you agree that the water is a property right, a right of ownership?

Micheline Fairbank:
You have a right to the use of the water, but it does not give you the ownership over the particles of water because that belongs to the public.

Assemblywoman Bilbray-Axelrod:
You used the term "reasonable groundwater levels." How is "reasonable" defined?

Tim Wilson:
In NRS 534.110 subsection 4, all groundwater appropriations allow for reasonable lowering of the water table. There is no definition of "reasonable"; it is left to the State Engineer's discretion.

Assemblywoman Bilbray-Axelrod:
Did any outside agencies, such as the Southern Nevada Water Authority (SNWA), offer any language or advice or supply any help in drafting these bills?

Tim Wilson:
No, absolutely not. We did not meet with SNWA when we were drafting this legislation. These are bills that we feel are necessary to address unclear statutory language, in particular with this bill, to eliminate what we feel is a conflict in the statute. Our next bill is something that we feel goes straight to the directive of the Legislature on conjunctive management.

Assemblywoman Bilbray-Axelrod:
To be clear, no other agency has asked you to bring this forward?

Bradley Crowell:
The response to your question is an emphatic "no," be it the entity that you mentioned or any other stakeholder.

Chair Swank:
I would like Mr. Amburn to talk a little bit about both of these bills. We have received a lot of comments about a lack of due process. We have had our staff look at that, and I would like him to talk about those issues for both this bill and the next one.

Allan Amburn, Committee Counsel:
When we were drafting these bills, our office looked into whether these bills violate due process concerns or issues. Essentially, our conclusion was that there were no due process violations or issues coming as a result of these bills. There are procedures in place, either by regulatory action or in statute, that allow someone to be heard if there is an issue. We are also talking about a situation in which there is the taking of water, there is adequate compensation provided with replacement of water, or in Assembly Bill 51, financial compensation.

Chair Swank:
We have a lot of people who are sending in comments to that effect. I think it is important to have that cleared up.

Assemblywoman Hansen:
Along the lines of a 3M plan, if a senior water rights holder is injured, what does the remedy look like?

Tim Wilson:
We look to developing these plans when they are needed. It has been rare that we try to utilize the 3M plans. For the mitigation process, we need to know what source might be impacted. Is it a nearby well that is not drilled very deep and could easily be deepened? Is it an issue where it could be a conflict with a spring? Springs are more problematic, you cannot replace a spring if it has other intrinsic values to it. There are instances, one in particular, in which we have a spring that is basically a hole someone dug in a shallow water table. Someone put a piece of casing in it and called it a spring. It is very small and maybe produces one or two gallons per minute. It is not very useful, but there is a certificated water right on it. It could easily be mitigated and that water rights holder could be made whole with an even better water right that flows year round. In this particular case, there is nothing dependent on the spring. There is no obvious evidence of any flora or fauna or dependent species—considering that it was most likely a hand-dug hole and was not originally a spring. We think something like that can be mitigated with a replacement well, for instance.

Bradley Crowell:
Every water system is different, so every solution to address an impact or conflict is going to be different. The idea is that the burden for keeping that senior water rights holder whole is not on them: so if there is a deepening of a well, it is not at their expense; it is at the new water right applicant's expense. To the greatest degree possible, it is done with the consent and agreement of the senior water rights holder.

Micheline Fairbank:
To elaborate a little more, when you look at A.B. 30, section 1, subsection 1, paragraph (b), the emphasis is on "monitoring." The idea is that if you have a project that is going to be affecting groundwater, you are going to be monitoring the effects of that project so that you can get in front of potential impacts to those senior water rights holders. If you see that the monitoring is demonstrating that there may be an effect or that an adverse impact could occur, that is when "management" steps in. Management is that you manage that project either by reducing pumping or moving the location of pumping—or any other variables—to avoid getting to "mitigation." Again, mitigation has been characterized as the last resort, or the contingency plan, and that is if all the other things occur in an unanticipated way, then you have some form of recourse. The idea is that mitigation is the last resort, and monitoring and management should be the focal point that provides protection for those senior water rights holders.

Assemblywoman Hansen:
Is it agreed that because of the state we are in, if we implement this, there could be some severe hardships to current senior water rights holders? My concern is, it is not a matter of just deepening a well, it could have some severe impact to their ability to maintain their operation. What would the remedy be for them if this bill were to pass?

Tim Wilson:
Remember, we are talking about cases in which water is available. If there is obviously not enough water and you are going to impact the senior water rights holder, we are not going to approve the application. We would never get past the denial stage. It is in cases in which there is great uncertainty whether there will be any impact, and we would like to have the ability to try to avoid that impact through monitoring and management. Even then, if we see that it is not working, we can order the pumpage to stop. We only want mitigation to hold the applicant responsible just in case.

Assemblywoman Peters:
With regard to environmental protection, we really do not talk about water quality and ecosystem management in water law. Many of those things are rather new to water law in the state of Nevada. I have concerns with that not being explicitly within the language of this mitigation, that we have to consider those issues. I think Assemblyman Watts touched on that. I also have a dilemma with the idea of the authority for conflict determination. We have an opinion from our legal counsel that due process is not impacted by this, but I just do not understand how the process of determining that a conflict is avoided takes into account the complexities of water in Nevada. We have water use, water availability, history, and culture of the water use for the impacted user. We have primary water rights and senior water rights—all of those things that have play in the idea of a conflict. Just coming up with an engineered plan will not necessarily mitigate those conflicts, those emotionally attached conflicts. How do you envision this mitigation, or even management, to do that in addition to the general management of water and beneficial use in this state?

Bradley Crowell:
With regard to appropriately taking into account environmental concerns and public interest, which in many instances is the same, I would have no problem making that more explicit in this bill because our intention is to take into account all those considerations. What we are asking for here, as I mentioned to Assemblyman Watts, is to get the green light from the Legislature to undertake a process in which we can talk to stakeholders on all sides of an issue and hopefully come to an agreed upon resolution about what degree of environmental concern should be taken into account, whether it can be mitigated, on all of those issues. I know there has been concern that past decisions have not adequately taken that into account, but in putting together new regulations with transparent data and robust stakeholder participation, I am hoping we can get to that place. In terms of conflict, I will let Ms. Fairbank describe how they identify those issues.

Micheline Fairbank:
Again, when we are talking about trying to resolve the conflict, there is no easy answer. We all know that is why water law is not the most fun topic. When we are talking about trying to resolve all of these different variable conflicts—that is part of the stakeholder general process. That is what we strive to encourage and find manners and mechanisms to utilize that stakeholder input and process to guide and direct decisions that our office is making. We do engage with the stakeholders to try to come up with different types of plans to the extent possible, but these plans also have to be guided by science and by our existing law. To the extent that there are different interests that are not necessarily represented in the four corners of our existing water law, that is what our office is confined by. The opportunity to be able to have more options and more authority to engage in these different types of issues and create solutions is what is going to resolve those conflicts and move the process forward.

Assemblyman Wheeler:
As I read this, the end of section 1, subsection 1, says that "the State Engineer may instead consider a proposal to avoid or eliminate the conflict, which may include, without limitation:" and then paragraph (c) states, "Any other plan to avoid or eliminate the conflict." Given the answers we have heard here about "existing law" and "in the appropriate manner," what I am taking away from this bill is that the State Engineer will have unlimited power to give water and take water away from someone regardless of right. I am not saying that you would do that, I am saying that this particular bill gives you that power. Then we have to wait for the appropriate manner and existing law that might be usurped by this.

Tim Wilson:
I respectfully disagree that this gives me the power to take away water rights. This section goes to NRS 533.370, which currently says that if there is any type of conflict with an existing right, the State Engineer shall deny. This conflicts with other sections that allow for a 3M plan. What we are looking at here is an applicant who comes forward and meets all of the statutory criteria and there is water available at the source, which is the first criteria for approval. If it is a possibility, should they have the ability to avoid a conflict or mitigate a conflict? Should they have that ability or should we deny their water right outright? Those are the only two options I have. I have to do one or the other. I cannot take away the

existing water user. As I said, the whole point of this process is to keep the existing user whole, to keep the senior water rights holder protected. We have to protect senior water rights, which is a basic tenet of our water law—prior appropriation, first in time, first in rights. We feel that this gives us additional abilities to protect those existing water users. They may not get their water out of a one hundred foot well, maybe they need a two hundred foot well, but it is the applicant that drills the new well.

Assemblyman Wheeler:
Again, I understand and agree with what you are saying, to a point. That is not what the bill says. I think maybe some different language needs to be used. I believe that this law would usurp the statute you stated because this would be the newer law giving you the right, or your successor twenty years from now, the right to make up his own mind. It says right in the bill, any other plan "to avoid or eliminate the conflict."

Allan Amburn:
Looking at section 1, subsection 1, paragraph (c), it is essentially a catchall provision and it is very broad, as you have pointed out. The goal of that is, we are dealing with a situation where there is not an agreement among the parties as in paragraph (a)—it is not a 3M plan as in paragraph (b), it is something else. It essentially provides flexibility. When it comes to someone who has an issue with the plan being proposed, based on section 2, he can still protest that: He can still protest whether the application is approved or denied. There are other procedures that he can also appeal this plan with.

Assemblyman Ellison:
Will this impact wildlife and the environment? Right now we are looking at some of the endangered species in the desert. The Bureau of Land Management (BLM) within the U.S. Department of the Interior, estimates 305 springs and 112 miles of streams, 8,000 acres of wetlands and 191,000 acres of shrub habitat. I am asking if this bill passes, with the BLM study, you could endanger the wild horses, sage grouse, elk, big horn sheep, tortoises, not counting 20 threatened and endangered species.

Tim Wilson:
In short, I would say no.

Assemblyman Ellison:
Have you met with the Department of Wildlife?

Tim Wilson:
I have not met with the Department of Wildlife regarding Assembly Bill 30. However, this is for instances in which there is water available at the source. We are looking at potential impact that can be mitigated. If there is an impact that cannot be mitigated, the application does not meet our threshold for approval and would be denied. This cannot be used in any way to dry up springs. Those applications would be denied. This is for very specific instances where we might be able to come to an agreement where we think monitoring and management can avoid a conflict and have mitigation as a fail-safe. That is our goal.

Assemblyman Ellison:
By the time the springs start to dry up, it will then be a little too late.

Tim Wilson:
Monitoring is key. Having an aggressive monitoring plan in place will give us early warning of any potential impact. If we see, for instance, a propagation of drawdown headed toward a sensitive area that we are monitoring, we will be able to act before that impact takes place. That is the idea behind a 3M plan.

Assemblyman Ellison:
Is A.B. 30 necessary? Most of the new language attempts to codify the Supreme Court's decision in the *Eureka Cnty v. State Engineer*, 359 P.3d 1114 (2015).

Bradley Crowell:
It is necessary because without it, we are left with two conflicting directions under statute that, no matter which one we follow, we end up in court over our decision. I personally do not think that we should be abdicating the decisions on water policy to the courts. I think we should be clarifying the law so it could be implemented appropriately. I think it can be done, but as the law stands now, there is the inevitability of litigation, which is not the scenario that any of us want.

Assemblywoman Carlton:
What has been the cost of litigation that has gone on? Will this solve any of that so things are clearer so that no matter which way you rule, you will not end up in litigation?

Micheline Fairbank:
In terms of the costs, we pay an allocation for representation by the Office of the Attorney General. This last biennium, that cost allocation has gone up substantially based upon the hours that have been spent by the attorneys representing our office. I can say, having once been the attorney representing the Division of Water Resources, that the propensity and frequency of litigation is increasing. Is this bill an absolute bar to future litigation? The answer to that is no. What this bill does do is create a consistency and it provides resolution of conflicts within the statute that has that purpose and to at least remove that particular dispute from being litigated. This allows us the authority, explicitly, that we can consider these different alternatives where there is water available to appropriate. In the scenario that was addressed earlier, if we deny an application even though there is water available to appropriate, then we are challenged on the basis that we could have allowed mitigation or an alternative plan to avoid or eliminate the conflict. On the other hand, if we approve an application, then we are again subject to litigation because we did not deny it because it conflicts with existing rights. At least this bill takes that particular issue and claim out of the arena and we can move forward on other things. I do not foresee, in the near future, litigation going down extensively, but we have to start somewhere.

Assemblywoman Carlton:
That is only if you decide there is water available. If the decision is that there is no water available, that applicant is denied?

Micheline Fairbank:
That is correct.

Chair Swank:
With that, I will give everyone the lay of the land for testimony. Just to remind everyone that we may not always agree, but we can always be civil. I will allow 30 minutes for support, 30 minutes for opposition, and 30 minutes for neutral. If we do not use all of the 30 minutes for support, then we still only have 30 minutes for opposition. Each person will get two minutes. Also, if we have any currently elected officials who have come in today, please come forward first. We are going to start in Las Vegas. Is anyone in Las Vegas in support? Seeing no one, is there anyone in Carson City who would like to speak in support? Seeing no one, is there anyone in Elko who would like to speak in support? Seeing no one, I will go to opposition.

Rupert Steele, Chairman, Confederated Tribes of the Goshute Reservation, Ibapah, Utah:
[Opening remarks were spoken in Shoshone.] I come here to stand before you with a good cause and much respect that we ask you to vote no on A.B. 30 and A.B. 51. The language in bills sounds attractive, deceptively so. But behind the language is another side that would help lay ruin to one of Nevada's great cultural and historic resources, a national historic property called Swamp Cedar Natural Area, or "Bahsahwahbee."

We have been fighting a good fight to protect this special place. The SNWA aims to drain it—and water from other senior water rights holders—in order to pipe the water 310 miles to Las Vegas. Last summer, the State Engineer denied all of SNWA's groundwater applications but approved their monitoring and mitigation plan, one that the White Pine County District Court previously rejected due to serious and deceptive flaws. It was a sham. Now in their latest plan, SNWA would not mitigate impacts on Swamp Cedars until every last cedar tree is dead. They would be the sole decision-makers as to when and how to mitigate.

We believe this is very wrong. Wrong because, as the site of the largest Indian massacre in United States history, and two more that followed, it is a place to be protected. Wrong because Swamp Cedars is holy to us. It is a place where we pay our respects to our ancestors and where we go to pray and hold spiritual gatherings. The State Engineer agreed it was wrong. He denied certain water rights because it is in the public interest to preserve Swamp Cedars in perpetuity, rather than draining its medicinal waters and killing the sacred trees, both of which we use in our traditional ceremonies.

Assembly Bill 30 and Assembly Bill 51 would undo efforts to protect Swamp Cedars. The bills would pave a new way for SNWA's groundwater project while making rural Nevadans suffer. We would be left high and dry.

Please vote no on A.B. 30 and A.B. 51. [Additional material was provided (Exhibit E).]

Robert McDougal, Commissioner, Board of Commissioners, Pershing County:
I am here to encourage you to vote no on A.B. 30. One of the problems that I see with it is that it is a top-down approach that the State Engineer would be using when, in fact, where there are conflicts existing, it should be a cooperative effort on the part of the users. We are a small rural community in Pershing County. The Lovelock Valley is dependent on the existence of the prior appropriation doctrine. The farmers in that valley hold some of the oldest water rights on the Humboldt River. They have already felt the impact of conflicts due to over-pumping in certain areas upstream of the Humboldt River that have negatively impacted flows in the river. That study is ongoing and we look forward to its completion to find out exactly how much damage that has caused.

The State Engineer's solution in our case is a conjunctive management plan that would include mitigation. In all likelihood, it would mean money, not water, to the farmers of the Lovelock Valley. We have already seen, due to the drought, the loss of hundreds of residents who used to work on the farms. They left permanently because there was no work to be done. They went to the mines and other places.

I think we would like to see 3M plans implemented where existing conflicts happen. The difficulty in two conflicting statutes that the Division of Water Resources spoke to—the solution is to remove that portion of the statute that allows 3M plans in the granting of new water rights and rather restrict that to being used as a solution to existing problems.

Norman Harry, Environmental Director, Environmental Protection Department, Washoe Tribe of Nevada and California:
I have worked with several tribes within Nevada addressing their groundwater and surface water rights negotiations. I would like to quickly state that there seems to be some major issues that could probably be clarified through language if this were to pass. What are the thresholds? Also looking at mitigations, since we are talking about mostly federal lands, does it require the U.S. Environmental Protection Agency involvement with something that is going to accompany and substantiate these concerns? I think those things should be included if this were to pass. On the other hand, the language that is being used generally is soft language. It talks about harmonizing and so forth. The bottom line is these valleys are overappropriated with groundwater. In review of the mitigation plans, what are the thresholds? Are they going to impact more than 100,000 acre-feet, or 20,000 acre-feet? There is no defined threshold. If the water right permittee is going to pay for that, I see the prospect of some industry coming, and, again, if they are impacting the senior water rights holder, the big company could throw $1 million at you to deepen your well. According to the state, if the Division wants to appropriate almost every drop of water, there is nothing there for the future for all of us.

Chair Swank:
I would like to clarify that this does not apply to water on federal lands. The federal government does not have to tell us anything about how much water they have in Nevada.

Norman Frey, Private Citizen, Fallon, Nevada:
I am a farmer in the Fallon area. My family has been farming in this state since the mid-1850s. I was a county commissioner in Churchill County, and the president of the Nevada Association of Counties. I was embroiled in a battle over transferring water rights from one place to the other on my own property; it cost me a lot of money to do that. It gets very expensive for a senior water rights holder to be involved in the process of developing a 3M plan. We do not have the expertise; that has to be hired. For senior water rights holders, sometimes it makes the difference in making improvements to your operation or sending your kids to college, et cetera. It is very expensive and puts a hardship on the farmers that have been there. I am in opposition to the way this legislation is written; 3M plans can work. Many of the issues have been addressed by others in their testimony.

Jeff Fontaine, Executive Director, Central Nevada Regional Water Authority and Humboldt River Basin Water Authority:
Central Nevada Regional Water Authority and Humboldt River Basin Water Authority are units of local government; together they have nine Nevada counties. As members, these nine counties encompass 70 percent of the land in Nevada, including communities, agriculture, mines, and vast expanses of public lands. These authorities were formed to protect the water resources in the membered counties. These membered counties not only have an economic future, but their value of quality of life and natural environment is maintained. These authorities share Director Crowell's and Acting State Engineer Wilson's concerns and certain interests in addressing the substantial and critical water issues that are facing our state. We must oppose A.B. 30. Arguably, A.B. 30 undermines the prior appropriation doctrine and weakens protections for existing water rights. We believe A.B. 30 will create uncertainty for the future.

Jake Tibbitts, Natural Resources Manager, Department of Natural Resources, Eureka County:
Eureka County opposes A.B. 30 for many reasons similar to what we had with Assembly Bill 298 of the 79th Session. We would like to point the Committee to our input and testimony we provided then and ask you to consider that. [Continued to read from prepared testimony, (Exhibit F)].

The language in A.B. 30 to allow plans to "avoid conflicts" is misleading and unnecessary. If a conflict is avoided, there is no conflict. Regardless of a plan or a private party agreement, the State Engineer would find that there is no conflict. Options to avoid conflicts are available today without a change in the law. These include what I consider the three best management practices of sound water policy. First, applicants need to configure their points of diversion and diversion rates to eliminate the conflict. Second, reduce the size of the project or improve water-use efficiency to eliminate the conflict. Third, work cooperatively with existing water rights holders, including domestic well owners, to resolve conflicts by mutual agreement before an application is even considered by the State Engineer.

That is the best management practice that we follow in this state, where we put it on the applicants to do the necessary work to come forward before they ever apply for the water. This bill would bypass that process.

We do not support 3M plans in the way this bill proposes. If a conflict with existing rights is identified when the application is considered, then it is apparent that the applicant has not done the groundwork necessary. We believe this bill pays "lip service" to prior appropriation in name only.

Regarding 3M plans, the only reference to monitoring, management, and mitigation in the statute is due to a bill that Eureka County brought forward in two separate attempts in two separate sessions. In 2011 there was an extreme effort to shelve the bill and place it in the drawer and it was not even brought forward. Our second try in 2013 through Senate Bill 133 of the 77th Session resulted in the language that is in statute today. I find it a little ironic that we are now speaking about a bill that is granting authority for a 3M plan in a way that it was never intended.

Monitoring, management, and mitigation need to be part of the process. Eureka County does not disagree, but we need to look at it in a surgical manner and in a way that protects prior appropriation, or it will be prior appropriation in name only.

Vested rights are under a different statutory scheme. These are rights that were put to use prior to 1905. Much of the mitigation that we have seen is to replace vested surface water rights with groundwater. There are some major considerations that you need to take in looking at replacing water that is under a totally different statutory scheme in our water law.

Kyle Roerink, Executive Director, Great Basin Water Network:
We represent ranchers, farmers, indigenous communities, public land advocates, and businesses who call the Great Basin home. Although A.B. 30 purports to be about 3M plans, it is a bill to further empower the powerful. Simply put, the bill would give the State Engineer the unfettered discretion to skirt current laws in order to give somebody's property that is senior in right to someone who is junior in right. This bill upends Nevada water law as we know it and attacks the prior appropriations doctrine.

Essentially, all of section 1 in A.B. 30 would give the State Engineer the ability to allow applicants to spend and buy their way around the law to get permits for water, even if granting those permits harms someone else. Considering that there are no long-term protections or guidelines for public participation in this bill, it is clear what entities this bill has in mind. This bill may not explicitly say Las Vegas pipeline, but those implications are all over it. We are currently in litigation over SWNA 3M plans that were erroneously approved by the State Engineer. Clearly, this is not the time for this bill. Indigenous communities, environmentalists, farmers, ranchers, elected officials from rural counties, and even former and current Clark County commissioners all agree with this assessment. We stand united against a bill that will harm Nevadans and the environment. We ask for bottom-up, stakeholder-driven opportunities to collectively work on water policy. This bill was written by a State Engineer who did no public outreach and who no longer serves. We want to be involved and we are ready to do the work. [A letter was also provided (Exhibit G).]

Chair Swank:
If you would like to be involved, please reach out to the Division of Water Resources.

Doug Busselman, Executive Vice President, Nevada Farm Bureau Federation:
The Nevada Farm Bureau Federation is opposed to A.B. 30. Simply put, our opposition is our concern over the way in which senior water rights holders will be impacted by a mitigation plan that may reduce their water availability. One of the points that we would like to make is section 1, subsection 1 where it mentions water available for appropriation. We would like to make sure there is a clarification that the water that is available matches what the application is actually calling for, versus just "having water available" that may or may not relate to that particular perspective.

The other point I would like to raise is a question. I have looked through A.B. 30, and I did not see, in my initial review, where the regulation provisions are identified for how mitigation might go forward. I think if there is going to be a promise of creating some type of a regulatory structure, that needs to be spelled out in order for stakeholders to effectively participate in that process. We are opposed to the bill and we urge that the Committee not pass it.

Patrick Donnelly, Nevada State Director, Center for Biological Diversity:
We are a nationwide nonprofit that has been active in Nevada for a decade. Our No. 1 issue has been fighting against the Las Vegas pipeline, which we have successfully litigated in federal court. The SNWA's pipeline would pump billions of gallons of groundwater per year from the aquifers in eastern Nevada and ship it 300 miles to Las Vegas. The BLM's own assessment showed the widespread drying of springs, wetlands, marshes, and the dying off of groundwater-dependent vegetation. The Nevada Department of Wildlife said it would result in the wholesale localized extinction of native fishes and the drying of water sources would cause collapses in mule deer and antelope populations. In short, it would be the most destructive project in the history of the Silver State's environment.

Assembly Bill 30 would enable the Las Vegas pipeline, make no mistake. The State Department of Conservation and Natural Resources may say that is not the intent of this bill, and I think we can take them at their word on that because there are broad challenges we need to address with Nevada water law. If they are serious that this bill is not intended to authorize the Las Vegas pipeline, they can take steps in that direction, such as carving out large-scale interbasin transfers from the language of this bill. As it stands right now, our attorneys, who are the experts on this issue and have been working on it for over a decade, are very clear—this would enable the pipeline. The pipeline has lost in court repeatedly because of the inadequacy of its mitigation. Indeed, as Mr. Crowell said, there are some things that simply cannot be mitigated. Withdrawing 100,000 acre-feet of water a year—billions of gallons—from the basins of eastern Nevada cannot be mitigated. Those losses are permanent, irreversible, and unmitigatable. This law would change the requirements of mitigation to allow the State Engineer to dictate his own terms of that mitigation. You can see how this would enable the pipeline by moving the goalposts for what is adequate mitigation. We are strongly encouraging the scrapping of this bill and starting over with a stakeholder-driven process. All the people in this room who care about water oppose this bill. Not a single person stood up to support this. The people in this room are the ones who are going to be affected, they should be the ones helping to determine the water future in Nevada. [A letter was also provided (Exhibit H).]

Tobi Tyler, Executive Committee Member, Toiyabe Chapter, Sierra Club:
The Toiyabe Chapter of the Sierra Club, representing more than 30,000 members and supporters in Nevada, is strongly opposed to A.B. 30. We urge the Assembly Committee on Natural Resources, Agriculture, and Mining to oppose and abandon this bill.

We oppose A.B. 30 because of the impacts it will have on Nevada's environment and its ability to facilitate a pumping and piping project that will siphon 58 billion gallons of water annually from eastern Nevada near Great Basin National Park to Las Vegas.

The bill allows the Nevada State Engineer to appropriate water when a conflict exists by giving junior water rights applicants the ability to negotiate away conflicts with senior water rights holders by any means, veering far from the current law and setting a dangerous precedent for the future. In the nation's driest state, it is most important for regulators to appropriate our limited water resources wisely.

Additionally, the bill allows replacement water as an acceptable tool for mitigating a conflict created by a junior rights holder against the environment or someone with senior rights. Replacement water is not an environmentally acceptable means of conflict resolution. Neither pipelines nor trucks full of water will ever make up for what Mother Nature naturally provides, nor will it ever guarantee that senior rights holders will be made whole with water of sufficient quality or quantity.

The aforementioned provisions would give life to disastrous projects like the Las Vegas pipeline and other water grabs in our state without providing sufficient long-term due process or public input.

Nevada's current water protections are among the most progressive in the West. All committee members must ask themselves: Why are we rushing to change a good thing? [A letter was also provided (Exhibit I).]

Laurel Saito, Nevada Water Program Director, The Nature Conservancy:
Our mission is to conserve the land and waters on which all life depends, and no issue is more important to protect the ecosystems and natural resources of Nevada than effectively managing the use and conservation of the state's limited water resources. Water is the

lifeblood of Nevada's residents and communities, and it is also essential for Nevada's natural environment—all plants, fish, wildlife, and people depend on freshwater resources.

We are testifying in opposition to A.B. 30 because we have concerns about this bill enabling the granting of applications where a known conflict exists with current water rights, domestic wells, and/or environmental resources in the public interest. In addition, we do not agree with using 3M plans to address known conflicts, and we do not believe that replacement water for environmental resources is a viable approach.

In addressing conflicts, The Nature Conservancy advocates applying the mitigation hierarchy for conflicts with water for the environment and existing water rights and domestic wells. The three tiers of the mitigation hierarchy are firstly, to seek to make water management decisions that avoid impacts to the environment and conflicts with existing water rights and domestic wells; secondly, to minimize impacts; and lastly, to mitigate, offset, or compensate impacts. Current Nevada water law is consistent with this hierarchy because it requires the State Engineer to deny applications with known impacts and conflicts, thereby avoiding them in the first place, and it serves to incentivize applicants to seek points of diversion that would not conflict with existing water rights or domestic wells or impact the environment.

Regarding section 1, subsection 1, paragraph (b) of A.B. 30, well-designed 3M plans are useful tools for protecting water for the environment in cases where it is uncertain if a conflict may occur. In the case presented in A.B. 30, however, 3M plans could be used where a known conflict occurs. In our view, this would put in statute a broader and riskier use of 3M plans that would weaken the incentives to avoid conflicts in the first place.

Finally, the replacement of water to replenish the source of supply is rarely ever adequate. Nevada is the driest state in the nation, yet it ranks eleventh in biodiversity with over 170 known endemic species; these are species found nowhere else in the world. The vast majority of these endemic species are associated with natural springs and other water resources on Nevada's landscape. We believe that it is highly unlikely that the unique geochemistry and physical habitat that species and ecosystems are adapted to can be replicated with water imported from elsewhere. [A letter was also provided (Exhibit J).]

Mark Butler, Executive Council Member, The Coalition to Protect America's National Parks:

I am also here on behalf of the National Parks Conservation Association to express our opposition to two bills before the Committee, Assembly Bill 30 and Assembly Bill 51.

We oppose A.B. 30 because of the potential to enable large-scale pumping projects that could cause irreparable harm to Great Basin National Park's unique water-dependent resources. Assembly Bill 30 would also expose Lake Mead National Recreation Area to harm by facilitating groundwater extraction from nearby aquifers where testing has shown that there has already been adverse impacts to the region's water resources from pumping at only one-third of current appropriations.

In our view, A.B. 30 would codify a "trust us" attitude rather than rely on sound science. The bill would give the State Engineer an overwhelming amount of discretion to continue appropriating our groundwater basins, even when the water does not exist for the taking. Those allocations will likely come at the expense of our parklands, public lands, and families who reside in these communities and regions.

Assembly Bill 51 would also enable large-scale pumping projects because it will alleviate the requirements to prove that water applicants' wants actually exist, by potentially masking or minimizing pumping impacts by using so-called conjunctive management. Conceivably, this bill could allow any applicant to sidestep the current groundwater protections that have worked in Nevada for decades.

Thanks to ongoing leadership in this Committee and others, Nevada offers spectacular outdoor recreational opportunities at many treasured destinations, including the Sierra Nevada Mountains, Great Basin National Park, Red Rock National Conservation Area, Lake Mead, and more than two dozen Nevada State Parks. These treasured destinations provide Nevadans with places to adventure and recharge while also bringing in billions of dollars into Nevada's economy. It is absolutely in line with the current preferences expressed by Nevadans as documented in a recent 2019 study, an astounding 81 percent of Nevadans believe that the outdoor recreation economy is important to the future of the state. An equally impressive 83 percent believe it is important to protect and restore the health of the state's rivers, lakes, and streams. Preserving our precious groundwater resources from overappropriation is the key to long-term health to many of the state's most wonderful outdoor recreational locations. Therefore, we urge members of this Committee to oppose this legislation. (A letter was also provided (Exhibit K).]

Susan Juetten, Private Citizen, Reno, Nevada:
I am representing Great Basin Resource Watch (GBRW), a Nevada-based nonprofit public interest organization which has been monitoring mining and extractive industries on our public lands since 1995. I will speak about both bills. Assembly Bill 30 proposes that the State Engineer may consider a proposal to avoid or eliminate the conflicts that occur between a new appropriation and an existing water right. The bill apparently provides no constraints or clear guidance on what is an acceptable proposal for conflict resolution. As a result this bill will give the State Engineer too much power, which has proved to be problematic in the past. For example, the State Engineer first approved water applications by Eureka Moly, LLC as Kobeh Valley Ranch, LLC (KVR) for the Mt. Hope Mine, a proposed molybdenum mine in Eureka County. However, these applications were in conflict with existing senior water rights, and it was necessary for the senior water rights holders to appeal the State Engineer's decision all the way to the Nevada Supreme Court. The Supreme Court overturned the decision of the State Engineer, stating in conclusion: "In sum, substantial evidence does not support the State Engineer's finding that KVR would be able to 'adequately and fully' mitigate the fact that its groundwater appropriations will cause Kobeh Valley springs that source existing rights to cease to flow."

In conclusion, Great Basin Resource Watch opposes A.B. 30. [A letter was also provided (Exhibit L).]

Kenny Bent, Private Citizen, Pahrump, Nevada:
I have to say our Assembly members asked some excellent questions. The public has given some brilliant testimony which helps me a lot. When I came in here, I was slightly nervous about this bill; now I am downright afraid. Assembly Bill 30 seeks to give the State Engineer even more undefined powers to use at his discretion. On its face, this type of power given to an unelected bureaucrat defies the established concept that laws should be clear, defined, and unambiguous. This bill allows him to approve water use that will very likely conflict with existing uses, including domestic use. It basically allows the State Engineer to create a future problem with the high hopes that the damaged parties will have to accept the outcome. It still feels likely that this bill was intended for a specific purpose not disclosed here.

These types of bills will likely lead to unintended consequences, including the type of court battles that inevitably end with the corporations with the most money prevailing over any opposition. The individual will almost always be the casualty. As far as the applicant paying the fees, if someone like Tesla moved in next to me, I do not think money would be an issue. I think applications that are in conflict should be denied, just as they are now. I do not see a reason to do this, it gives me a feeling that this is a 3M plan with an "M" for money.

Undefined powers are a very bad idea. This is what has led to the massive over-appropriation and a lot of the problems we have instead of following clear defined laws.

"Trust us" does not work for me.

John Hiatt, Conservation Chair – Press Liaison, Red Rock Audubon Society:
I would like to speak on behalf of the public interest and groundwater-dependent ecosystems which are not addressed in this bill and have historically been given short shrift by the State Engineer. We have many significantly overappropriated basins in Nevada. My concern is that we are going to do the same with additional basins, particularly places like Spring Valley which has a very vibrant groundwater-dependent ecosystem. There is nothing in this bill, or any other bill that I see, that will address those problems. Therefore, I have to oppose A.B. 30 and I think we need a much different process for resolving some of the conflicts in the Nevada water law. Looking to the future at how we actually preserve a living environment in the state of Nevada so that we do not repeat the problems we have in both Las Vegas and Reno, where vibrant groundwater-dependent ecosystems were essentially obliterated by development and no consideration, I am opposed to the bill and strongly suggest we go back and start over and come up with some legislation which really will address the problems and lead to sustainable groundwater development in the future.

Patti Jesinoski, Private Citizen, Henderson, Nevada:
I grew up in a small rural area in Minnesota, so I feel for the 16 counties outside of Clark County. At the budget meeting of the Henderson City Council last year, they were ecstatic of the 450 current permitted building projects going on at the same time. Building takes water.

The SNWA meeting last fall spoke to us about using our reclaimed water within budget—we were only using 10 percent.

However, these major building projects are not reclaimed water. Now we have the new Las Vegas Stadium that is being built. Last month, at a Henderson City Council meeting, it was stated that we may need to start looking for some other water conservation in our homes. We are only using 10 percent of what we are allowed to use in our homes. Our conflict at this time is too much building. I support the rural areas with a no on A.B. 30.

Chair Swank:
Is there anyone else who would like to testify in opposition? [There was no one.] Would anyone like to testify in neutral?

Ed James, General Manager, Carson Water Subconservancy District:
We are a multicounty, bistate organization dealing with water resources in the Carson watershed. We have had an opportunity to meet the State Engineer's staff and also many of the people in this room to talk about these various water bills. We applaud the State Engineer for being proactive in trying to take action, but sometimes you can hear the issues that need to be vetted a little more. We believe that with opportunities with this group and working with the State Engineer, we can make some better laws than this. Nevada has some very good, strong water laws today, but there is a need to look at some of these changes. We applaud the State Engineer in trying to do that, but again, I think we need to be working cooperatively with him. You will never hear consensus and water law in the same sentence, but I think we have a chance to work together to come up with better laws. If we do not move forward, we will start falling backward.

Chair Swank:
Is there anyone in Las Vegas who is speaking in neutral?

Andrew M. Belanger, Director of Public Services, Southern Nevada Water Authority:
I wanted to testify today in a neutral capacity. We at the SNWA are focused on three main things this year, as we indicated prior to session. We are focused on completing the low lake level pumping station at Lake Mead, completing the drought contingency plan on the Colorado River, and increasing water conservation in southern Nevada. Those are our priorities. While we worked on a 3M plan bill last year, and while we agree with the State Engineer's office that these issues are complex and that they require legislative action to solve, we also recognize that there is a lot of concern about what this bill will do.

We recognized that last session when we withdrew our bill, and we recognize that today. We encourage the Legislature to address the issues of the 3M plan. We cannot support the bill in its current form, but we do not oppose the bill in its current form. We do believe that if the Legislature does not act at some point in the future, you are going to spend a lot more money in the courts than you are today. This is just a fact. Southern Nevada uses 5 percent of the state's water supply, with 70 percent of the state's population. Over the 50-year planning horizon that we look at when we consider the future, the groundwater project moves our water demand from 5 percent to 6 percent. That is the context we are talking about here. While we appreciate some of the concern we are hearing from the opposition, there are a lot of overblown statements, distortions, and misinformation. There is a huge legislative record. The 2007 Legislature addressed staged development of water; in 2013, the Legislature addressed 3M plans. That record is there for your perusal.

Chair Swank:
Is there anyone in Elko who is speaking in neutral? Seeing no one, does the bill sponsor have closing remarks?

Bradley Crowell:
I want to say to everyone who made statements, we appreciate them. Specifically, I want to remind folks that in the context of A.B. 30, we are talking about available water and within that context, the best way to manage available water. There is obviously disagreement about the best way to manage it. I hope there is not disagreement about the need to manage available water. We do not have enough water in Nevada to let it be locked up or held hostage. We need to find a path forward if we are going to smartly and strategically use our limited water resources. I want to reference Mr. Tibbitts' remarks specifically. I appreciate his comments in that context, and I actually do not think we are that far apart. There are instances that are not being addressed or thought through. If you have a senior water rights holder with a groundwater well that has been there for 100 years and has been used—and through more contemporary science, we have learned that the aquifer is much deeper and more plentiful, and there is available water—if the senior water rights holder is unwilling to allow his well to be deepened so that others can access that water, he is holding hostage Nevada's water that belongs to everyone. It is those kinds of instances that we are trying to address with this legislation. It is clearly not perfect, but I hope the intent and understanding is common among us. There were a few folks who provided solutions, and I want to thank them. I understand criticisms, but I sure hope they come with solutions if we agree that there is a problem. As the Department, and as the Division of Water Resources, we stand ready to work with anyone and everyone in a collaborative process to understand concerns and come up with constructive solutions. I leave that as an open invitation.

Chair Swank:
I will close the hearing on A.B. 30. [Also provided but not mentioned are (Exhibit M, Exhibit N, and Exhibit O).] We will open the hearing on Assembly Bill 51.

Assembly Bill 51: Revises provisions governing the management of water. (BDR 48-213)

Bradley R. Crowell, Director, State Department of Conservation and Natural Resources:
Assembly Bill 51 addresses the very real and prudent scenario of conjunctive management, which is recognizing that our surface waters and groundwaters are connected and we should manage them in that way. Nevada is a leader among our peers in the West in recognizing this. However, in recognizing the connectedness of water and managing it conjunctively, we

are going to have conflicts arise. We have been managing groundwater and surface water separately for over 100 years. If we now start to look at them as connected entities—which we should because the science is undisputable—we are inevitably going to have conflict among the existing right holders. We are not talking about new available water, we are talking about existing water rights holders, senior, junior, and everything in between. When we look at our waters conjunctively, we are going to have some conflict. Assembly Bill 51 is designed to recognize that and get some direction from the Legislature as to how to best manage that situation.

Tim Wilson, Acting State Engineer and Administrator, Division of Water Resources, State Department of Conservation and Natural Resources:

I am here today to present testimony in support of Assembly Bill 51, which addresses the implementation of "conjunctive management," an important water management concept approved by the Legislature in 2017. [Continued to read from prepared testimony (Exhibit P)]. Please allow me to begin with a bit of background and context. In 2017, the Legislature amended *Nevada Revised Statutes* (NRS) 533.024, subsection 1, and added a new paragraph, (e), requiring the Division of Water Resources within the State Department of Conservation and Natural Resources "To manage conjunctively the appropriation, use and administration of all waters of this State, regardless of the source of the water." This simple amendment acknowledges that surface water sources and groundwater sources that are hydrologically connected need to be managed conjunctively.

My office has provided the members of the Committee with PowerPoint slides that I will walk through to illustrate the concept of conjunctive management and how it relates to the bill before you today (Exhibit Q). When Nevada's foundational water statutes were adopted in 1903, the statutes focused exclusively on surface water sources and did not even consider underground sources of water. Therefore, the implementation of Nevada water law initially focused only upon the allocation and management of surface water sources. During the period of early statehood and into the 1900s, this approach was sufficient given Nevada's small population and an economy that utilized water primarily for agricultural and mining needs. However, as groundwater well technology was developed and our economy expanded and diversified, the need to utilize and regulate additional water sources increased. In 1939, NRS Chapter 534, Underground Water and Wells, was adopted and specifically directed the management and administration of all groundwater sources. Because groundwater management is compartmentalized into its own chapter, since 1939 the State Engineer and the Division of Water Resources generally administered surface water and groundwater sources independently.

This practice, however, did not fully account for the fact that many surface and groundwater sources are hydrologically connected. In 2017, the Legislature took a proactive step to reconcile this disconnect. Specifically, the Legislature issued a declaration directing the Division to conjunctively manage all waters of the state, regardless of the source of water, as a necessary and appropriate first step towards harmonizing our laws with the science [Senate Bill 47 of the 79th Session].

Assembly Bill 51 is the next step to effectively and accurately implement conjunctive management practices in Nevada.

While the 2017 Legislative declaration helpfully recognizes the hydrological connection that often exists between groundwater and surface water sources, existing statute does not provide the framework necessary to effectively implement the Legislature's policy direction. Assembly Bill 51 seeks to incorporate conjunctive management into Nevada water law while balancing the interests of these formerly separately administered water sources in a legally defensible manner. This is a critical need, for unless statutes provide additional legislative direction for the manner in which the Division should implement the conjunctive management of Nevada's water resources, the ambiguity will ultimately be decided by the courts without the benefit of any substantive legislative intent to guide these inevitable judicial decisions.

As a continuation of the 2017 policy directive, Assembly Bill 51 proposes two basic first steps: First, it directs the Division of Water Resources to adopt regulations for the conjunctive management of groundwater and surface water resources. Regulations need to be specific to the affected region to account for different hydrologic settings and different manners of use. The process of developing regulations will include full public and stakeholder participation with full transparency. It is critical that any new regulations for conjunctive management have the benefit of careful consideration and a clear, understandable outcome. Second, A.B. 51 authorizes the Division of Water Resources to create the programs necessary to develop regulations and effectively implement conjunctive management of groundwater and surface water. Please allow me to walk through the language to accomplish the purposes as set forth in Assembly Bill 51.

Section 1 establishes a new section of NRS Chapter 533 with provisions allowing for the development of regulations and programs for the conjunctive management of connected surface and groundwater sources.

Section 2 incorporates domestic well owners, who are legally authorized to withdraw up to 2 acre-feet of groundwater without possessing a water right, into the definition of a "groundwater user." This does not require domestic wells to acquire a water right, but simply ensures that groundwater pumping from domestic wells is factored into overall usage when managing connected ground and surface water resources.

Section 3, subsection 1 directs the State Engineer to adopt conjunctive management regulations. This section further directs that any conjunctive management regulations must recognize existing uses of water while protecting senior water rights holders. Further, section 3, subsection 2 establishes certain elements that may be included in the adoption of conjunctive management regulations, including: (a) requirements or guidelines for establishing mitigation plans to address conflicts between groundwater and surface water users; (b) the creation of a conjunctive management program to help manage and mitigate conflicts between groundwater users and surface water users; and (c) establish additional methods as appropriate and necessary to effectively facilitate conjunctive management.

To provide some context regarding the hydrologic interaction between surface water and groundwater sources, page 2 (Exhibit Q) shows an illustration of how the Division of Water Resources historically administered surface water and groundwater sources. As illustrated, groundwater was administered as if there were an artificial barrier between appurtenant surface water sources. This was not a scientifically supported manner of administration. Today, we recognize that decisions made decades ago have incrementally led to conflict between surface water and groundwater users.

As illustrated on page 3, a groundwater source may have direct hydrological connectivity with a surface water source, such as a river or stream. When a well is first pumped, water is derived from aquifer storage. Over time, the water removed from aquifer storage may be replaced by capture from surface water. Capture can occur by reducing groundwater discharge to a stream or by inducing infiltration from the stream. Depending on the distance and hydrologic conductivity between the stream and the well, these effects may take years to manifest and many more years to recover, even after the pumping has ceased. The effects may also be muted by variability between wet and dry years.

Although groundwater pumping may capture surface water flows, this does not automatically mean there is a conflict with the surface water uses. Practically every stream and river system in Nevada is a fully appropriated system, meaning the totality of the flow of the surface water source is allocated to existing uses. The vast majority of these surface water rights are senior to all groundwater uses. Surface water rights are administered based upon "priority" and the seasonal flow of the river. If a surface water is flowing at a rate that satisfies each of the existing rights along the system, there is no harm or "conflict" to senior surface water rights, even if groundwater use has captured some of the flow, because all senior rights have been fully satisfied.

Conjunctive management is the mechanism for the Division of Water Resources to identify where, when, and how groundwater uses may cause near-term or long-term conflict with existing surface water uses. Presently, the Division has contracted with the United States Geological Survey (USGS) within the U.S. Department of the Interior and Desert Research Institute (DRI) to develop a capture model for the Humboldt River basin, depicted on page 4, which spans nearly 300 miles and includes 34 groundwater basins. Once completed early next year, this capture model will provide the best available science to accurately identify whether over a specified period of time, groundwater pumping results in capture of Humboldt River surface water. Based upon the results of the capture model, the Division will be able to determine the amount of conflict, if any, with senior surface water rights along the river system. Page 5 (Exhibit Q) demonstrates how the capture model helps identify a groundwater well location, and determine the quantity of water captured from the Humboldt River. The image on the lower right shows a hypothetical well located near the river. The different colors indicate model results of capture at any location after a certain duration of pumping. The chart on the upper left shows the percent capture of that same hypothetical well after pumping for 10 years. In this case, capture of stream flow is about 40 percent of the water pumped by that well.

Availing ourselves of the best available science is imperative when considering the development of conjunctive management programs. As illustrated on page 6 (Exhibit Q), unlike other states, Nevada is attempting to "sharpen the pencil" and identify with particularity whether a specific groundwater use is actually resulting in capture of surface water. Based upon that data, the Division has the ability to calculate the amount of conflict. Identifying a conflict using best available data is only the first step. Resolving conflicts based on sound management practices is equally important.

Each basin dominated by surface water in Nevada is hydrologically unique. The science and response in one region may not be appropriate in another region. Accordingly, the ability to develop regulations to address these unique areas is critical to assuring that the Division applies the best available science and avails itself of the best available management approaches.

Section 4 addresses the proposed scope of conjunctive management programs administered by the Division of Water Resources. Specifically, subsection 1, paragraph (a) provides that if the Division of Water Resources adopts a conjunctive management program, it is not required to curtail a conflicting groundwater use if it can be demonstrated that curtailment or the cessation of pumping will not result in the delivery of water to the conflicted surface water right. This is often referred to as the "futile call doctrine" because curtailment of a particular junior use is futile and will not result in an actual delivery of water to the senior use. In such instance, the junior use is not required to cease its use.

Section 4, subsection 1 paragraph (b) allows the Division to require a groundwater user, who is capturing surface water flow that results in conflict to senior users, to provide replacement water. It also requires the replacement water to be of sufficient quality to satisfy the use of the senior user. In essence, this provides the opportunity for a groundwater user to replace conflicted water rights by providing its own surface water rights or acquiring them from another surface water user. However, many groundwater users found to cause some conflict with surface water uses may not have substitute surface water available to use or offer to an impacted senior water rights holder.

Unfortunately, in these instances, curtailment of such uses may take years, if not longer, to reverse the surface water depletions and eliminate any conflict, with the very real potential to cause significant economic injury to those curtailed users and the communities in which they live. Therefore, section 4, subsection 1, paragraph (c) provides the Division of Water Resources authority to levy a special assessment for the purpose of creating a fund that would provide financial mitigation to senior surface water users in cases where replacement water is not immediately available. The mitigation fund would allow certainty for groundwater users and would provide a mechanism to make senior surface water users economically whole. It could also incentivize conservation, by exempting groundwater right holders from assessments if they choose not to pump. Subsection 1 paragraph (d) also allows the assessment of fees to pay the expenses of administering the conjunctive management program. It is important to emphasize that these assessments are not ad valorem taxes.

Section 4, subsection 2 addresses the mechanism for the collection of the assessments. Section 5 allows the Division of Water Resources to suspend the "use it or lose it" provision in law to help promote conservation over excessive use or waste as well as the unfair forfeiture of a water right when a conjunctive management plan is adopted. If a conjunctive management program is adopted, the best practice is to encourage water conservation. Accordingly, it is imperative that voluntary conservation, or mandated nonuse, of water does not subject the water rights holder to a claim of abandonment or forfeiture while the conjunctive management program is in effect. The goal of conjunctive management should be for the benefit of all users within the bounds of what the water resources in question can support over the short, medium, and long term.

Sections 6 through 9 contain conforming and clarifying language regarding existing law and establish that this bill would become effective upon approval. At this time, I am happy to take any questions from the members of the Committee.

Assemblywoman Peters:
My question is dependent on federal decisions and implications that they have on the idea of conjunctive management and how we manage it in the state of Nevada. What would it mean to be in the middle passing a law like this or even conducting management on the existing statutes? We have two situations, one is the *Agua Caliente Band of Cahuilla Indians v. Coachella Valley Water Dist.*, 849 F.3d 1262 (C.A.9 (Cal.), 2017). That confirmed jurisdiction to tribal governments to an aquifer for which they pull water from. That is for managing water quality, in particular. The other is that the Supreme Court has agreed to review whether the Clean Water Act can regulate groundwater, which also has to do with water quality. If we are addressing conjunctive management, and we get to the point where we address water quality in conjunctive management, how would those impact how we address conjunctive management?

Tim Wilson:
I would like to bring our attorney, Micheline Fairbank back. She is more familiar with those cases.

Micheline Fairbank, Deputy Administrator, Division of Water Resources, State Department of Conservation and Natural Resources:
When we talk about conjunctive management in the context of the *Agua Caliente* case, or some of the other pieces of litigation, this really establishes the framework for which our office can go ahead and address those particular issues. The *Agua Caliente* case is an extension of the analysis and potential application of a Federal Reserved Right Doctrine, otherwise known as the *Winters* doctrine, and that extension to groundwater. There are still a lot of questions and undecidedness in terms of how that is going to actually interplay in Nevada with respect to our water laws and the application.

Without a framework and guidance in terms of how we establish these management programs, we are stuck with competing interests. This is a mechanism to pave the way of how we can go ahead, within the statutory framework and through regulatory process, provide that management solution, so that any potential conflict that may arise with regards to those differing and conflicting interests, can then have a mechanism in state law to be resolved. Again, the public owns the water, and we have to operate within those confines. With respect to water quality issues, obviously there is a little bit of an overlap with regards to water management and water quality, but that is a different agency that has the integral association with respect to the management of water quality. Obviously, we look at water quality issues when we are addressing issues of appropriation, but in terms of long-term management, that is more of a collaborative process within our agencies.

Assemblywoman Peters:
Is there is a way in this language that we could include our relationship with tribal governments and their right to the water, their ownership of the water in these aquifers, as the *Agua Caliente* case rolls out? I believe there are appeals happening around that, but perhaps we can make it clear in this bill that we consider the tribes in the decision making and build our framework for conjunctive management around, or at least with that in mind?

Micheline Fairbank:
I think that is part of the dialogue when it comes down to the regulations in terms of stakeholder involvement. Certainly, the regulations are intended to build upon stakeholder involvement, making sure we have all of the appropriate stakeholders involved is part of that dialogue. Whether that is a statutory amendment to the bill is certainly open for discussion. With regards to how that rolls out, I think that is part of not being overly specific while still allowing the regulatory process to ensure that we are doing our role, fulfilling our duty in terms of making sure we have that stakeholder and collaborative process as part of the program.

Bradley Crowell:
This should be duly considered as appropriate and we can discuss and figure out how to incorporate it. This also reminds me, as a point of clarification, during the comments on the last bill, there was discussion about federal land and federal ownership of water. While we do have approximately 86 percent of land in Nevada under federal control, all of the water in Nevada belongs to the people of Nevada. We want to be careful as we change our laws and do not subvert any of our water rights to the federal government.

Another point of emphasis, before we get to implementing conjunctive management in a way that meets everyone's concerns, there is a lot of analysis and data that needs to be done. The example of the Humboldt River and what we are doing with DRI, and the USGS, we need contemporary, best science like that in many other places in Nevada. We have it in some places, but not everywhere. There is a lot of hydrologically connected systems that would benefit from understanding their function and connectivity as a first step to implementing any plans that balance interest within conjunctive management.

Assemblywoman Titus:
Getting back to the language in the bill, section 4, subsection 1 states, "If the State Engineer creates a program for the conjunctive management of groundwater and surface water in a

hydrographic basin, the State Engineer . . . " and then it goes on about being required to curtail groundwater use, does not have to deal with the conflict, et cetera. Does this totally upend the prior appropriation concept in our laws? Also, it seems to me, this would actually strip seniors of property rights, their priority date, and therefore a taking. Would you clarify that?

Tim Wilson:
In the past when we administered surface water and groundwater separately, surface water priority has never been used against groundwater priority and vice versa. By eliminating that artificial brick wall, if we are going to look at both of those priorities together, the senior rights are almost always going to be senior to the groundwater rights. When people first came here, they obviously used surface water; we did not have good well technology to drill deep wells and tap our aquifers. We see this as protecting those senior surface water rights against groundwater depletion.

That is what the groundwater models are doing—they are telling us, first, is there an issue. Groundwater can be very compartmentalized, there can be lots of faulting. What is under the ground is very difficult to determine. We believe we have the technology to use groundwater models to determine an impact to the river. We have a well that is pumping near the Humboldt River. We do not know what that impact is today, but we think we will know what that impact is. If it is having a conflict with senior water rights holders on the Humboldt River, we want to make those senior water rights holders whole. We want to find a method to compensate them for the amount of water being taken out by that well. That is the goal of this legislation. Deputy Administrator Sullivan is intimately familiar with this subject and might be able to elaborate.

Adam Sullivan, Deputy Administrator, Division of Water Resources, State Department of Conservation and Natural Resources:
I think there is an additional point that will help clarify the answers. We need to work within the prior appropriations system, and in order to address existing conflicts, we have very limited tools within statute. Simply put, until the senior water user gets 100 percent of their water, the junior water user does not get any. The response to that would be to entirely curtail a groundwater user. In this example of the Humboldt River, we could entirely curtail groundwater users, but because of the hydrogeology of the system, that still would not result in a full delivery of water to the senior surface water users. This is a problem that has developed over many decades, and it would take many decades to solve it in that manner. What we need is to have some flexibility to work with the stakeholders in the affected region to fully satisfy the senior users but also allow junior users at least a portion of their water to the extent that it does not conflict.

Assemblywoman Titus:
Acting State Engineer Wilson, you stated that the senior water rights holders will always have priority in "most" cases. Will you clarify that statement?

Tim Wilson:
If I did state that, I did not intend it. If you are a senior water rights holder, you are a senior water rights holder. Our state is a prior appropriation state; it is based on the date when your water right came into fruition, either through a permit or through decree, and that sets your priority date. If we are going to balance surface water priorities to groundwater priorities, as I mentioned, the surface water is going to be senior in almost every case. There could be a very old well, maybe someone hand dug a well in the 1800s and they have a vested claim on it. That vested claim has an earlier priority date, and as a groundwater rights holder, he could have a senior right to a surface water holder later in time. That is almost never the case.

Assemblywoman Titus:
I have water rights on my property in Smith Valley. I understand if there is a drought year, we only get 10 percent, even though I have so many acre-feet, I may only get 10 percent of that due to the curtailment. I understand that. There are folks downstream from me, especially the Indian reservation in Schurz, who have much older rights than I have. We have to make sure they get their water, and I do understand all of that. I just want to make sure that we are managing the water with due process. I am concerned that, with this wording, there is potential for a loss of rights.

Assemblyman Wheeler:
Section 4, subsection 1, paragraph (c), says, "Any such special assessment must be proportionate to the amount of conflict caused by the groundwater user to the surface water user whose water right is senior in priority." The State Engineer can levy a special assessment annually. How much is a domestic well user going to be charged? How is the usage actually going to be measured? Are you going to put meters on wells? We went through that last session, and it was not good. I am trying to figure out what the "special assessment" really is.

Adam Sullivan:
For the specific example of the Humboldt River, the assessment would be based on the value of the portion of water that is not delivered. This is a concept that has been developed through working group negotiations with stakeholders as a potential mechanism for making surface water users whole. The assessment would be specific to that area for a given period of time. In this particular case, we have engaged with agricultural economists at the University of Nevada, Reno to make that determination. To address the point about domestic wells, in recent negotiations with the stakeholder working group, domestic well owners would be excluded from the mitigation program.

Assemblyman Wheeler:
What you are telling me is that you cannot put a figure on the assessment. It will just be something that is studied and we will define it later? This does not say anything about measurement. That is why I am asking about the meters on wells, how do you measure it? How do you know how much is being taken out, et cetera?

Adam Sullivan:
In the Humboldt region, all permitted water rights have meters on their wells and report monthly data to our office. To the first part of your question, the answer is, yes, specific for a region, we would directly study the value of water and make that determination with the assistance of a neutral third party.

Assemblywoman Hansen:
Section 4, subsection 1, paragraph (b) states, "May require a groundwater user to furnish replacement water to a surface water user so long as the replacement water is of sufficient quality." When there is a loss and the senior user has to be compensated, do you have any projections of how much water would need to be replaced? I am trying to envision what that looks like. How is the water getting there? Where is the water coming from? What kind of quantities are we talking about?

Adam Sullivan:
You are absolutely right, these are very difficult things to quantify. It is what we have to do because there is no fixed direction within our legislative prerogative to give us a more direct approach to resolve the existing conflict to the extent that it exists. The first point that you brought up was how to determine how much water is not being delivered. In the case of the Humboldt River, we have over 100 years of delivery records, an understanding of the system, and how much water is available to deliver to each user in priority based on flow at a given measuring point. Where those delivery schedules are not met, the challenge is in fractioning out exactly how much was deserved to be delivered to that user, how much was due to drought, for instance, versus how much was due to capture from surface water by groundwater pumping. These are all the difficult questions that we are trying to resolve through groundwater modeling and with the assistance of the USGS and DRI, and with abundant stakeholder engagement and negotiations on regional solutions.

Assemblywoman Hansen:
If there is a determination of water that needs to be supplied, how does the water get there? Where is the water coming from? If it is not going to come from the Humboldt River, where is the supply of water coming from?

Adam Sullivan:
Preferably, in that situation, the water would come from the Humboldt River. It would be an exchange or agreement to not divert an upstream users' rights so that it can be delivered as wet water to a downstream user.

Assemblywoman Hansen:
Section 5 states, "If the State Engineer creates a program for the conjunctive management of groundwater and surface water in a hydrographic basin, a right to groundwater or surface water that is not being used because of the program is not subject to a determination of abandonment or forfeiture for as long as the program is in effect." The discomfort I have with that is it is essentially giving all the authority to the State Engineer, someone who is not an elected official. This does not have a lot of input from the elected body, per se. During

Mr. Wilson's presentation he said ambiguity would be decided by the courts. To me, this shows that ambiguity will be decided by the State Engineer. Are we giving a lot of power to the State Engineer that does not reside there now?

Tim Wilson:
Section 5 goes a little bit to my very first presentation that I gave on water law. One of our concepts is that if you are not beneficially using the water, you could be subject to cancellation, forfeiture, or abandonment. In this case, if this program is in effect, we do not necessarily want the groundwater user to pump. That may be his solution, he does not want to pay for the interference of the surface water, so he is just not going to pump his well. That is a good thing. That is essentially like a voluntary curtailment. We do not want to take away his right through abandonment or forfeiture. Forfeiture works after five years of nonuse on a groundwater right, so we want to toll that provision while this program is in effect, so that people who choose to turn off their wells as their mitigation, they will not lose their water rights certificate. They can hold their water rights certificate so if they choose to participate in the program at a later date, they can pump their well and either supply the extra surface water to make up for their impact or have a financial obligation.

Assemblyman Watts:
I need some clarification around judicial review and how that might work through this process. I know in this bill, part of the framework is the development of regulations. I assume that as long as those are constitutional, they are set in terms of framework. When it comes to individual plans, I am wondering what that process would look like. Who would be able to initiate judicial review of a conjunctive management plan once it was approved? If it would only be the affected water rights holders, or if others would be able to participate in that process.

Bradley Crowell:
It is nearly impossible to predict the outcome of judicial review, especially in water cases. We get quite a range of outcomes from judicial review. If the regulations on conjunctive management conform to all of the rules, laws, and regulations, and the date and science underpinning the decisions related to conjunctive management are sound and defensible, I would hope that would guide any judicial review to the correct outcome. We cannot predict that, we can just set the table as appropriately as possible for that review.

Assemblyman Watts:
When a water rights application comes in, people have the ability to protest. Those protestants can participate in judicial review after an order is released. Outside of the regulations, when a conjunctive management is approved, who do you envision would be able to challenge the findings in that plan?

Bradley Crowell:
In the instance of judicial review for conjunctive management, we are not talking about new water right applicants, we are talking about all of the existing water rights. It is a matter of

the balancing of priority of different rights, based on different situations and hydrological scenarios.

Chair Swank:
I would like Mr. Amburn to answer that.

Allan Amburn:
When looking at NRS 533.450, which is what we are addressing with the new language, it addresses the judicial review of orders and decisions of the State Engineer. It states that any person feeling aggrieved by any order or decision of the State Engineer, acting in person or through the assistants, they have the ability to have that reviewed by a court.

Micheline Fairbank:
To build upon that response, any decision or order is subject to judicial review. The implementation of regulations are subject to one component of judicial review, not necessarily under NRS 533.450, but if the State Engineer were to adopt a conjunctive management program, if that adoption were to come through an order or other form of decision, then it is subject to the NRS 533.450 judicial review process. As already stated, any person feeling aggrieved by a decision or order is available to bring that action.

Assemblyman Ellison:
We have had hundreds of letters in opposition. Out of all of them, I have not seen one that says please adopt A.B. 51. These hundreds include letters from ranchers, farmers, businesses, The Nature Conservancy, et cetera. All of these letters show concern about this bill. I have a concern about this bill. I also have a concern about the lost value and collateral items. If you look at ranching and agriculture, and the impact, and the ecosystem, also, with the Southern Nevada Water Authority and what they have to say—I think you need to go back and take a look at this and maybe look at some other way to come up with a different approach. Assembly Bill 51 is totally against the reins of the people. I hope you will take that into consideration.

Chair Swank:
Are there any more questions? Seeing none, we will go back to the same process for testimony. Thirty minutes for support, 30 minutes for opposition, and 30 minutes for neutral. Each person gets two minutes. I will start with support in Carson City, Elko, or Las Vegas. Seeing no one, we will start with opposition in Las Vegas.

Kenny Bent, Private Citizen, Pahrump, Nevada:
Assembly Bill 51 strikes me as a kitchen sink concept. It is highly relying on what we heard before with Assembly Bill 30 for the mitigation aspect of it. I think this bill could easily change the balance and control of water in this state. In something like this, there are a lot of unintended consequences. I think we should be very cautious approaching this. It makes more sense to try this on a per-basin approach, rather than statewide, and do a test run on it. Largely, I am having a little trouble with the whole domestic well issue. I appreciate what Assemblyman Wheeler said, but I am going to address the domestic well issue here because

this seems to keep dragging around in the shadows, pretending that the State Engineer has authority to regulate. I think I heard that we are not going to regulate domestic wells, just their water. Domestic use was purposely exempted from 17 of the 18 western states. That was for both moral and legal reasons. What seems to be lacking here is anyone coming up and saying, From this day forward, we are going to deal with new domestic wells. There seems to be an intent here to take the water, at least 75 percent of it, from the existing domestic wells. I think it is very important that all of you on this Committee understand that the domestic use is exempt purposely out of water law.

Chair Swank:
Is there anyone in Carson City in opposition?

Doug Busselman, Executive Vice President, Nevada Farm Bureau Federation:
The Nevada Farm Bureau Federation is opposed to A.B. 51. One of the complicating factors in considering perennial yield assessments involves a way in which groundwater and surface water provide their respective and relative contributions to the basins. In the reach of the Humboldt River, and I think a lot of this bill is focused on that specific area, there are 32 basins that interact with groundwater and surface water. There are variations and complexities that I think some of this fails to recognize. Modeling is being carried out to attempt to capture a scientific perspective, but at this point, that is still a work in progress.

One of the things I would like to point out is in the discussions for this bill, much of this mirrors what was proposed as possible regulations during the interim process. Those proposed regulations never went anywhere, but they had a lot of components that were outlined here. There was mention made of stakeholders being involved in the construction of that. There were six or eight people who were involved representing different areas, but it did not involve stakeholders as a whole. I think that is part of our concern, there needs to be a greater level of input from the local stakeholders in order to facilitate meaningful solutions.

David G. Hillis, Jr., Principal Engineer, Turnipseed Engineering, LTD, Carson City, Nevada:
I work and deal exclusively with Nevada water rights. I have had the privilege of working with hundreds of Nevada ranchers, farmers, municipalities, and miners all across our state. I commend the State Engineer's proactive approach with both bills. We have heard tonight that the State Engineer's office wishes to collaborate with experts and stakeholders; however, to my knowledge, no collaboration has taken place in the drafting of the actual bills that are before you. Assembly Bill 51 promotes the concept of conjunctive management. This concept is not new; however, it is new within our state. I feel that this bill would rush forward legislation which has had no input from experts and stakeholders across our state. I would suggest the State Engineer's office collaborate and revise the bill for resubmission to the Committee. In addition, Director Crowell stated that it is beneficial to rely on the best and current science available; however, within our state, within some basins, we still rely on a perennial yield estimate, which was estimated from Hardman precipitation maps from 1936. That is a little outdated when it comes to establishing our most sacred concept when it comes to perennial yield. The newest, latest, and greatest science needs to apply to first

establish accurate perennial yields before we can begin management, especially across many basin lines. In addition, under A.B. 51 it is possible when implementing this legislation that a senior groundwater rights holder could be curtailed while a junior groundwater rights holder may not be affected based on his geographic proximity to the Humboldt River, for example.

Steve Walker, representing Douglas County; and Storey County:
Statewide application of conjunctive use methodology being developed on the Humboldt River is premature. The rulemaking process needs to be accepted, completed, and implemented before making a blanket state law or methodology that could affect other river systems. Each river system is unique both hydrologically and also have different decrees. Conjunctive use plans should be adapted on a case-by-case basis to recognize its uniqueness. We inherently know there is a relationship between surface water and groundwater, and our existing law could be used to deal with the current and future conflicts.

Bennie B. Hodges, Manager, Pershing County Water Conservation District:
I am here to speak in opposition to Assembly Bill 51. The Pershing County Water Conservation District (PCWCD) is a surface water irrigation district. Our reservoir is Rye Patch Reservoir. The main source of our water is the Humboldt River. We have an irrigation district 40,000 acres in size, and we are the largest surface water holders in the Humboldt River system. However, the downfall is that we are at the bottom of the system. The prior appropriation doctrine, "first in time, first in right," has been the cornerstone of Nevada water law for over 100 years. If it is not broken, please do not try to fix it.

Assembly Bill 51 would allow for the creation of a monetary assessment for conjunctive management of groundwater and surface water within the Humboldt River drainage. This mitigation program would allow junior underground water users to cause an injurious depletion of senior surface water users.

Water rights for the PCWCD constituents range from 1862 to 1921. These water rights are senior to all groundwater rights in the Humboldt River drainage.

Under this mitigation program, PCWCD constituents would receive monetary compensation from junior groundwater pumpers for causing injurious depletion and affecting base flows of the Humboldt River. The PCWCD constituents do not want money, they want their water. If they are compensated with money, the water table will drop and drastically affect current and future irrigation with less water.

Passage of A.B. 51 will slowly lead to the demise of a rural way of life in the Humboldt River drainage basin, namely the communities of Lovelock, Winnemucca, Battle Mountain, Carlin, and Elko.

Jake Tibbitts, Natural Resources Manager, Department of Natural Resources, Eureka County:
Eureka County does not support A.B. 51 as drafted. Again, we stand ready to continue our involvement in trying to find a good solution. I was happy to hear Director Crowell speak that this was intended to address existing appropriations in which there are conflicts. The bill as drafted does not make that clear. It seems that this bill could be used again, similar to our concerns with A.B. 30, where you could, under a conjunctive management rule, potentially appropriate new water that would be in conflict with existing rights. If the intent is truly to address conflicts that exist from rights that were already appropriated, I think there is some room to potentially find a solution. We have had this situation occur in Diamond Valley where we have had prestatutory vested rights affected and we feel that some rules to define situations like that are good to pursue. We do support localized approaches rather than a blanket conjunctive management rule for all of the state. We would support more localized rulemaking rather than blanket regulations. Again, we stand ready to assist in trying to find a common solution for this problem.

Kyle Roerink, Executive Director, Great Basin Water Network:
We oppose A.B. 51. We believe that A.B. 51 masquerades as conjunctive management, but the bill, in truth, intends to roll back existing laws and gives the State Engineer greater authority. State Engineers have the toughest job in the nation's driest state. I respect their service to Nevada, but over the years, State Engineers have overappropriated our basins and have lost many cases in court because the office mismanages its authority. We have to ask, why do we want to give him more power?

As written, A.B. 51 is a violation of constitutional rights under the Takings Clause. Section 4, subsection 1, paragraph (a) is a clear and explicit attempt to say that the "first in time, first in rights" doctrine no longer matters. Next, the bill sanctions unsound and unsustainable replacement water schemes. If someone takes your water, under A.B. 51 he can replenish it with something else—you could be getting your water from a pumper truck. Lastly, the bill sanctions monetary compensation as a means of repaying a harmed senior water rights holder. Assembly Bill 51 is giving the wealthy and powerful the upper hand with no recourse for the little guy. We envision scenarios where a powerful junior rights holder says, Take the money or take us to court. Money does not solve all problems in water policy, but A.B. 51 erroneously relies on that mantra and paves the way for powerful entities like the Southern Nevada Water Authority to build their disastrous 300-mile pipeline at the expense of hardworking families whose rights deserve protection. [A letter was also provided (Exhibit R).]

Patrick Donnelly, Nevada State Director, Center for Biological Diversity:
I think, with A.B. 51, what we have is an example of bad process leading to a bad outcome. This is really a top-down, heavy-handed approach with the State Engineer asking for almost unfettered discretion to pick winners and losers in our water system. We had Assembly Bill 298 of the 79th Session, which was an excruciating process involving the stakeholder negotiation in the committee room immediately before committee hearings. That was not the way to craft good water policy. In the interim, there have been no stakeholder processes on

this legislation. There are individual conjunctive management processes going on, some of which may result in good outcomes, but as far as addressing an overall framework, that has not happened. As a result, again, all of the people who would be affected by this legislation oppose it, even though I believe we all recognize groundwater and surface water are a single resource. I think there is widespread agreement that some form of conjunctive management is a good thing, and there is room for these parties to come together, but no effort has been made to do that. Instead, this seems like an attempt to railroad everyone who has an interest in rural water. Meanwhile, we have the ghost of former State Engineer, Jason King, looming over this process—these are Jason King's bills. These are not the current administration's bills. They are constituency lists. Nobody supports them, everyone who is affected opposes them, and we do not even have their progenitor in the room with us to defend them. These bills are a bad process leading to a bad outcome. They need to be scrapped and start over with a genuine bottom-up process to involve stakeholders to come up with something we can all at least live with, if not agree with. (A letter was also provided (Exhibit S).]

Tobi Tyler, Executive Committee Member, Toiyabe Chapter, Sierra Club:
The Toiyabe Chapter of the Sierra Club, representing more than 30,000 members and supporters in Nevada, is strongly opposed to A.B. 51. We urge the Committee to oppose and abandon this bill.

We oppose A.B. 51 because of the harm it will inflict on the people, wildlife, and scarce water resources of this state. It will encourage the overappropriation of our limited water resources and facilitate projects like the disastrous pumping and piping plan to siphon 58 billion gallons of water annually from eastern Nevada near Great Basin National Park to Las Vegas.

While the bill sets forth a path for outlining conjunctive management policies, the bill fails to mention any actual conjunctive management policies, only mitigation policies. The bill sanctions replacement water schemes, monetary compensation, and other unsound and inadequate gambits as a means for resolving conflicts when a junior rights holder harms a senior rights holder. This creates a situation where the powerful and wealthy will have the ability to push out anyone they like. That is not acceptable.

Most importantly, the bill completely upends Nevada water law's prior appropriations doctrine. The provision threatens the due process rights and constitutional rights of Nevadans by stripping senior water rights holders of a property right and their priority date, which results in a taking. After a permit is granted, an affected party would have only 30 days to file an appeal in district court. What about three months after? What about three years? Where is the recourse?

Progressive water policy ensures that a permit cannot be granted if conflicts exist between senior water rights holders, domestic well owners, and the environment. Nevada already has that enshrined in law. Our problem is not with the law. Our problem is with overappropriation of our scarce water resources. [A letter was also provided (Exhibit T).]

Laurel Saito, Nevada Water Program Director, The Nature Conservancy:
A goal of our Nevada water program is to ensure that there is water for people and nature for future generations. Dating back to the 2017 Legislative Session, The Nature Conservancy has consistently recognized conjunctive management as essential to the appropriate management of Nevada's scarce water resources. We commend the State Engineer's office for introducing A.B. 51 to address this topic.

However, we have some concerns with some areas of the bill and cannot support A.B. 51 in its current form. The bill should require conjunctive management to be environmentally sound. Most groundwater dependent ecosystems in Nevada are sensitive to the interaction of surface water and groundwater and could benefit from proper conjunctive management. Despite the importance of conjunctive management to the environment, the proposed legislation does not include any consideration of how conjunctive management regulations would influence or change the amount of water available for the environment. The Nature Conservancy recommends that the legislation be amended to direct the State Engineer's office, when adopting conjunctive management regulations, to recognize among existing uses of water not only water rights that are senior to priority, but also water that is being used by, and is necessary for, the environment. We believe this can be achieved by requiring that conjunctive management of groundwater and surface water be done in a manner that is environmentally sound.

As I said earlier, we support applying the mitigation hierarchy to avoid, minimize, and then mitigate. The language in A.B. 51 specifically mentions mitigation several times but does not acknowledge or require the need to avoid and minimize effects first. The Nature Conservancy recommends including such language to ensure that mitigation is not applied before all opportunities are explored to avoid and minimize conflicts first.

Finally, replacement water provisions are not appropriate for conjunctive management for environmental resources.

In summary, we are interested in working with interested parties to improve the legislation and hope that amendments can be made along the lines of our recommendations. Thank you for the opportunity to speak. [A letter was also provided (Exhibit U).]

Jeff Fontaine, Executive Director, Central Nevada Regional Water Authority and Humboldt River Basin Water Authority:
We are opposed to A.B. 51. That said, both authorities do support conjunctive management and certainly recognize the need to work within that arena. We also agree with Director Crowell's comments regarding the need for more detailed studies to determine the interaction between groundwater and surface water. We also agree very strongly with the previous speakers regarding the need for additional stakeholder input. The State Engineer has been working on promulgating regulations for conjunctive management in the Humboldt River Basin for about 18 months, and commented about the Humboldt River Basin working group to help craft those regulations. I have been a member of that group for a short period of time. There are not a lot of members, but to the extent that conjunctive management may, or can,

work out in a river basin, that may be the test case, or it may not. At this point we believe that the proposed legislation is probably not necessary and certainly premature.

Rebekah Stetson, Private Citizen, Reno, Nevada:
I am here representing our communities and specifically our children. Assembly Bill 51 is simply the destruction of Nevada's landscape history and future. Sustainability is most commonly defined as a way of meeting our needs while not limiting the ability of future generations to meet their needs. This legislation seriously puts in question the ability of our children to meet their needs in future generations. As written, A.B. 51 seems to encourage mismanagement of our most precious and already overappropriated resources in the nation's driest state. While we are looking at the effects of climate change, we are still uncertain of how severe that will be. Voting yes would be a modern day repeat of the Owens Valley disaster. Let us choose not to consciously and intentionally destroy our resources for our children. Please vote no on A.B. 51.

Anthony Sampson, Tribal Chairman, Pyramid Lake Paiute Tribe:
We oppose A.B. 51 for the simple fact that we have been through so much with water wars for over 100 years. We are dealing with water quality and the amount of water that is being flowed. We even have problems with our domestic wells in our area, to where we are looking at critical components of our groundwater in the Wadsworth area. When it comes down to it, you give the State Engineer all the power. He can do anything he wants. We were having problems with water recruitment; when it is going to happen, we do not know. That is something that is a reality. In opposing this bill, I hope that you will listen to what other people have to say about this. Some oppose it, some are for it. It is not about one group of people, it is about sharing it. We are a major stakeholder, one of the oldest in the state of Nevada. Thank you for your time. I hope you make the right decision.

Will Adler, representing Pyramid Lake Paiute Tribe:
I would like to ditto Mr. Sampson's comments and get a loud opposition to A.B. 51 on the record.

Chair Swank:
Is there anyone in Elko who would like to testify in opposition? [There was no one.] Is there anyone who would like to testify in neutral? Seeing no one, are there any closing remarks?

Bradley Crowell:
I would like to thank the Committee's indulgence and everyone in the room for some very good discussion. In the 2017 Legislative Session, this body approved the language in NRS 533.024 subsection 1, paragraph (e), that says, "To manage conjunctively the appropriation, use, and administration of all waters of this State, regardless of the source of water." That is what we are attempting to do. We do not have any further direction or guidance on how to do that. Assembly Bill 51 is our best attempt to untangle and address a very complex problem. If there is the sentiment and the will to not look at our waters conjunctively, then we can choose to do that. If we are going to move forward and manage

our waters conjunctively, then we need guidance to implement that. I hope that at the end of this hearing there is at least a sentiment of continuing constructive dialogue.

To folks who mentioned domestic wells, I understand the sensitivity, but if we ignore the fact that domestic wells in certain places can affect groundwater and surface water users, we are pretending and are not playing in the realm of reality. We have to recognize that.

To the comments regarding the accuracy of perennial yield, we fully agree. We would love to have the resources to do that on as quick a basis as we can. Data is essential for anything we do here, no matter what we come up with.

To comments regarding localized solutions, that is absolutely our goal and intention. That is what we are doing in the Humboldt River; that is what we are doing on the Lower White River Flow System and the Muddy River in Clark and Lincoln Counties, which we are happy to discuss further if folks are interested.

To comments regarding keeping the status quo, I would ask if that means you do not see any problems now or in the future with how our water laws allow us to administer and manage water.

I appreciate the comments regarding the importance of conjunctive management as the proper approach that reflects science and data, and I also appreciate the comments regarding the fact that more upfront work is needed. We agree. The system is not always designed to allow us to do that, but going forward, we certainly have no opposition and hope we have the support and participation of everyone in doing that.

To comments regarding monitoring, management, and mitigation as a last resort, that is absolutely our intention. Mitigation is not the preferred outcome, nor is it the first solution. Through monitoring and management we hope to never have to do mitigation, but if you simply want to ignore the need for mitigation after monitoring and management has not shown to be able to manage the situation, then what are we left to do?

This is a long way of saying I appreciate everyone's comments and hope we can have some additional guidance from this body as well as the stakeholders in the room.

Micheline Fairbank:
I want to build upon one of the elements that was discussed—that is that there is a desire and emphasis for a localized solution. That is absolutely what the structure of this bill is intended to do. The first part of A.B. 51 allows and directs our office to establish conjunctive management regulations and to allow for the authorization to adopt conjunctive management programs. The second part of the bill references what a conjunctive management program may or may not include. The reality is, the Humboldt River situation and process has been partly instructive and guiding with regards to the language, but the Humboldt River is not the only system that we are actively engaged in with this process. It certainly is not representative of the state. We understand that each system is unique and has to have its own

independent and individualized regulation and program. That is what this bill is conceptualized to do. What is going to work on the Humboldt River, ultimately, is not going to be appropriate for the Lower White River Flow System and the management of that interconnected water system. That is the idea; we need the ability, we need direction, and we need to have that from this body because right now we are left with very little.

Chair Swank:
Thank you for all the work done this evening. I will close the hearing on Assembly Bill 51. [Also provided and not mentioned were (Exhibit V and Exhibit W).] I will open it up for public comment. Seeing no one, we are adjourned [at 7:20 p.m.].

RESPECTFULLY SUBMITTED:

Nancy Davis
Committee Secretary

APPROVED BY:

Assemblywoman Heidi Swank, Chair

DATE:

EXHIBITS

Exhibit A is the Agenda.

Exhibit B is the Attendance Roster.

Exhibit C is a copy of a PowerPoint presentation titled "Division of Water Resources Overview," dated February 27, 2019, presented by Tim Wilson, P.E., Acting State Engineer and Administrator, Division of Water Resources, State Department of Conservation and Natural Resources.

Exhibit D is written testimony dated February 27, 2019, presented by Tim Wilson, P.E., Acting State Engineer and Administrator, Division of Water Resources, State Department of Conservation and Natural Resources regarding Assembly Bill 30.

Exhibit E material submitted by Rupert Steele, Chairman, Confederated Tribes of the Goshute Reservation, Ibapah, Utah, consisting of the following:

1. A letter to Assemblyman Ellison, dated February 26, 2019, in opposition to Assembly Bill 30 and Assembly Bill 51.
2. A document titled "Talking Points on Water."
3. A document titled "Swamp Cedars Massacre Site," dated September 19, 2016, offered by the Confederated Tribes of the Goshute Reservation.

Exhibit F is written testimony dated February 27, 2019, presented by Jake Tibbitts, Natural Resources Manager, Department of Natural Resources, Eureka County, in opposition to Assembly Bill 30 and Assembly Bill 51.

Exhibit G is a letter dated February 25, 2018, to Chair Swank, authored by Kyle Roerink, Executive Director, Great Basin Water Network, in opposition to Assembly Bill 30.

Exhibit H is a letter dated February 26, 2019, to Chair Swank, authored by Patrick Donnelly, Nevada State Director, Center for Biological Diversity, in opposition to Assembly Bill 30.

Exhibit I is a letter dated February 27, 2019, to the Assembly Committee on Natural Resources, Agriculture and Mining, authored by Tobi Tyler, Executive Committee Member, Toiyabe Chapter, Sierra Club, in opposition to Assembly Bill 30.

Exhibit J is a letter dated February 26, 2019, to Chair Swank, authored by Juan Palma, Nevada State Director, The Nature Conservancy, presented by Laurel Saito, Nevada Water Program Director, The Nature Conservancy in opposition to Assembly Bill 30.

Exhibit K is a letter dated February 26, 2019, to Chair Swank and Members of the Assembly Committee on Natural Resources, Agriculture, and Mining, authored by Mark Butler, Executive Council Member, Coalition to Protect America's National Parks, et al., in opposition to Assembly Bill 30.

Exhibit L is a letter dated February 27, 2019, to the Assembly Committee on Natural Resources, Agriculture, and Mining, authored by John Hadder, Director, Great Basin Resource Watch, presented by Susan Juetten, Private Citizen, Reno, Nevada, in opposition to Assembly Bill 30.

Exhibit M is a letter dated February 26, 2019, to Chair Swank, authored by Richard Howe, Chairman, White Pine County Commission, in opposition to Assembly Bill 30 and Assembly Bill 51.

Exhibit N is a letter dated February 26, 2019, to the Assembly Committee on Natural Resources, Agriculture, and Mining, authored by Simeon Herskovits and Iris Thornton on behalf of Great Basin Water Network, submitted by Advocates for Community and Environment, in opposition to Assembly Bill 30 and Assembly Bill 51.

Exhibit O is a compilation of material in opposition to Assembly Bill 30, consisting of the following:

1. A letter to Members of the Assembly Committee on Natural Resources, Agriculture, and Mining, written by Christine Saunders, Policy Director, Progressive Leadership Alliance of Nevada.
2. A letter dated February 25, 2018, to Chair Swank, authored by Tick Segerblom, Commissioner, Board of County Commissioners, Clark County.
3. A letter dated February 25, 2018, to Chair Swank, authored by Meghan Wolf, Environmental Activism Manager, Patagonia.
4. A letter dated February 26, 2019, to Nevada State Assembly, written by Dave Mendiola, Humboldt County Manager on behalf of the Humboldt County Commission.
5. A statement written by Delaine Spilsbury, Private Citizen, McGill, Nevada.

Exhibit P is written testimony dated February 27, 2019, presented by Tim Wilson, P.E., Acting State Engineer and Administrator, Division of Water Resources, State Department of Conservation and Natural Resources, regarding Assembly Bill 51.

Exhibit Q is a copy of a PowerPoint presentation titled "Assembly Bill 51" dated February 27, 2019, presented by Tim Wilson, P.E., Acting State Engineer and Administrator, Division of Water Resources, State Department of Conservation and Natural Resources.

Exhibit R is a letter dated February 25, 2018, to Chair Swank, authored by Kyle Roerink, Executive Director, Great Basin Water Network, in opposition to Assembly Bill 51.

Exhibit S is a letter dated February 26, 2019, to Chair Swank, authored by Patrick Donnelly, Nevada State Director, Center for Biological Diversity, in opposition to Assembly Bill 51.

Exhibit T is a letter dated February 27, 2019, to Assembly Committee on Natural Resources, Agriculture, and Mining, authored by Tobi Tyler, Executive Committee Member, Toiyabe Chapter, Sierra Club, in opposition to Assembly Bill 51.

Exhibit U is a letter dated February 26, 2019, to Chair Swank, authored by Juan Palma, Nevada State Director, The Nature Conservancy, presented by Laurel Saito, Nevada Water Program Director, The Nature Conservancy, in opposition to Assembly Bill 51.

Exhibit V is a letter dated February 26, 2019, to Chair Swank and Members of the Assembly Committee on Natural Resources, Agriculture, and Mining, authored by Mark Butler, Executive Council Member, Coalition to Protect America's National Parks, et al., in opposition to Assembly Bill 51.

Exhibit W is a compilation of letters in opposition to Assembly Bill 51, consisting of the following:

1. A letter to Members of the Assembly Committee on Natural Resources, Agriculture, and Mining, authored by Christine Saunders, Policy Director, Progressive Leadership Alliance of Nevada.
2. A letter dated February 25, 2018, to Chair Swank, authored by Tick Segerblom, Commissioner, Board of County Commissioners, Clark County.
3. A letter dated February 25, 2018, to Chair Swank, authored by Meghan Wolf, Environmental Activism Manager, Patagonia.
4. A letter dated February 27, 2019, to the Assembly Committee on Natural Resources, Agriculture, and Mining, authored by John Hadder, Director, Great Basin Resource Watch.

EXHIBIT 2

EXHIBIT 2

IN THE OFFICE OF THE STATE ENGINEER
OF THE STATE OF NEVADA

ORDER **#1329**

ESTABLISHING INTERIM PROCEDURES FOR MANAGING GROUNDWATER APPROPRIATIONS TO PREVENT THE INCREASE OF CAPTURE AND CONFLICT WITH RIGHTS DECREED PURSUANT TO THE HUMBOLDT RIVER ADJUDICATION

I.

OVERVIEW

WHEREAS, it is well established that the source of water to a pumping well originates from three primary sources; first from groundwater storage, then increasing over time from capture of streamflow (where present in a hydrographic system) and evapotranspiration.[1,2] The terms "stream capture" or simply "capture," as used in this Order, refer to a reduction in streamflow caused by groundwater pumping. Decades of groundwater pumping in the Humboldt River Region (Region) has led to increasing capture of the Humboldt River and its tributaries, resulting in growing conflict with rights of the Humboldt Decree.

WHEREAS, there are a range of actions or strategies that may be implemented by water users, whether in cooperation with the State Engineer or through other means, to mitigate or avoid conflict. Regional groundwater models currently in development by the United States Geological Survey (USGS) and Desert Research Institute (DRI) are an important tool that will be used to demonstrate the effectiveness of different management strategies and possible administrative actions. Public participation throughout the process of developing a long-term management strategy is an essential component for communication, transparency, and successful implementation. Through the State Engineer's engagement with the community of water users within the Humboldt Region, several viable strategies have come under consideration, and include:

- Prohibition on pumping within a determined capture zone under certain thresholds of predicted seasonal water supply;
- Credit systems that account for non-use or for return flow from artificial recharge;

[1] Charles V. Theis, 1940, *The Source of Water Derived from Wells -Essential factors controlling the response of an aquifer to development*, Civil Engineering, v. 10, no. 5, p. 277-280.
[2] Barlow, P.M., and Leake, S.A., 2012, *Streamflow Depletion by Wells – Understanding and Managing the Effects of Groundwater Pumping on Streamflow*, U.S. Geological Survey Circular (Dec. 1, 2021, 1:06 p.m.) 1376, 84 p., https://doi.org/10.3133/cir1376

- Enhanced storage capacity, including aquifer storage and recovery that benefits the Humboldt River system;
- Use of conservation funds to enact measures that benefit the Humboldt River such as purchase of groundwater rights that are in immediate/frequent conflict with the Humboldt decree;
- Other private party agreements to resolve conflict; and/or
- Withdrawal or abandonment of existing committed rights.[3]

WHEREAS, the primary mechanism available to the State Engineer to unilaterally address conflict among water right holders is to order that withdrawals of groundwater be restricted to conform to priority rights per NRS 534.110(6). However, it is also well established that groundwater use in the Humboldt River Region is fundamental to the Region's culture, communities and economic vitality. Strict curtailment would be a draconian measure resulting in significant and lasting economic harm. It is further recognized that permitted groundwater use is a beneficial use. Additionally, a varying amount of the source of water to pumping wells originates from sources other than stream capture and this use is not in conflict with the Humboldt Decree. For these reasons, among others, strict curtailment is not a preferred option. Rather, implementation of a management framework based on the quantifiable impact of each groundwater well's capture of streamflow will more precisely address harm from any conflict with Humboldt decreed rights.

WHEREAS, the State Engineer recognizes that any comprehensive solution will require extensive outreach to those impacted by any future decisions and management strategies, including water right holders, tribal communities, water users, representatives of conservation and environmental interests, and other interests (collectively referred to as "stakeholders"). The State Engineer seeks to collaborate with stakeholders on the development of long-term management strategies, supported by groundwater models that are currently in development, to address conflict caused by stream capture without arbitrary curtailment or other administrative restrictions on groundwater use. The State Engineer anticipates that any future management framework shall consider active water replacement plans carried out by groundwater right holders, local water resource plans developed in accordance with NRS 278.0228, implementation of Water Conservation Plans pursuant to NRS 540.131, preferred uses of water in the interest of public

[3] *See generally*, comments received from the draft interim order; notes from Working Group meetings, notes from Humboldt River Basin Water Authority meetings, official records of the Nevada Division of Water Resources.

welfare pursuant to NRS 534.120(2), and domestic well protections under NRS 533.024(b). It is also anticipated that any such framework will be supported by the use of the USGS and DRI models to demonstrate effectiveness in preventing conflict resulting from groundwater use within the Humboldt River Region.

WHEREAS, the State Engineer recognizes that under the current conditions there are substantial implications for the water users in the Humboldt River Region. The State Engineer also acknowledges and appreciates that the water users understand the issue and share in the desire to see an effective management strategy that addresses the issues relating to groundwater use that conflicts with senior decreed rights and the need for a defensible outcome. While the science that will be used to inform those long-term management strategies is being finalized, an interim protocol is necessary to avoid exacerbating existing problems. This Order establishes the management framework that the State Engineer is adopting for this period to avoid additional harm to water rights above what is already occurring.

II.
BACKGROUND OF THE HUMBOLDT RIVER REGION

WHEREAS, the Humboldt River Region is delineated by the topographic boundary of the Humboldt River watershed, extending over 11,000 square miles, including 34 hydrographic basins in eight Nevada counties. Hydrographic basins within the Humboldt River Region include Marys River Area (042), Starr Valley Area (043), North Fork Area (044), Lamoille Valley (045), South Fork Area (046), Huntington Valley (047), Dixie Creek-Tenmile Creek Area (048), Elko Segment (049), Susie Creek Area (050), Maggie Creek Area (051), Marys Creek Area (052), Pine Valley (053), Crescent Valley (054), Carico Lake Valley (055), Upper Reese River Valley (056), Antelope Valley (057), Middle Reese River Valley (058), Lower Reese River Valley (059), Whirlwind Valley (060), Boulder Flat (061), Rock Creek Valley (062), Willow Creek Valley (063), Clovers Area (064), Pumpernickel Valley (065), Kelly Creek Area (066), Little Humboldt Valley (067), Hardscrabble Area (068), Paradise Valley (069), Winnemucca Segment (070), Grass Valley (071), Imlay Area (072), Lovelock Valley (073), Lovelock Valley-Oreana Subarea (073A), and White Plains (074).

WHEREAS, the Bartlett Decree[4] dated October 20, 1931, in the Sixth Judicial Court of the State of Nevada, establishes relative rights to the use of the waters of the Humboldt River and setting forth the dates of priority and duties of water for the decreed claims. The Bartlett Decree determined the waters of the stream system to be fully appropriated, and that in an average year there existed no surplus water for irrigation. Subsequent decrees, orders and writs made corrections to the Bartlett Decree, collectively forming the Humboldt River Adjudication, hereafter referred to as the "Humboldt Decree." This process was complete by 1938. The most senior decreed surface water right in the Humboldt River system has a priority date of 1861 and the most junior right has a priority date of 1921.[5] The Humboldt Decree does not include the Little Humboldt River adjudication or Reese River vested claims.

WHEREAS, Humboldt River flow measured at the Palisade gage is the primary tool utilized for determining and scheduling delivery amounts of Humboldt River decreed rights.[6] Deliveries are scheduled during the irrigation season based on the daily flow measurement at the gage.[7] When daily flows at the Palisade gage are sufficient to deliver all decreed rights on the Humboldt River and its tributaries, all water rights irrespective of location above or below the gage are scheduled to receive their full duty of water. When flows are not sufficient to deliver all decreed rights, those rights with senior priority dates are served first. In practice, actual deliveries over the expanse of the Humboldt River Region may be different than exact scheduled deliveries due to a wide range of variables including water distribution and management practices and climatic variations that affect riparian evapotranspiration rates, streambank storage, and baseflow.

WHEREAS, during the 2012–2015 period the Humboldt River Region experienced one of the worst droughts since 1902.[8] Annual flow at the Palisade gage for that 4-year period averaged 82,872 acre-feet, which is 30% of the historical average annual flow of 287,846 acre-feet for the

[4] Bartlett Decree, incorporated as Section 1 into the Decree entered *In the Matter of the Determination of the Relative Rights of Claimants and Appropriators of the Waters of the Humboldt River Stream System and its Tributaries*, Case No. 2804, Sixth Judicial District Court of the State of Nevada, In and For the County of Humboldt (October 20, 1931).
[5] *In the Matter of the Determination of the Relative Rights of Claimants and Appropriators of the Waters of the Humboldt River Stream System and Tributaries*, Case No. 2804, Sixth Judicial District Court of the State of Nevada, In and For the County of Humboldt (October 20, 1931).
[6] Bartlett Decree, the decreed irrigation season begins March 15th downstream of Palisade and April 15th upstream of Palisade and ends on varying dates depending on location and culture.
[7] United States Geological Survey (USGS) Gage 10322500, Humboldt River at Palisade.
[8] Period of record for the Palisade gage begins in 1902.

period of record spanning 112 years.[9] At the headwaters of the Humboldt River system during 2012–2015, upstream of any significant groundwater pumping, Lamoille Creek also experienced its lowest 4-year flow since at least 1944 when continuous flow measurements on Lamoille Creek started.[10] By the end of the irrigation seasons in 2014 and 2015 the Humboldt River at Imlay was dry and water was unavailable to allocate to downstream surface water users in the Lovelock area. In the midst of the unprecedented drought, senior decreed water right holders alleged that junior groundwater appropriators were capturing surface flows of the Humboldt River and that groundwater use conflicted with the delivery of their surface water rights. In a writ petition filed in the 11th Judicial District Court for Pershing County in 2015, senior water right holders requested that the Court require the State Engineer to take action within his statutory authority to address the alleged conflict.[11]

WHEREAS, nearly all groundwater uses within the Humboldt River Region are junior to decreed surface water rights in the Humboldt River and its tributaries. There are only four active groundwater permits having a priority date earlier than 1921, the date of the most junior Humboldt Decree right.[12] Groundwater development began to increase more substantially in the 1960s and has gradually increased in the decades since. Groundwater is now extensively relied upon for all manners of use, supporting communities and industry throughout the Region. Groundwater rights were approved in accordance with existing Nevada law over the years by the State Engineer based upon findings that unappropriated water was available and its use would not conflict with existing rights or the public interest.

WHEREAS, it is scientifically understood that groundwater pumping has the potential to capture streamflow when surface water and groundwater are hydraulically connected, either by inducing greater infiltration losses from the stream channel or by reducing the amount of

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[9] For water years between 1902–1906 and 1912–2019.

[10] USGS Gage 10316500, Lamoille Creek Near Lamoille. Note that flow measurements also exist for a period between 1915 and 1923.

[11] *Petition for Writ of Mandamus, or in the Alternative, Writ of Prohibition*, In the Eleventh Judicial District Court of the State of Nevada In and For the County of Pershing, (Case No. CV 15-12019), *Pershing County Conservation District v. Jason King, P.E., State Engineer of the State of Nevada, Division of Water Resources, Department of Conservation and Natural Resources.*

[12] *See* Permit 1843, Certificate 139; Permit 2397, Certificate 399; Permit 3520, Certificate 995; and Permit 4589, Certificate 749, Nevada Division of Water Resources' Water Rights Database, official records of the Nevada Division of Water Resources, http://water.nv.gov/hydrographicabstract.aspx

groundwater that would otherwise discharge as baseflow to the stream.[13] The potential for hydraulic connectivity and capture by itself does not necessarily demonstrate that conflict is occurring or will occur in the future, or that surface water deliveries cannot be met. However, because stream capture due to pumping necessarily reduces streamflow, any amount of capture in a fully appropriated river system when not in full priority will reduce surface water that would otherwise have been delivered to surface water right holders. In addition, with climate models forecasting a continuing pattern of increasing frequency and intensity of droughts and flood events,[14] drought-accentuated natural losses from the river, combined with the likelihood for greater drawdown due to increased reliance on groundwater during drought, may increase the future potential for insufficient surface flow to fully serve decreed rights. The hydrologic connection between surface water and groundwater was not a consideration in the Humboldt Decree, but these long-term dynamics underscore the difficulty in developing and implementing conjunctive management strategies for future administration of groundwater and surface water in the Humboldt River Region.

III.
ACTIONS TAKEN SINCE THE 2012–2015 DROUGHT

WHEREAS, a basic tenet of prior appropriation is that if there is not enough water to serve all users then senior water right holders are entitled to water before junior right holders.[15] During the drought period of 2012–2015 available data were insufficient to identify to what extent groundwater pumping was causing the inadequacy of water supply for Humboldt River senior decreed right holders and to what extent it was the result of natural low flow because of drought.

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[13] *Charles v. Theis*, 1940, *The Source of Water Derived from Wells—Essential factors controlling the response of an aquifer to development*, Civil Engineering, v. 10, no. 5, p. 277-280.
[14] USGCRP, 2017, Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp., *See* Chapter 8, page 237.
[15] *See* NRS 534.110, providing for curtailment by priority. *See also Wilson v. Pahrump Fair Water, LLC*, 481 P. 3d 853, 860 (2021) ("That some water rights must necessarily acquiesce to senior water rights is a natural consequence of the prior appropriation doctrine" quoting *Fox v. Skagit Cty.*, 372 P.3d 784, 796 (Wash. App. 2016)); *U.S. v. Orr Water Ditch Co.*, 600 F.3d 1152, 1158-59 (9th Cir. 2010) ("Surface water contributes to groundwater, and groundwater contributes to surface water…[Surface rights granted by decree] cannot be defeated by allocation of water to others–whether by allocation of surface water or groundwater.").

Analysis of the data at the time indicated that curtailing junior groundwater pumping to protect senior decreed rights would result in a negligible addition to flow in the River and that such action would not likely be legally defensible without additional data and scientific analysis. However, such action would have had devastating and severe impacts to the communities and economies throughout the Region that rely on groundwater.[16] Consequently, no curtailment was imposed.

WHEREAS, in the years since the end of the 2012–2015 drought, the State Engineer initiated several measures to improve the available data in the Region and thus provide an informed and sound basis to render decisions with regard to avoiding potential conflict. Among these measures:

1. All non-designated basins within the Region were designated pursuant to NRS 534.030;
2. Totalizing meter installation and reporting were required by State Engineer's Order 1251;
3. Field investigations were completed to verify installation and meter data;
4. The Nevada Division of Water Resources enhanced its database capacity to maintain and manage the pumping data in a publicly accessible manner;
5. The State Engineer established a policy requiring water rights for pit lake evaporation; and,
6. Applications to appropriate groundwater or to change the point of diversion (POD) of existing groundwater rights were denied if granting the application would conflict with existing senior rights due to stream capture.

WHEREAS, in 2016, the State Engineer assembled the Humboldt River Working Group[17] to assist in developing draft regulations to resolve future conflict between surface and groundwater rights. The Working Group members included both surface water and groundwater users representing municipalities, agriculture, mining, and other community interests across the Humboldt River Region. Over the course of the next three years, the Working Group developed a conjunctive management approach whose objective was to protect senior water interests while at the same time maximizing beneficial use of surface water and groundwater. This effort culminated in a set of draft regulations that relied on a combination of mitigation plans and financial compensation to avoid future conflict. However, in the 2019 Legislative session, the statutory

[16] Nevada Division of Water Resources, public presentations on the Humboldt River in Lovelock, Winnemucca, and Elko, February 12–13, 2015. Analysis available in the files of the Nevada Division of Water Resources.
[17] The Humboldt River Working Group consists of representatives from key stakeholder and water user groups from within the Humboldt River Region with the common purpose to propose, negotiate, and provide feedback on conjunctive use management regulations.

revisions required to give the State Engineer the authority to implement the draft regulations were unsuccessful.[18] Surface water users expressed no interest in financial mitigation in lieu of water. Groundwater users likewise expressed no interest in being assessed fees for capture that had yet to be quantified by best available science.[19]

WHEREAS, since 2016, the State Engineer has worked with the USGS and DRI to develop improved groundwater budgets at the basin scale and to develop numerical groundwater capture models for the Humboldt River Region. These peer-reviewed products are intended to serve as a basis for determining the effect of groundwater pumping on flows in the Humboldt River and its tributaries.[20] When published, and made publicly available, this model study will provide a consistent basis and a scientifically sound measure to evaluate different management strategies. These products will allow for the development of capture maps, which identify the relative potential for the capture of surface water flow at any given well location and the potential for the capture of surface water flow over different durations of time. This study will also serve as a foundation for review of the perennial yield[21] values for the Region, first estimated from the early USGS Reconnaissance Series Reports and Water Resource Bulletins, which are the primary guidelines used by the State Engineer to determine the water budget for any particular basin.[22]

WHEREAS, while the completion of the Humboldt River Region groundwater model study is expected in 2022, preliminary findings from that effort provide insight into the dynamics of stream capture by groundwater pumping. These findings indicate that there may be important non-linear, climate-driven behaviors that influence interactions between the surface water and

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[18] AB 51 (2019).

[19] *See Minutes of the Meeting of the Assembly Committee on Natural Resources, Agriculture and Mining*, February 27, 2019, (Dec. 2, 2021, 1:08 p.m.) https://www.leg.state.nv.us/Session/80th2019/Minutes/Assembly/NRAM/Final/309.pdf

[20] *See Nevada Water Science Center: Evaluation of Streamflow Depletion Related to Groundwater Withdrawal, Humboldt River Basin*, (December 2, 2021, 1:10 p.m.) https://nevada.usgs.gov/humboldtdepletion/index.html

[21] Perennial yield is defined as the maximum amount of groundwater that can be withdrawn each year over the long term without depleting the groundwater reservoir. Perennial yield is ultimately limited to the maximum amount of natural discharge that can be utilized for beneficial use. The perennial yield cannot be more than the natural recharge to a groundwater basin and in some cases is less. *See* Office of the State Engineer, *Water for Nevada, State of Nevada Water Planning Report No. 3*, p. 13, Oct. 1971.

[22] *See, e.g.* Hydrographic Area Summary for Marys River Area, (042), (December 2, 2021, 1:10 p.m.) https://nevada.usgs.gov/humboldtdepletion/HumboldtDepletionProposal_Public.pdf official records in the Nevada Division of Water Resources.

groundwater systems. These behaviors suggest that pumping-related capture of surface water tends to increase during wet years when excess water is available and decrease during dry years when the potential for conflict is greater.[23] Understanding these phenomena is necessary to accurately define both the timing and distribution of capture so that conflict attributable to groundwater pumping can be characterized and quantified. Long-term management strategy will rely on completion of the modeling effort and a process of public review and deliberation to determine best practices that satisfy legislative directives of prior appropriation, beneficial use and the public interest. Until then, the interim management practices described herein focus on statutorily available mechanisms for avoiding conflict due to increased capture caused by new appropriations or changes to existing groundwater permits.

WHEREAS, as of the date of this Order (Fall 2021) the Region is two years into a Severe to Extreme Drought.[24] Humboldt River flows for the summer of 2021 were running at or below 10th percentile flow levels,[25] very little decreed water was served during the 2021 irrigation season, and current Rye Patch Reservoir storage is approximately 7,000 acre-feet, which is 4% of the reservoir's capacity. This current condition highlights the difficult issues that face the water users in the Region, which are especially apparent during droughts like these.

IV.

AUTHORITY AND NECESSITY

WHEREAS, NRS 533.024(1)(c) directs the State Engineer "to consider the best available science in rendering decisions concerning the availability of surface and underground sources of water in Nevada."

WHEREAS, NRS 533.024(1) was amended in 2017 adding a new subsection declaring that it is the policy of Nevada "[t]o manage conjunctively the appropriation, use and administration of all waters of this State, regardless of the source of the water."[26]

WHEREAS, NRS 532.120 authorizes the State Engineer to make such reasonable rules as

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[23] Steven Jepsen, Kip Allander, and Kyle Davis, "Behavior and prediction of stream capture under varying streamflow conditions," presentation at Nevada Water Resources Association Annual Conference, Jan. 26, 2021, (Dec. 2, 2021 1:11 a.m.) https://www.youtube.com/watch?v=2vLa1hcsE_E
[24] U.S. Drought Monitor, Nevada Map, October 5, 2021, (Dec. 2, 2021, 1:12 p.m.) https://droughtmonitor.unl.edu/data/pdf/20211005/20211005_nv_trd.pdf
[25] USGS gaging stations (10318500, 10321000, 10325000, 10327500, 10333000).
[26] NRS 533.024(1)(e).

may be necessary for the proper and orderly execution of the powers conferred by law.

WHEREAS, NRS 534.020 provides that all underground waters of the State belong to the public and are subject to all existing rights.

WHEREAS, NRS 533.370(2) requires that, in review of an application to appropriate water or to change water already appropriated, the State Engineer must consider whether there is unappropriated water in the source of supply, whether the uncommitted groundwater has been reserved pursuant to NRS 533.0241, whether the proposed use or change conflicts with existing rights or protectable interests in existing domestic wells, and whether it threatens to prove detrimental to the public interest.

WHEREAS, the State Engineer's procedures to evaluate applications to appropriate water or to change existing appropriations must be applied in a manner that is consistent and understandable to water right holders and their representatives.

WHEREAS, the State Engineer is responsible for establishing procedures to evaluate applications that provide clarity to water users about how to meet the needs of communities and local economies while avoiding conflict with senior decreed water rights.

WHEREAS, procedures established by this Order are intended to allow for efficient administration of groundwater rights, with provisions for in-stream replacement water and withdrawal or duty limitation of groundwater permits, when necessary. The intent is to provide needed flexibility for water right holders without increasing conflict by adding to any capture impacts above what is already occurring. In the short term, these procedures will make progress toward avoiding conflicts and preserving the availability of surface water in the Humboldt River Region to serve senior priority rights.

WHEREAS, during this interim period before the USGS and DRI models are published and while long-term strategies are being developed with involvement from the stakeholder community, the State Engineer may adopt further conjunctive management measures necessary to address capture impacts.

ORDER

NOW THEREFORE, IT IS HEREBY ORDERED, that in addition to those considerations required by NRS 533.370 and established by previous State Engineer's Orders discussed herein, the following procedures are being implemented by the State Engineer for the review of applications for groundwater rights in the Humboldt River Region:

1. Applications for groundwater rights will be reviewed for increases to stream capture,

and cannot increase conflict along the Humboldt River or its tributaries. Capture shall be determined by the State Engineer using established analytical or numerical methods along with any available knowledge of aquifer properties associated with the points of diversion. These rules apply to:

A. New appropriations of groundwater where annual capture is predicted to exceed 10% of duty for any year during 50 years of continual pumping.[27] Continual pumping is defined as the annualized duty amount requested under the application. Where there is a non-consumptive return flow component of the application, the annualized duty amount only applies to the consumptive portion.

B. Applications to change the point of diversion of existing rights that are predicted to result in an increase of net capture on the system or a tributary, defined as the difference between capture at the proposed POD and capture at the existing POD, and where annual capture at the proposed POD is predicted to exceed 10% of the permitted duty in any year during 50 years of continual pumping.

C. Temporary applications filed under NRS 533.345 to change the point of diversion of an existing groundwater right and applications for new groundwater appropriations filed under the provisions of NRS 533.371.

2. Capture shall be offset by not diverting an existing decreed right (in-stream replacement water), or by the withdrawal of an existing groundwater permit (meaning that the groundwater permit is no longer active, in part or in its entirety) so the resulting availability of streamflow is not less than it was prior to the appropriation or the change in the point of diversion.

A. In-stream replacement water or withdrawn groundwater rights shall be sufficient to equal or exceed the predicted annual capture amount if there is a reasonable probability that the replacement water will be available, in both time and quantity, as determined by the State Engineer. The State Engineer finds that "reasonable probability" would be an 80% probability threshold, which is established to ensure a replacement surface water right or a groundwater withdrawal right is of sufficient quantity and priority to reliably offset annual capture in 40 out of 50-years after an application is approved. In the case of replacement water, probabilities can be determined based on historical

[27] This threshold is considered to represent the range of certainty of the methods currently being used to calculate capture.

Humboldt River flow and diversion records. In the case of withdrawal of a groundwater right, probabilities can be determined based on analytical or numerical model predictions of recovered capture amounts.

B. If in-stream replacement water is used to offset capture, then the following applies:

   i. If a decreed water right is the source of replacement water, it shall be for a crop-type, duty amount, and priority date that is sufficient to equal or exceed the predicted total capture amount of the new appropriation over a 50-year period of use, as determined by the State Engineer.

   ii. Replacement water shall have an existing place of use that can and will be stripped of use. Water use on areas of natural flooding and other areas where water cannot be physically removed from the land will not be considered for replacement water.

C. If withdrawal of an existing groundwater right is used to offset capture, whether withdrawn in its entirety or an adequate portion of the existing right, the predicted total capture amount of the withdrawn right shall be sufficient to equal or exceed the predicted total capture amount of the new appropriation over a 50-year period of use, as determined by the State Engineer.

D. Where a change application moves an existing POD capture source from the Humboldt River or a tributary to either an upstream reach or to a different tributary, offset will be required for capture impacts on the new reach or tributary as well as for net capture on the Humboldt River. If capture impacts occur on a new reach or tributary, the applicant will have to offset the entire amount of capture on the new reach or tributary.

E. If either temporary in-stream replacement water or temporary withdrawal of a groundwater permit is used to offset capture, the predicted capture offset amount of the replacement water or withdrawn right must equal or exceed the predicted 50-year total capture amount of the temporary application within 10 years of the application's approval, as determined by the State Engineer.

3. These procedures do not apply:

A. to any application where pumping at the proposed POD results in capture less than 10% of the permitted duty every year during 50 years of continual pumping.

B. to change applications where capture at the proposed POD is less than or equal to capture at the existing POD.

C. to any application for groundwater where annual capture associated with pumping at the proposed place of use does not exceed 5 acre-feet during a 50-year period of use.[28]

D. to temporary applications to change PODs within an area designated by State Engineer order allowing for multiple PODs from a single representative POD for mining, milling, and dewatering operations.

4. Uncommon or unforeseeable circumstances will be treated on a case-by-case basis, as determined by the State Engineer, with the same overall objective of preventing additional stream capture.

5. This order is in effect until it is replaced by a subsequent order establishing long term management practices addressing conflict caused by capture to the satisfaction of the State Engineer, or it is superseded by another order or decision.

Adam Sullivan P.E.
ADAM SULLIVAN, P.E.
State Engineer

Dated at Carson City, Nevada this
7th day of December, 2021.

[28] This exemption is equivalent to a capture rate of less than 0.01 cfs and would effectively exempt all domestic use, much stockwater use, and other pumping resulting in nominal capture.

EXHIBIT 12

EXHIBIT 12

Administrative Hearing in the Matter of the Administrative and Management of the Lower White River Flow System

October 3, 2019

Nevada Cogeneration Associates No. 1 and

Nevada Cogeneration Associates No. 2

Matters of Interest to the State Engineer

a. The geographic boundary of the hydrologically connected groundwater and surface water systems comprising the Lower White River Flow System;

b. The information obtained from the Order 1169 aquifer test and subsequent to the aquifer test and Muddy River headwater spring flow as it relates to aquifer recovery since the completion of the aquifer test;

c. The long-term annual quantity of groundwater that may be pumped from the Lower White River Flow System, including the relationships between the location of pumping on discharge to the Muddy River Springs, and the capture of Muddy River flow;

d. The effects of movement of water rights between alluvial wells and carbonate wells on deliveries of senior decreed rights to the Muddy River; and,

e. Any other matter believed to be relevant to the State Engineer's analysis.

Previous Hearings LWRFS

- July 2001 – Las Vegas Valley Water District
  - Applications 54055-54059 inclusive
  - Requesting ≈ 27,500 afa
- August 2001 – Coyote Springs Investments, LLC
  - Applications 63272-63276 inclusive and applications 63867-63876 inclusive
  - Requesting ≈ 107,500 afa junior to LVVWD
    - Requested the entire amount, but at a minimum four applications
      - Two permits 14,478 afa for development
      - Two permits 14,478 afa for stress with use being for temporary development
- After nearly four weeks of hearings, report analysis and internal discussion it became evident that there was insufficient data to proceed with the issuance of any of the applications resulting in Order 1169

Previous Hearings LWRFS

- Order 1169 issued on March 8, 2002
  - Required two year pump test of 50% of the Coyote Spring Valley hydrographic basin total duty
  - Identified basins referred to as the Lower White River Flow System (LWRFS)
- Order 1169 pump test finally began more than 8 years later on November 15, 2010 and was declared completed by the NSE on December 31, 2012
- Responses to pumping stresses imposed during the Order 1169 pump test were very apparent and significant

NCA - Recommendation No. 2

Black Mountain Area Boundary (NSE Question A – Geographic Boundary)

NCA disagrees with the Park Service recommendation that the entire Black Mountain Area (BMA) Hydrographic Basin be included within the LWRFS

- Where is the appropriate southeastern LWRFS boundary location?
  - Pumping from the BMA may not contribute to responses in the LWRFS

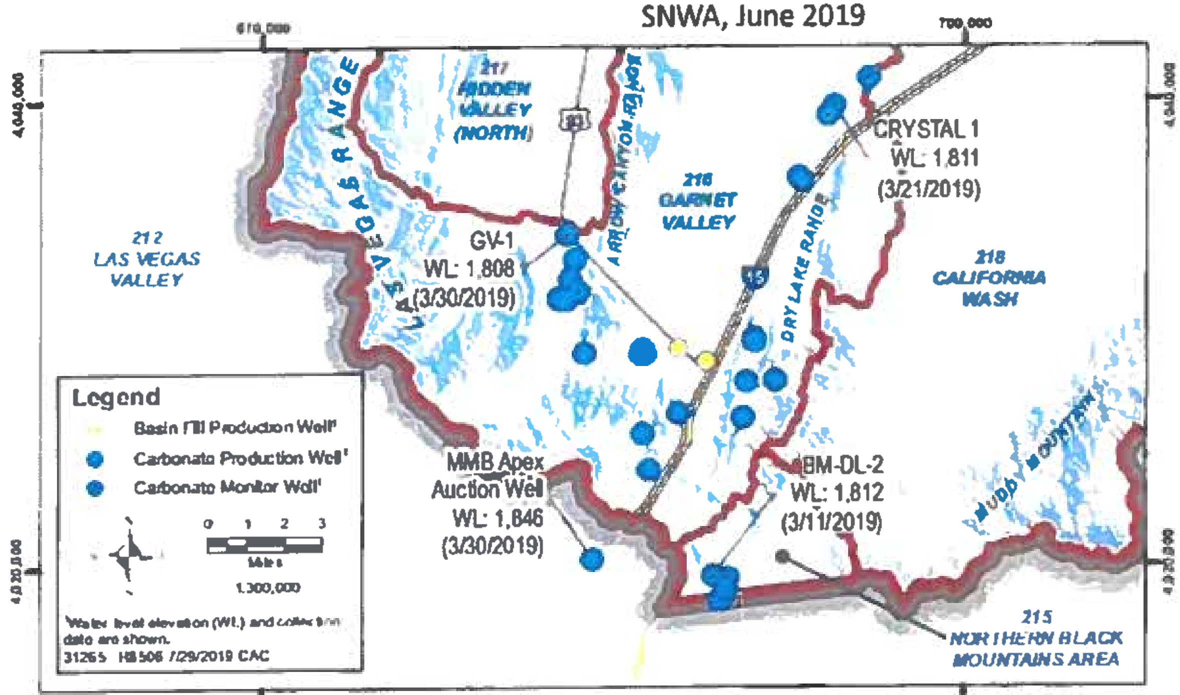
- Geology within the BMA does not support inclusion of the entire basin

NCA - Recommendation No. 2

Black Mountain Area Boundary - Continued

- Is NCA pumping in BMA affecting MRSA in the LWRFS?
- If not and NCA pumping is managed outside of LWRFS, then max. pumping within the LWRFS maybe less than we thought

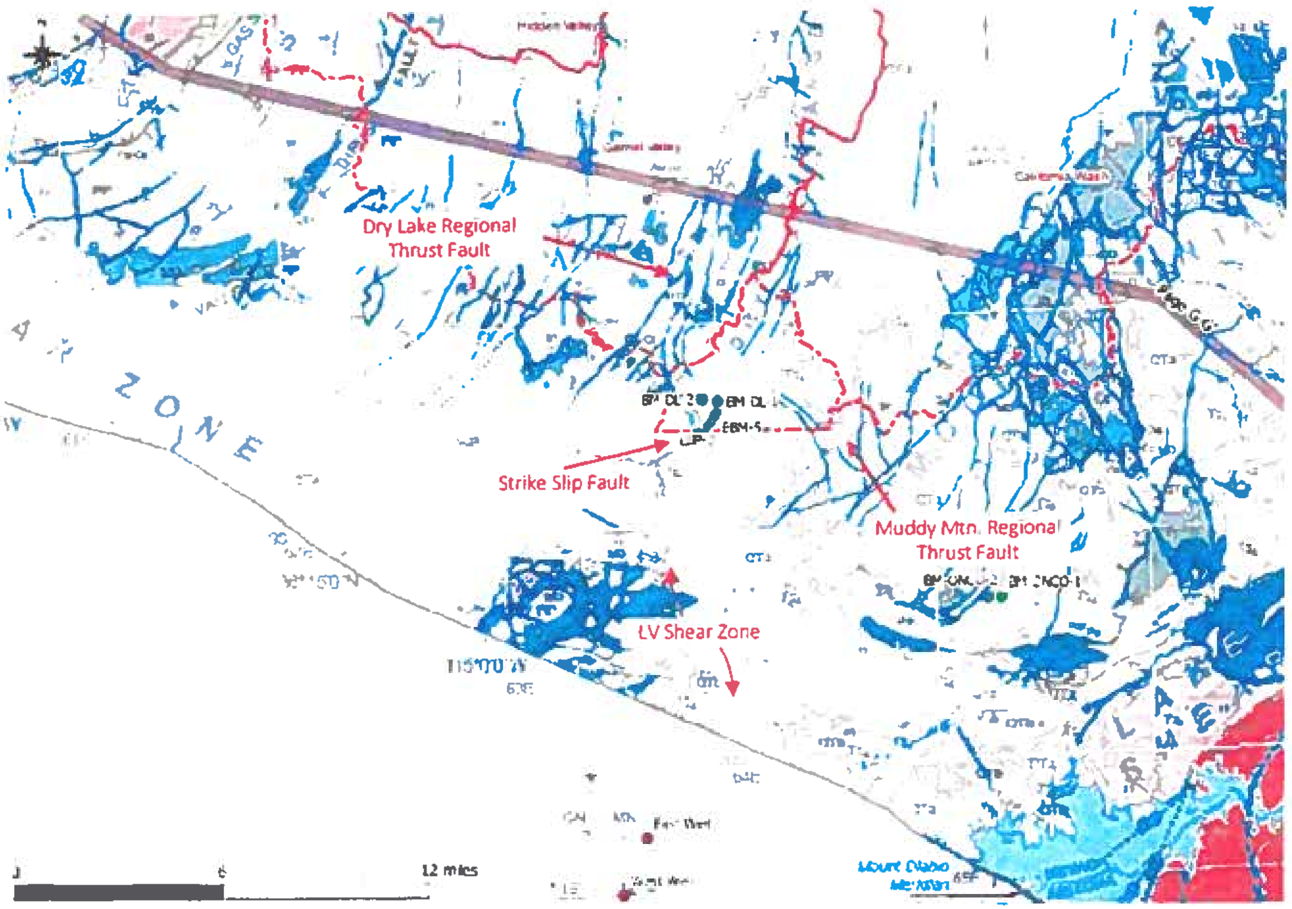
SNWA, June 2019



SNWA, June 2019

NCA - Recommendation No. 2

Black Mountain Area Boundary - Continued

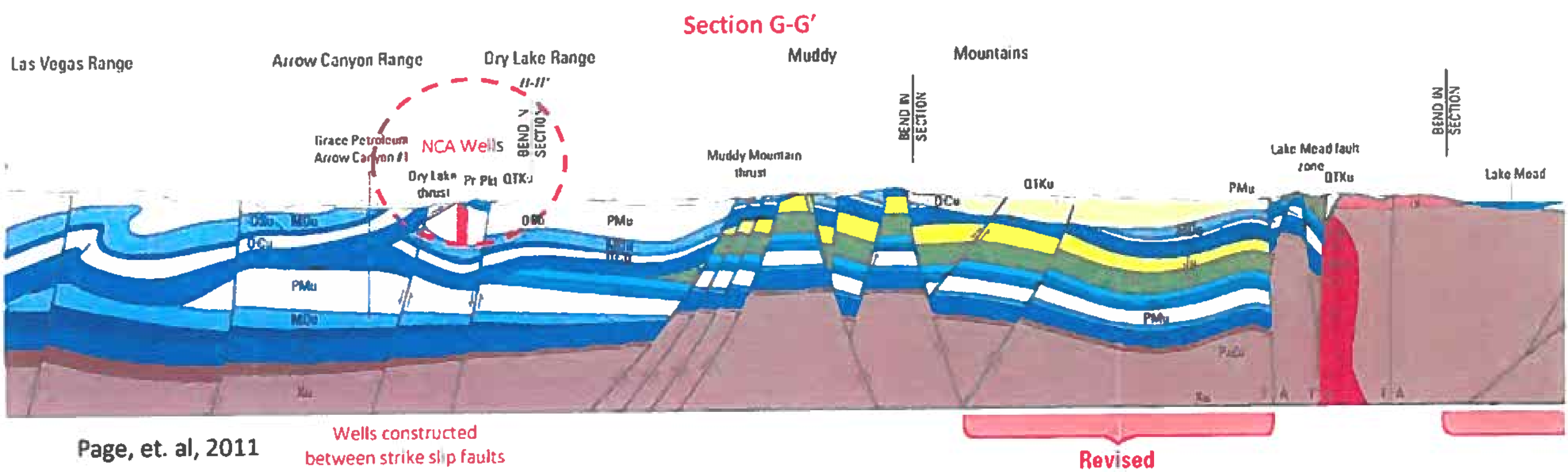


- NCA wells are situated between two major thrust faults

Rowley, 2017

NCA - Recommendation No. 2

Black Mountain Area Boundary - Continued



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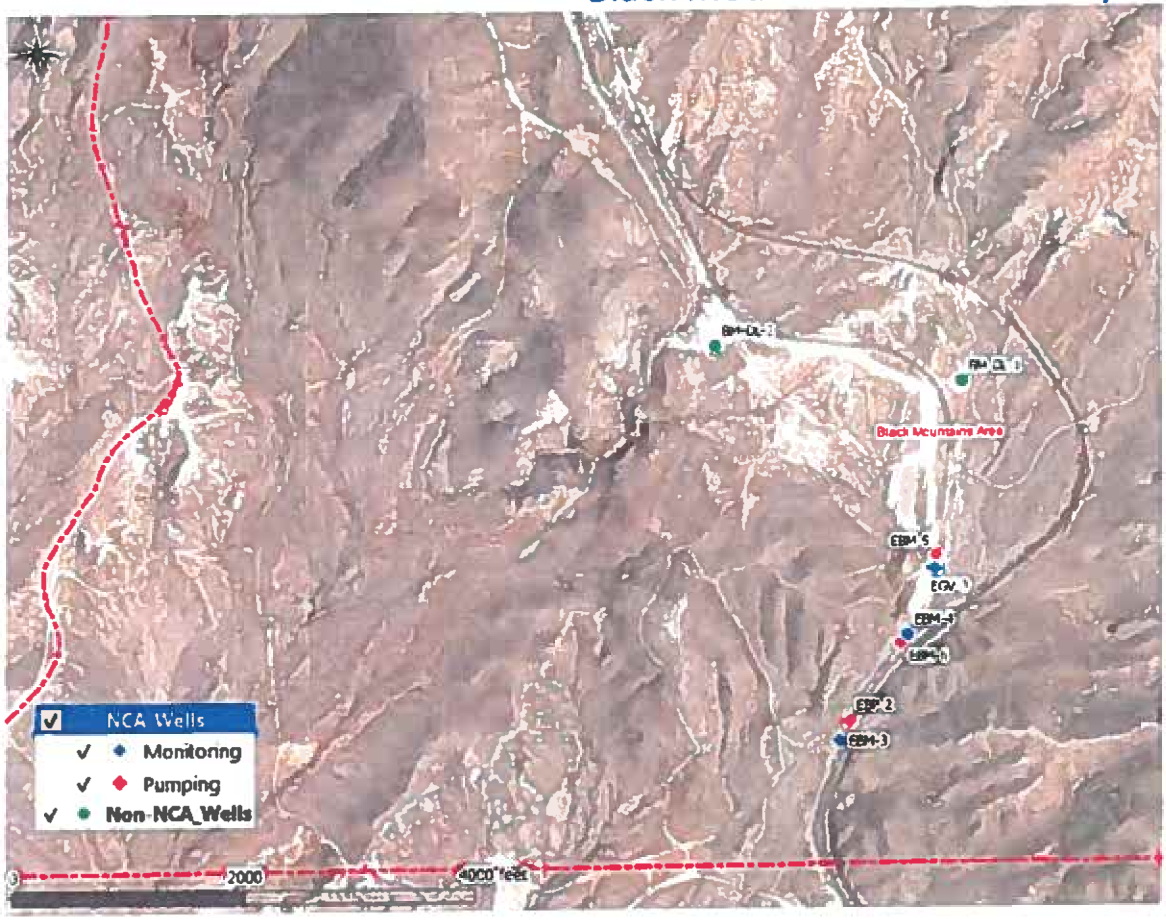
NCA - Recommendation No. 2

Black Mountain Area Boundary - Continued



<u>Recent NCA Well Drilling</u>

- In 2015, replaced two production wells
- Performed limited investigation to support well design
- Summary of findings

NCA - Recommendation No. 2

Black Mountain Area Boundary - Continued

2015 NCA Well Replacements

- Mifflin's 1992 completion report included the following:
  - Upper 600' of borehole is hang wall of northerly trending high angle fault
  - Series of high angle fractures penetrated below 600' with abundant fractured limestone
  - "Bottom hole samples indicate travertine and collapsing blocks indicate a **large open solution structure**"

NCA - Recommendation No. 2

Black Mountain Area Boundary - Continued

EGV-3 borehole behind failed casing (2015)

EBM-5 borehole for (EGV-3) replacement well

NCA - Recommendation No. 2

Black Mountain Area Boundary - Continued

The SNWA Order 1303 Rebuttal Report stated the following with regards to NCA pumpage from the current production wells pumpage within the Black Mountain Basin

- *"BM-DL-2 is undoubtedly within the carbonate aquifer of the LWRFS, the current production wells are probably not."* (Pg 17, SNWA Aug 2019)
- Our opinions as to how SNWA arrived at this conclusion?

NCA - Recommendation No. 2

Black Mountain Area Boundary - Continued

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.913
R Square (R^2)	0.834
Adjusted R Square	0.792
Standard Error	0.663
Observations	26

P-Value Definition:

- A predictor (EH-4 water levels) that has a low p-value (<.05) means that changes in the predictor value (EH-4 levels) are related to changes in the response variable (pumping).
- P-Values > 0.05 are not statistically significant

ANOVA

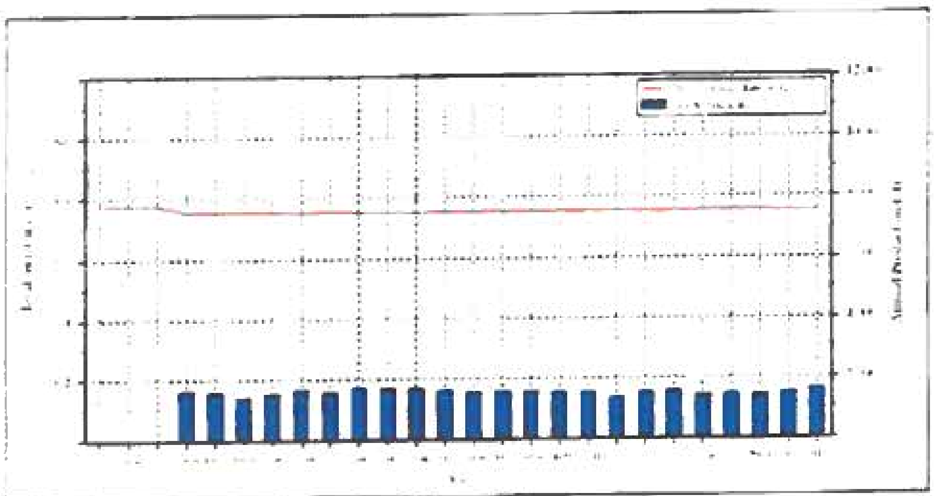
	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	44.1346	8.8269	20.0636	0.0000
Residual	20	8.7989	0.4399		
Total	25	52.9335			

SNWA (2019), Rebuttal Report

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1,817.74	0.45	4,078.01	0.00	1,816.81	1,818.67	1,816.81	1,818.67
Black Mountains Area	0.0001	0.0003	-0.4046	0.6901	-0.0008	0.0006	-0.0008	0.0006
California Wash	0.0042	0.0015	2.8279	0.0104	0.0074	0.0011	0.0074	0.0011
Coyote Spring Valley	0.0002	0.0001	2.1496	0.0440	0.0004	0.0000	0.0004	0.0000
Garnet Valley	0.0011	0.0004	2.9602	0.0077	0.0018	0.0003	0.0018	0.0003
MRSA	0.0004	0.0003	1.6901	0.1065	0.0010	0.0001	0.0010	0.0001

NCA - Recommendation No. 2

Black Mountain Area Boundary - Continued



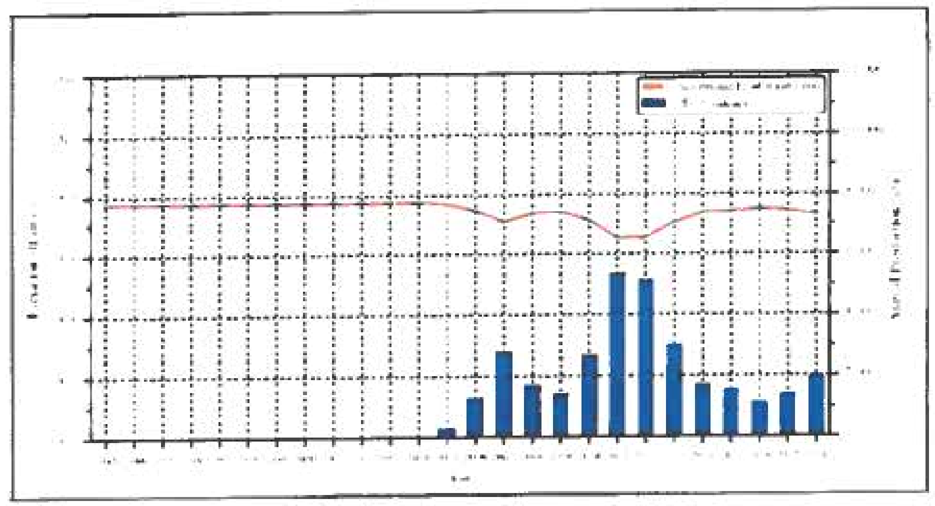
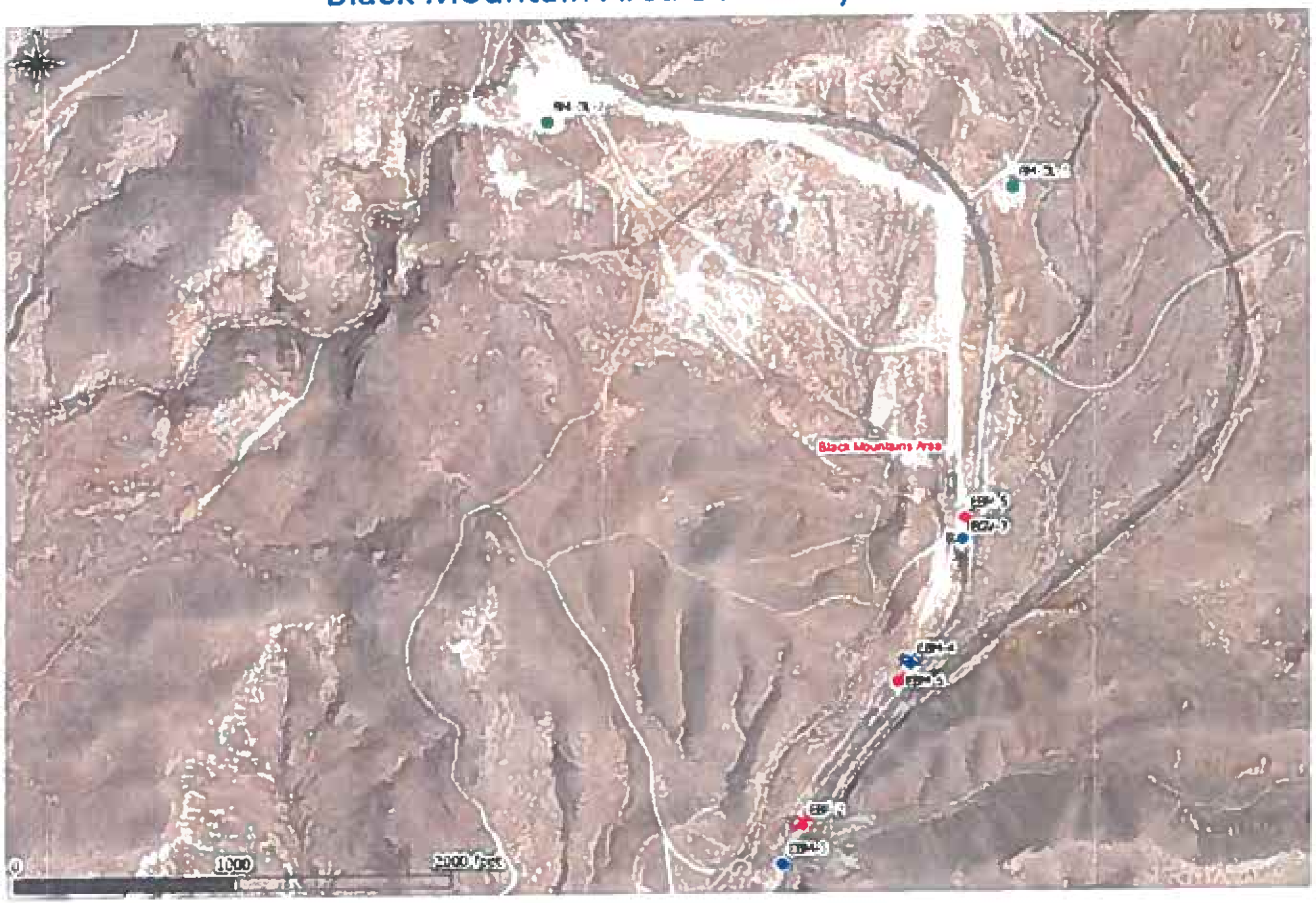


Figure A-3
MLR Results - Black Mountain Annual Carbonate Production and Calculated Water Levels at Well EH-4

SNWA (2019), Rebuttal Report

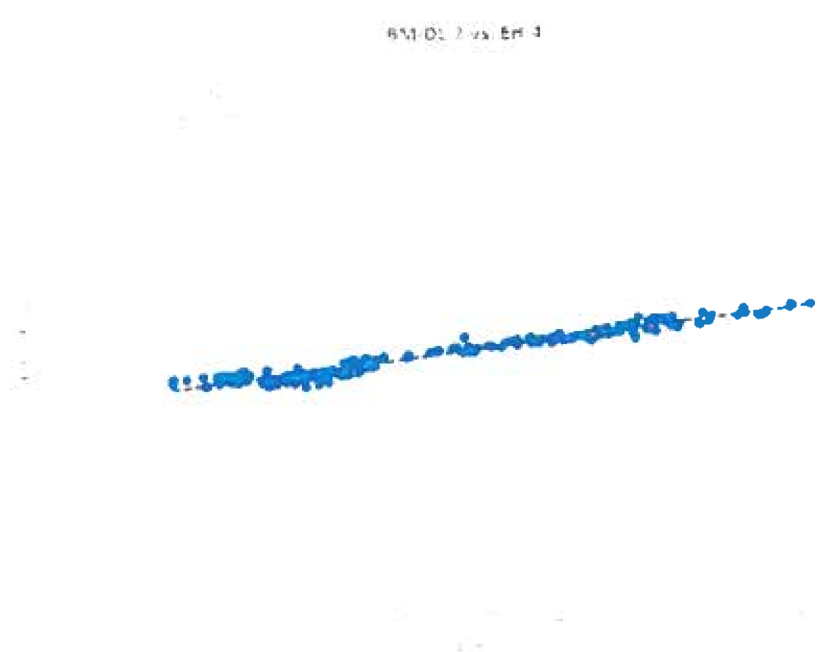
NCA - Recommendation No. 2

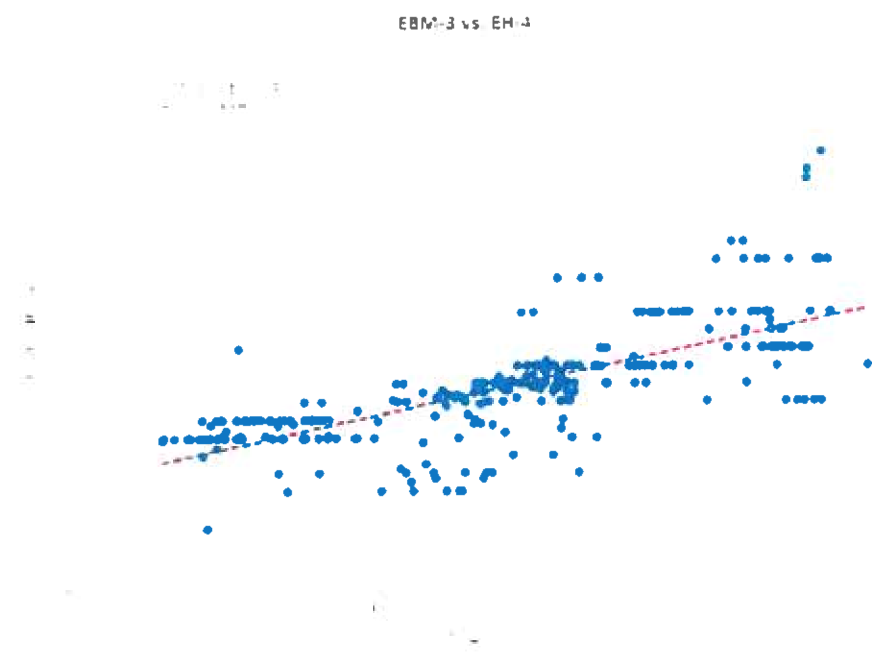
Black Mountain Area Boundary - Continued



NCA - Recommendation No. 2

Black Mountain Area Boundary – Continued

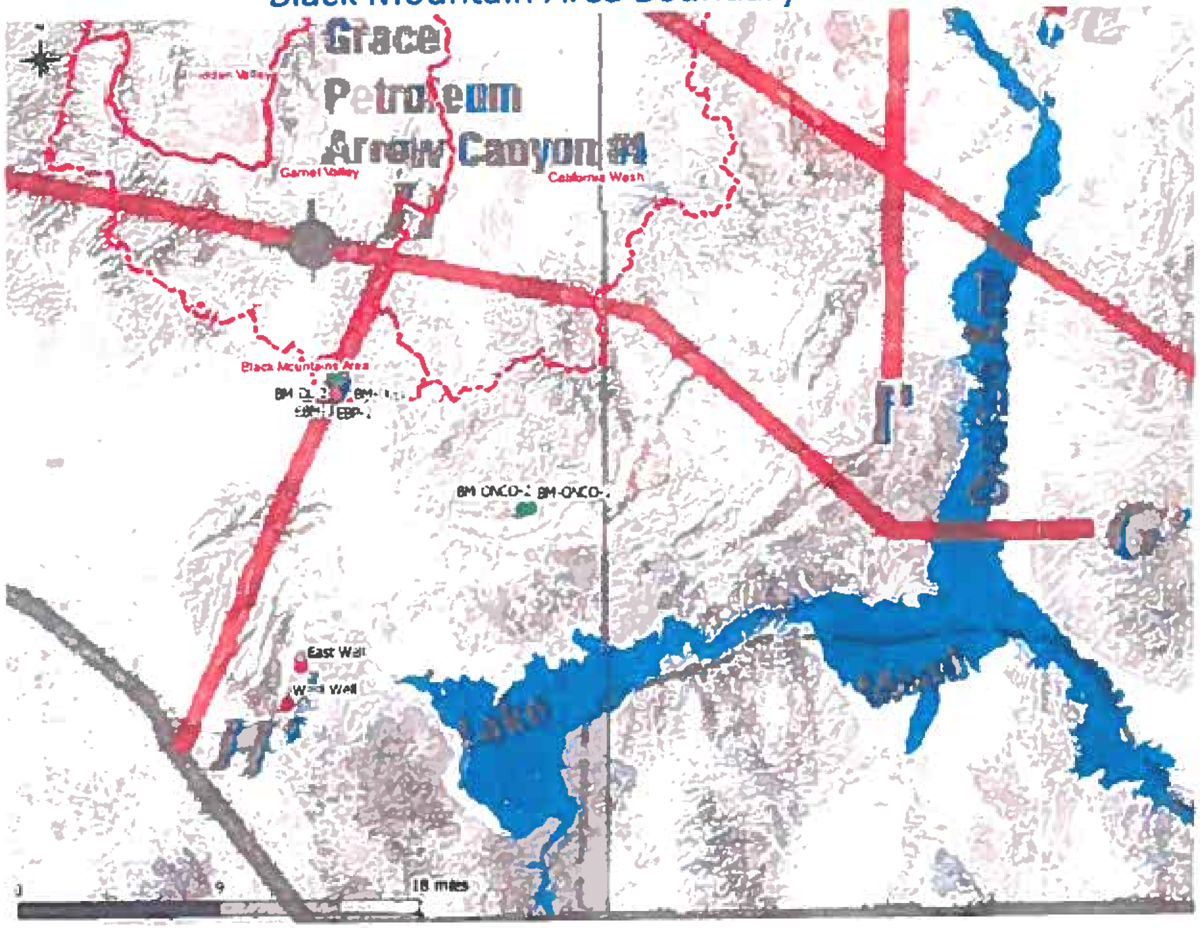




EBM-3 is 3,584 ft southeast of BM-DL-2

NCA - Recommendation No. 2

Black Mountain Area Boundary - Continued



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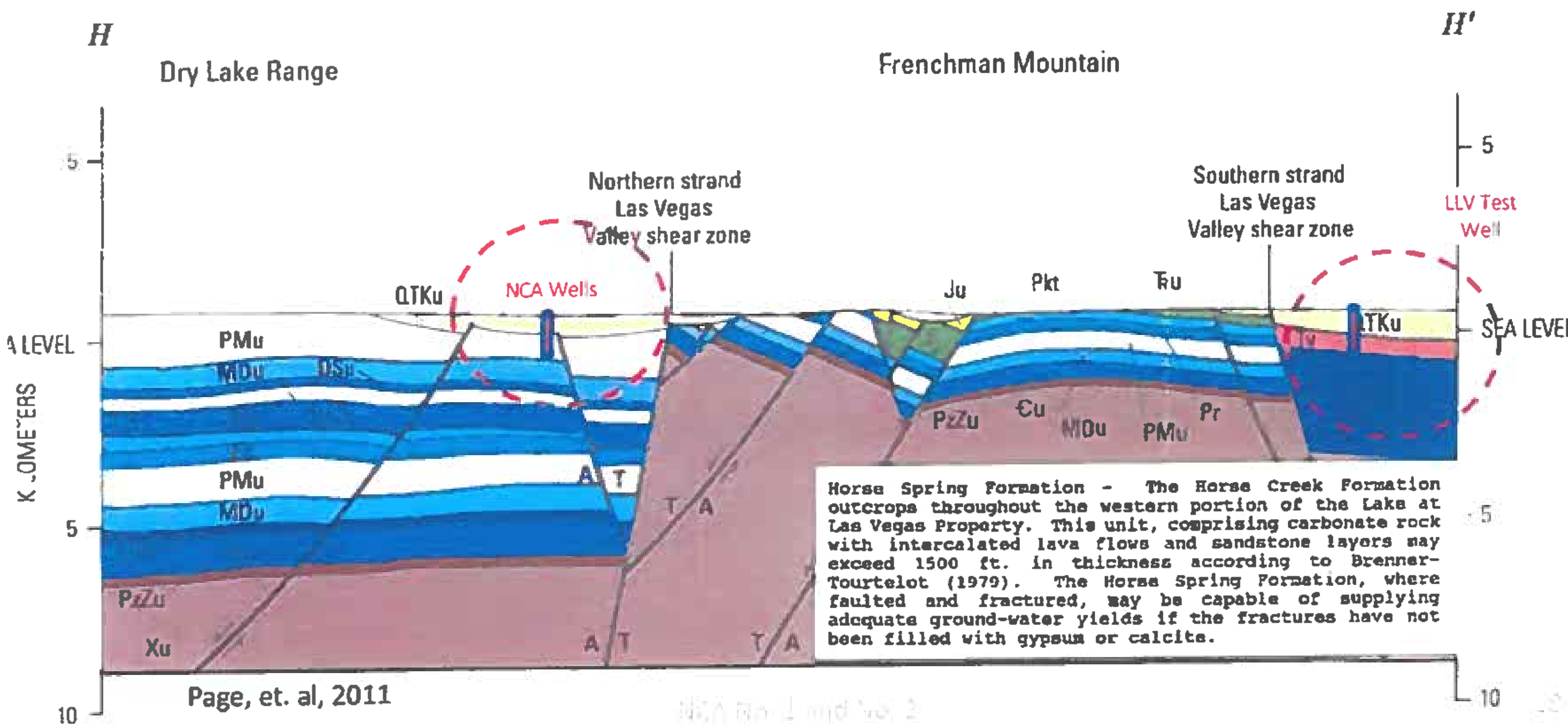
NCA - Recommendation No. 2

Black Mountain Area Boundary - Continued



Page, et. al, 2011

NCA - Recommendation No. 3

Lower Meadow Valley Wash Basin Boundary (NSE Question A – Geographic Boundary and Question E - Other matters believed to be relevant)

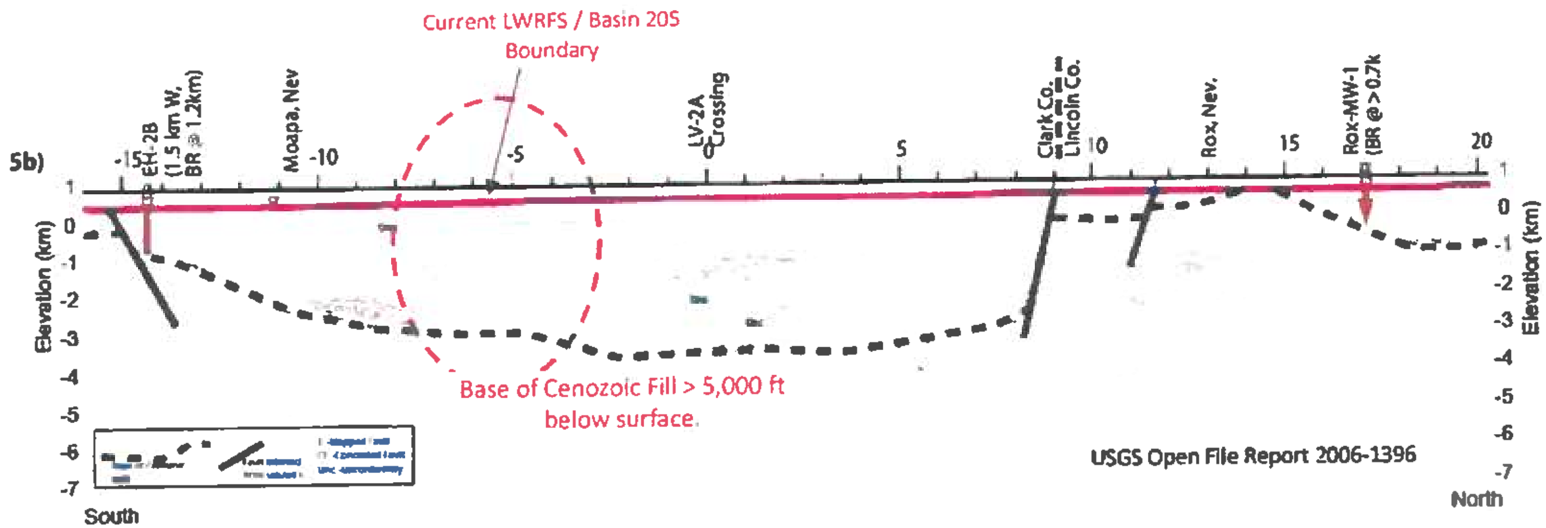
- NCA disagrees with the U.S. Fish and Wildlife Service recommendation to include Basin 205 in the LWRFS:

1. Carbonate aquifer is deep; potential for development is low
2. No effects from LWRFS pumping observed in groundwater levels
3. Current pumping in the basin is minimal
4. Potential ramifications for inactive water rights

NCA - Recommendation No. 3

Lower Meadow Valley Wash Basin Boundary - Continued

1. Carbonate aquifer is deep; potential for development is low

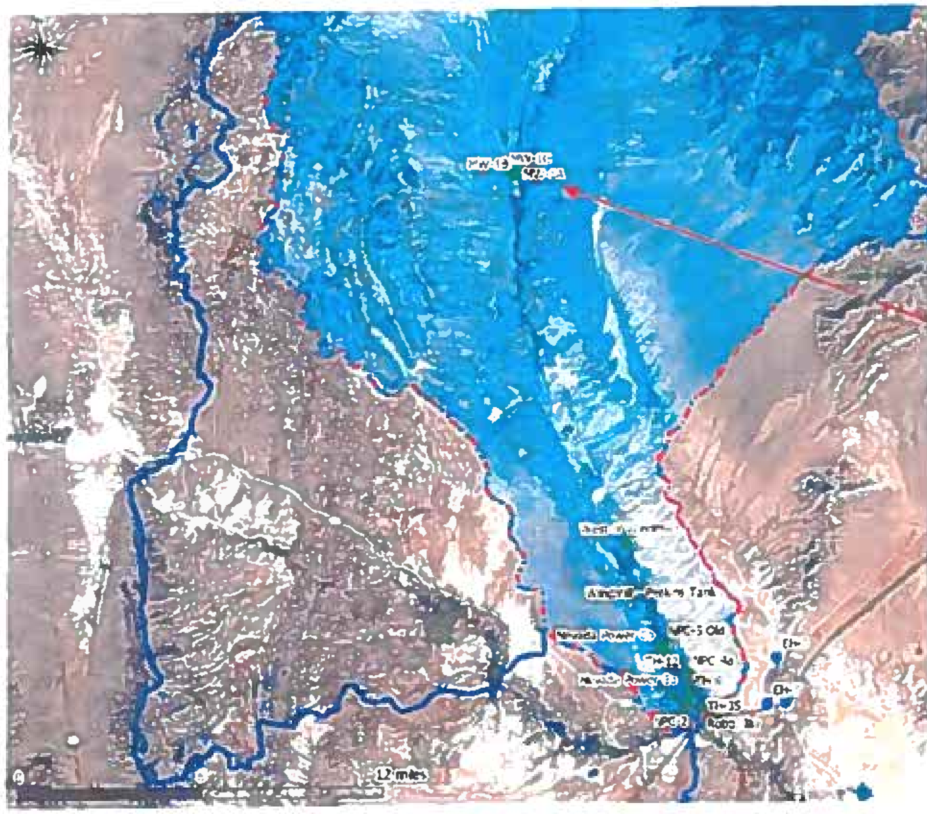


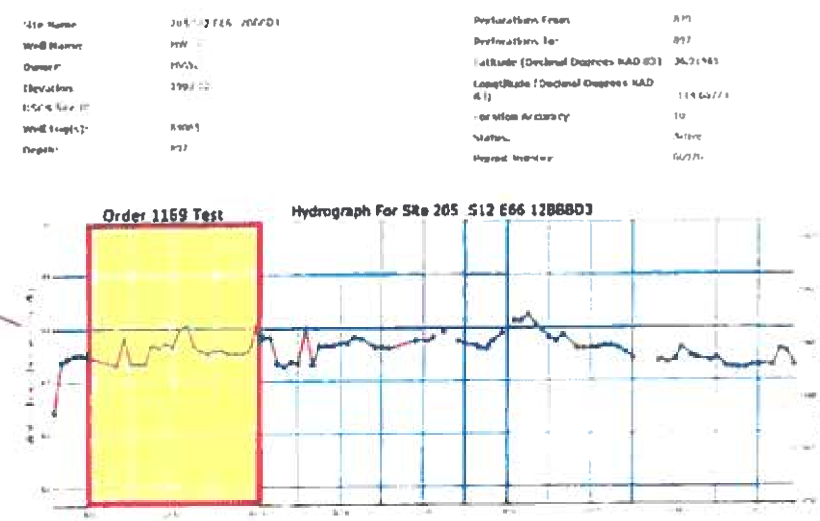
- State Engineer already has the authority to prevent a deep carbonate production well from being constructed

NCA - Recommendation No. 3

Lower Meadow Valley Wash Basin Boundary - Continued

2. No effects from LWRFS pumping observed in groundwater levels



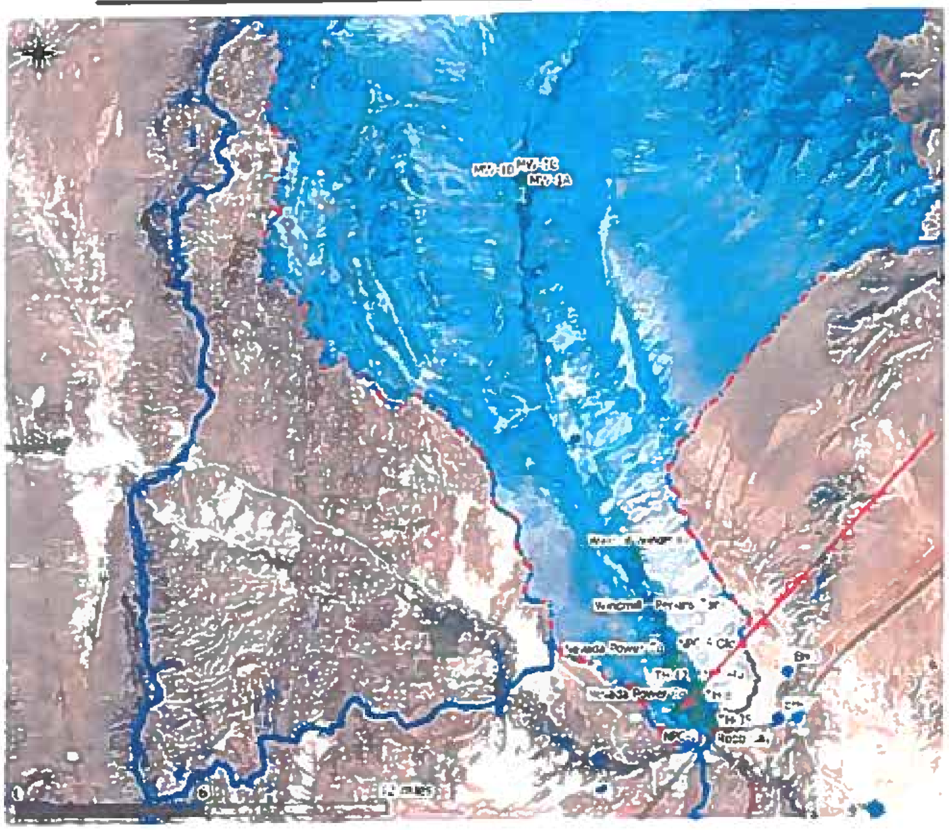


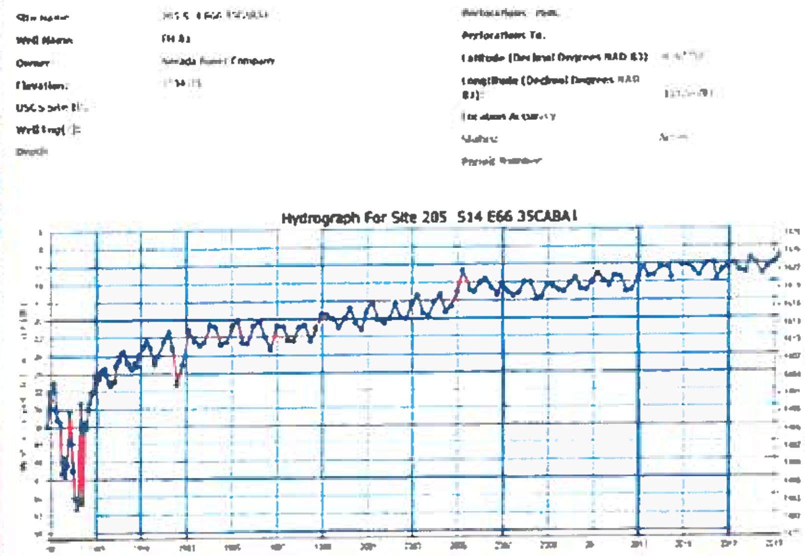
- Encountered consolidated material at 1,600 ft-bgs; deep completion to 829-ft
- No response from Order 1169 pumping

NCA - Recommendation No. 3

Lower Meadow Valley Wash Basin Boundary - Continued

2. **No effects from LWRFS pumping observed in groundwater levels**





- Dual completion (Alluvial and Muddy Creek)
- Continued recovery from intense pumping through the late 1980s

NCA - Recommendation No. 3

Lower Meadow Valley Wash Basin Boundary - Continued

3. Current pumping in the basin is minimal

Basin Number	Sub	Basin Name	County	Inventory Type	COM	CON	DOM	ENV	IND	IRR	MM	MUN	OTH	PWR	QM	REC	STK	WLD	Total
205		Lower Meadow Valley Wash	Clark		4	0	11	0	0	735	0	0	0	0	0	0	0	0	750
205		Lower Meadow Valley Wash	Lincoln		3	0	23	0	0	650	0	431	0	0	0	3	2	0	1,112

NDWR (2017), 2015 Statewide Pumpage Inventory

Nevada Division of Water Resources Run Date: 9/22/2019

Groundwater Commitments and Availability (NRS 532.167)

Hydrographic Area No.	205	Hydrographic Area Name	LOWER MEADOW VALLEY WASH
Hydrographic Region No.	13	Hydrographic Region Name	COLORADO RIVER BASIN

Perennial Yield (AFY)	25000
System Yield (AFY)	
Yield Reference(s)	USGS Recon. 27
Yield Remarks	Yield for basins 198 - 205 totals 25,000

Manner of Use	Committed Acre Feet Annually (AFA)
Commercial	1,814.00
Construction	0.00
Domestic	0.00
Environmental	40.33
Evaporation	0.38
Industrial	8,504.87
Irrigation	6,631.78
Mining and Milling	5.40
Municipal	10,616.87
Power	0.00
Quasi-Municipal	4.40
Recreation	3.00
Stockwater	10.53
Storage	0.00
Wildlife	0.00
Other	44.51
Groundwater Committed	25,397.09
Domestic Well Use	28

All alluvial pumping

NCA - Recommendation No. 3

Lower Meadow Valley Wash Basin Boundary - Continued

4. **<u>Potential ramifications for inactive water rights</u>**
   - There is a substantial quantity of (inactive) underground water rights with a priority date in the 1960s.
   - Adding Basin 205 into the LWRFS could re-active these (senior) rights elsewhere.
     - Some of these existing rights are unusable at their current location (and well depths) due to poor water quality

NCA - Recommendation No. 4

Inclusion of Kane Springs Valley (KSV) (NSE Question A – Geographic Boundary)

NCA disagrees with the following "Key Findings" from the Lincoln/Vidler report (pg 6-1):

1. The effects of pumping from KSV would not be felt for over 100 years outside of KSV
2. There is no discernible trend/pattern in water levels overtime between production well KPW-1 and pumping trends
3. There is no correspondence between the water level trends in wells in KSV/northern CSV, and wells located in southern CSV
4. The trend in water levels in both KMW-1 and CSVM-4 indicate water levels are still being affected by the 2005 precipitation event

NCA - Recommendation No. 4

Inclusion of Kane Springs Valley - Continued

1. Lincoln/Vidler "Key Finding" the effects of pumping from KSV would not be felt for over 100 years outside of KSV
   - Lincoln/Vidler claims that pumping from KSV would not be felt for over 100 years and the NSE has already ruled on the issue of whether the appropriation of GW from KSV would effect the Muddy River Springs Area (MRSA) or for that matter other springs of interest. To validate this claim Lincoln/Vidler cites from ruling 5712 (Feb 2007) and ruling 6254 (Jan 2014) as follows:
     - *"The State Engineer finds there is not substantial evidence that the appropriation of the limited quantity [of water] being granted under this ruling will likely impair the flow at Muddy River Springs, Rogers Springs or Blue Point Springs."*
     - *"The State Engineer finds there is not substantial evidence that the appropriation of a limited quantity of water in Kane Springs Valley Hydrographic Basin will have any measurable impact on Muddy River Springs that warrants the inclusion of Kane Springs Valley in Order No. 1169."*
     - *"...the State Engineer found that where no significant effects would be felt for hundreds of years, the upgradient water could be appropriated."*

NCA - Recommendation No. 4

Inclusion of Kane Springs Valley - Continued

- Lincoln/Vidler rebuttal report quotes the following "...*the State Engineer found that where no significant effects would be felt for hundreds of years, the upgradient water could be appropriated.*" (Pg. 2-2 and 2-3 Lincoln/Vidler 2019) The NSE has NEVER stated that "KSV groundwater can be developed because there will be no significant impact, if
removed my objection
of groundwater for hundreds of years."

-2MHILL Hydrologic Assessment of Kane Spring Valley Report of pumpage, wells 10 miles away from KPW-1 would experience a ater level decline of between 10 and 20 feet. (Pg. 15 Vidler/Lincoln

e of 10 miles is well outside the boundary of KSV

ther hydrologic basin within the State of Nevada a draw down of 10-20 vould be considered a reasonable lowering of the water table, however e of 10 to 20 feet in northern CSV would potentially be catastrophic to

NCA - Recommendation No. 4

Inclusion of Kane Springs Valley - Continued

- Ruling 5712 was written and issued at a time when the NSE had limited data relevant to the impacts caused by carbonate GW pumpage within the LWRFS and had yet statutorily recognized the conjunctive manage of all waters regardless of source. (SB47-2017)
- Even with limited data and possible statutory restrictions the NSE found in ruling 5712 the following:
  - "The State Engineer further finds that the Applicants' pumping test supports the conclusion that there is considerable potential for ground-water flow in the carbonate rocks in the vicinity of well KPW-l." (Pg. 7)
  - "The State Engineer finds the evidence indicates a strong hydrologic connection between Kane Springs Valley and Coyote Spring Valley, specifically, that ground water flows from Kane Springs Valley into Coyote Spring Valley." (Pg. 21)
  - "Given the unique hydrologic connection between the Kane Springs Valley Hydrographic Basin and the Coyote Spring Valley Hydrographic Basin, the development of ground water within Kane Springs Valley will ultimately affect water levels and flows in the White River regional carbonate-rock aquifer system." (Pg. 15)

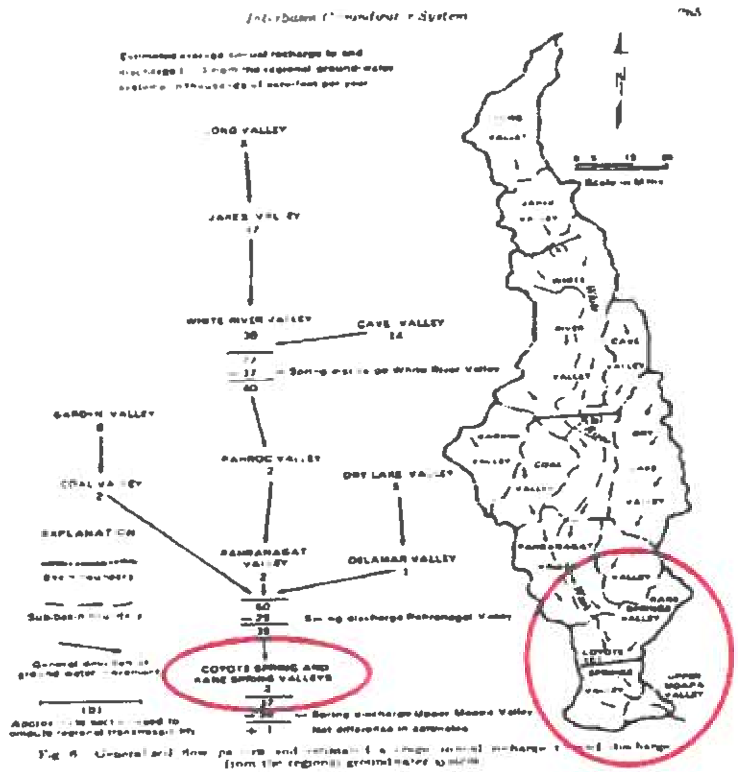
NCA - Recommendation No. 4

Inclusion of Kane Springs Valley - Continued

- Since the issuance of ruling 5712 the following has occurred:
  - Order 1169 pump test was initiated and declared completed by the NSE on December 31, 2012
  - January 29, 2014, rulings 6254-6260 were issued denying all pending applications, many senior in priority to Lincoln/Vidler, within Coyote Spring Valley, Garnet Valley, Hidden Valley, California Wash and the Muddy River Springs Area on the bases that there was no unappropriated ground water available, the proposed use would conflict with existing rights and prove detrimental to the public interest.
  - June 9, 2017 SB-47 became effective creating NRS 533.024(1)(c), which allows for the NSE to manage conjunctively the appropriation, use and administration of all waters of this State, regardless of the source of the water.
  - January 11, 2019, Interim Order 1303 issued by the NSE designating the Lower White River Flow System consisting of Coyote Spring Valley, Garnet Valley, Hidden Valley, California Wash and the Muddy River Springs Area as a joint administrative unit for purposes of administration of water rights.

NCA - Recommendation No. 4

Inclusion of Kane Springs Valley - Continued



Eakin 1966 – A Regional Interbasin Groundwater System in the White River Area, Southeastern Nevada

NCA No. 1 and No. 2

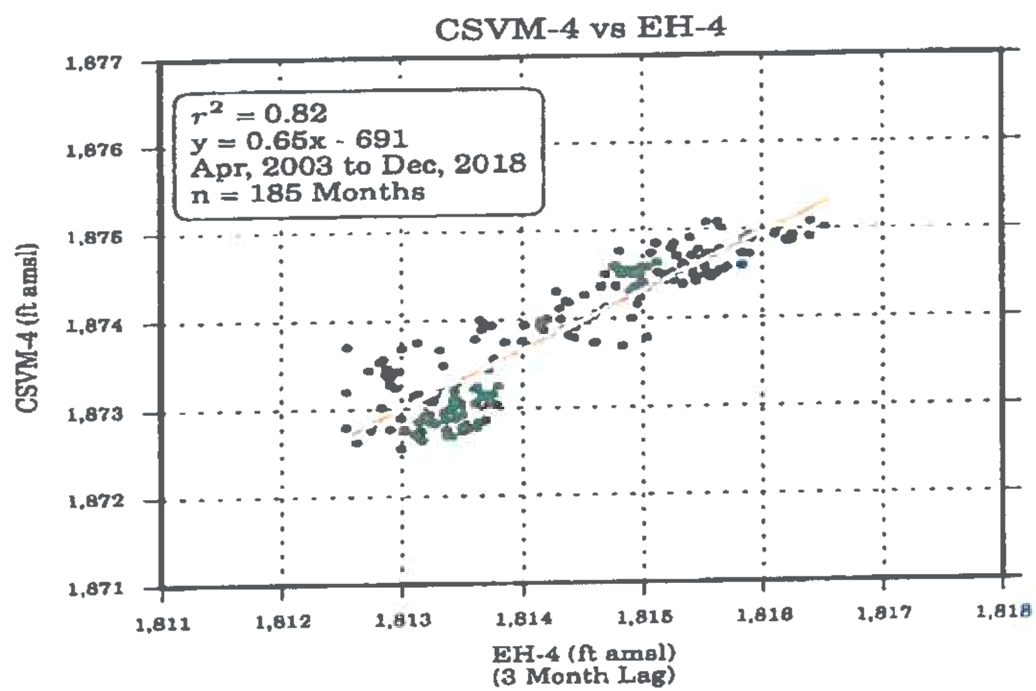
NCA - Recommendations No. 4 and No. 5

Inclusion of Kane Springs Valley and Continued Inclusion of Northern Portion of Coyote Spring Valley - Continued

- NCA believes that there is a discernible trend/pattern in water levels overtime between production well KPW-1 and pumping trends.
- NCA also believes that there is correspondence between the water level trends in wells in KSV/northern CSV, and wells located in southern CSV.
  - SNWA, USFWS, NPS, CBD and NCA all found that CSVM-4 and KMV-1 showed effects resulting from the Order 1169 aquifer test
  - The values for several wells including CSVM-4 were then plotted against EH-4 for various periods. There was a high correlation between all the carbonate wells plotted against EH-4 with the correlation of CSVM-4 and EH-4 resulting in a R^2 value of 0.82. These high correlations between carbonate wells in the LWRFS indicate a high level of hydraulic connectivity across the basins within the LWRFS

NCA - Recommendations No. 4 and No. 5

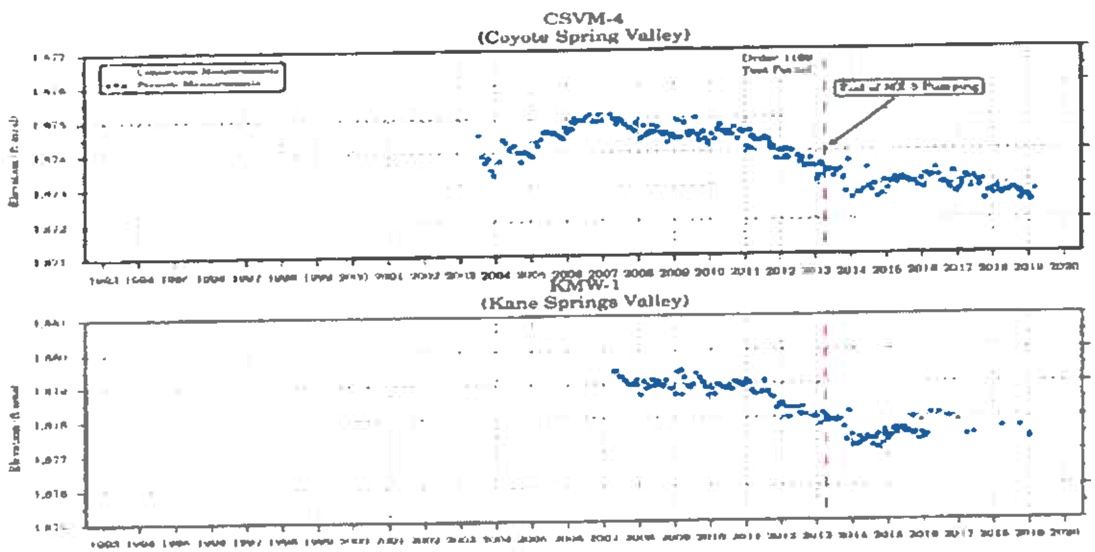
Inclusion of Kane Springs Valley and Continued Inclusion of Northern Portion of Coyote Spring Valley - Continued



NCA - Recommendations No. 4 and No. 5

Inclusion of Kane Springs Valley and Continued Inclusion of Northern Portion of Coyote Spring Valley - Continued

SNWA did not calculate a correlation between EH-4 and KMW-1, therefore a direct visual comparison of the hydrographs of CSVM-4 and KMW-1 was done. The visual comparison found that the hydrographs for CSVM-4 and KMW-1 are virtually identical with an estimated R^2 value > 0.9, which indicates a high correlation between KMW-1 and carbonate wells in the LWRFS with a high level of hydraulic connectivity across all of the basins within the LWRFS.



NCA - Recommendations No. 4 and No. 5

Inclusion of Kane Springs Valley and Continued Inclusion of Northern Portion of Coyote Spring Valley - Continued

- Lincoln/Vidler claims that there were no effects ascribable to the start and stop of the Order 1169 aquifer test. (Pg 4-10 Lincoln/Vidler 2019) The contrary is true in that there is a high correlation between KMW-1 and carbonate wells in the LWRFS with a high level of hydraulic connectivity across all of the basins within the LWRFS, including KSV.

- The following agencies make various references that are supportive to the inclusion of KSV within the LWRFS
  - SNWA states "northern Coyote Spring Valley is hydraulically connected with Kane Springs Valley and the remainder of the LWRFS" (Pg 14, SNWA Aug 2019)
  - CBD states "the data presented by Lincoln County et al does not support the interpretations, and the geophysics are not evidence that KSV should not be considered part of the LWRFS." (Pg. 20, Myers Aug 2019)
  - USFWS states "Based on the continuity of water level responses across this portion of the carbonate aquifer, any changes in lithology or discrete low permeability structures present in the carbonate aquifer between KMW-1 and central Coyote Spring Valley are not sufficiently impermeable to preclude or significantly minimize the impacts of carbonate pumping in KPW-1 (or KMW-1) on carbonate water levels in Coyote Spring Valley (or the other basins currently recognized as the LWRFS), consequently the Muddy River Springs or Muddy River." (Pg21, USFWS Jul 2019)
  - NPS states "… additional data has been collected since that time which the NPS believes strongly supports this hydrologic connection and, therefore, inclusion of Kane Springs Valley into the LWRFS" (Pg. 11, NPS Aug 2019)

NCA - Recommendations No. 4 and No. 5

Inclusion of Kane Springs Valley and Exclusion of Northern Portion of Coyote Spring Valley

- In the event that Lincoln/Vidler develops water from KPW-1 and the NSE excludes pumpage from KPW-1 from the management of the LWRFS, there would be detrimental impacts to the existing senior rights owned and controlled by NCA and other senior water right users within the LWRFS

- The Lincoln/Vidler ground water rights are junior in priority to approximately 98% of the ground water rights within the LWRFS and during any curtailment of pumpage within the LWRFS, these rights would be among the first to be subject to curtailment.

NCA - Recommendations No. 4 and No. 5

Inclusion of Kane Springs Valley and Continued Inclusion of Northern Portion of Coyote Spring Valley - Continued

Why is the Inclusion of KSV Important

- Assuming that the NSE determines that the maximum long-term annual quantity of groundwater that may be pumped from the LWRFS is 9,318 afa, Lincoln/Vidler would maintain the right to pump 500 afa from KPW-1 and an additional 500 afa from a separate site in KSV, which equates to an additional 11% of pumpage, for a total potential of 10,318 afa of pumpage actually impacting the LWRFS.
- Ass umpage within the LWRFS by an additional 10% from 9,318 afa to mpacts to the MRSA. Lincoln/Vidler, while being in the bottom 2% ain the unencumbered right to continue pumping 1,000 afa of jun
- Adc ased the potential impacts from KSV pumpage when on August 27, pplications 82727 and 82728 moving the 500 acre-feet pre 2218 and 72219 by Ruling 5217 approximately 12.4 and 6.5 mile /.

removed by objection
outside of scope of these hearings

new analysis not contained in report

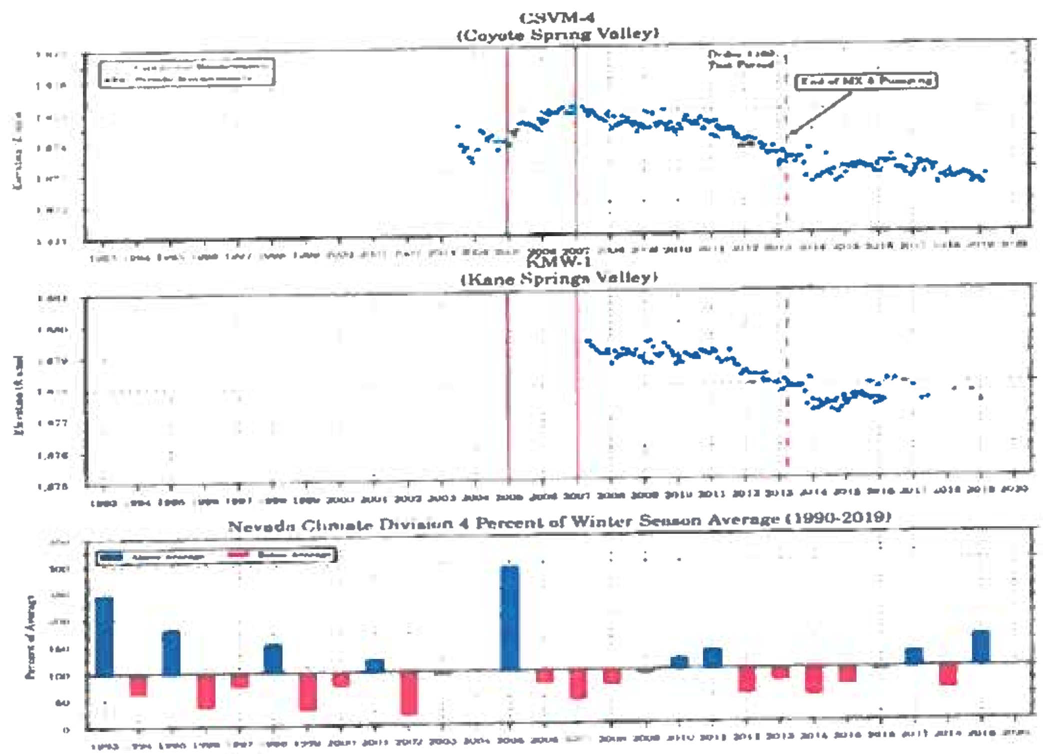
NCA - Recommendation No. 4

Inclusion of Kane Springs Valley - Continued

4. NCA disagrees with Lincoln/Vidler's "Key Finding" The trend in water levels in both KMW-1 and CSVM-4 indicate water levels are still being affected by the 2005 precipitation event.
   - Lincoln/Vidler well KVW-1 was completed in October 2005
   - First depth to water level reading from KVW-1 was collected in April 2007

NCA - Recommendation No. 4

Inclusion of Kane Springs Valley - Continued



NCA - Recommendation No. 4

Inclusion of Kane Springs Valley - Continued

- On cross Lincoln/Vidler stated that they determined the effects of the extraordinary 2005 precipitation event on KMW-1 by correlating the hydrographs of CSVM-4 and KMW-1
  - NCA agrees that there is a strong correlation between CSVM-4 and KMW-1 and it was proper for Lincoln/Vidler to determine the effects of the extraordinary 2005 precipitation event on KMW-1 by correlating the hydrographs of CSVM-4 and KMW-1
- However, a correlation between CSVM-4 and KMW-1 can not be relied upon to determine precipitation impacts and then disregard the correlation between CSVM-4 and KMW-1, when considering hydrologic impacts from the Order 1169 aquifer test

Matters of Interest to the State Engineer

a. The geographic boundary of the hydrologically connected groundwater and surface water systems comprising the Lower White River Flow System;

- As shown earlier there's a basis for SNWA's statement that the NCA current production wells are probably not within the LWRFS
- NCA believes that additional work needs to be done to validate SNWA's Multiple Linear Regression analysis with regards to the attributable impacts to the MRSA resulting from groundwater pumpage from NCA's production wells in Black Mountain Hydrographic Basin
- It is important for the NSE to know if the NCA pumpage within the BM hydrographic basin is impacting the MRSA. If NCA's pumpage is not effecting the MRSA, that's obviously good for NCA, but more importantly that also means that actual impacts to the MRSA are being caused by less pumpage than initially thought
- Therefore, NCA supports SNWA's position that the current boundary of the LWRFS should stay the same pending the water management decisions in the next phase

Matters of Interest to the State Engineer

b. The information obtained from the Order 1169 aquifer test and subsequent to the aquifer test and Muddy River headwater spring flow as it relates to aquifer recovery since the completion of the aquifer test;

- There are a number of faults within the LWRFS and these faults act as a conduit for flow or an impediment to flow, but DO NOT act as a barrier to flow as evidenced by the high correlation of water level responses within the LWRFS
- The various structures within the LWRFS with lower transmissivity values result in a lag of measurable impacts in some areas but not the overall impact. These delayed impacts can be even more detrimental to the MRSA as the impact will take longer to identify and the benefits of any subsequent corrective action will also take longer to begin recovery from impacts

Matters of Interest to the State Engineer

c. The long-term annual quantity of groundwater that may be pumped from the Lower White River Flow System, including the relationships between the location of pumping on discharge to the Muddy River Springs, and the capture of Muddy River flow

- There has been substantial discussion regarding the amount of underflow out of the LWRFS and NCA agrees that there is some amount of underflow. However, NCA is not aware of any location where the underflow can be captured by carbonate pumpage within the LWRFS without detrimental impacts to the MRSA
- While NCA does not completely agree with the current pumpage goal of 9,318 AFY, NCA understands the complexity of the determination and potential fluency of the proposed pumping limit and urges the State Engineer to proceed expeditiously, but with extreme caution
- NCA is concerned that a delayed decision with regards to the management of the LWRFS could result in Federal action resulting in a Cappaert type decision to manage spring flow through minimum groundwater hydraulic head levels, thus preventing the State of Nevada the ability to manage it's own resources

Matters of Interest to the State Engineer

d. The effects of movement of water rights between alluvial wells and carbonate wells on deliveries of senior decreed rights to the Muddy River:

- NCA does not support the transfer of senior alluvium ground water rights within the MRSA to the carbonate system within the LWRFS as the supply source for <u>new</u> uses
- NCA does supports the transfer of senior alluvium ground water rights within the MRSA to the carbonate system within the LWRFS to upgrade the priority date of existing carbonate pumpage within the LWRFS on a one to one basis.
- NCA believes that simplified guidelines should be established for the movement of groundwater within and near the LWRFS as part of this process but not necessarily through the issuance of an Order at this time.
- NCA supports the change in <u>place of use</u> of MRSA alluvium rights when associated with a conjunctive use agreement between a holder of Muddy River decreed rights and the user of the pumped MRSA alluvium rights

Matters of Interest to the State Engineer

e. Any other matter believed to be relevant to the State Engineer's analysis.

- NCA does not believes that the State Engineer should proceed with any new aquifer test within the LWRFS
  - To see verifiable results, any aquifer test would require pumpage in the 1,000's of af over a period > 6 months
  - It makes little sense to do conduct an aquifer test for less than a six month period when it is known that some impacts within the LWRFS are delayed by a period of 3 to 4 months
  - Given the lack of a full recovery from the Order 1169 aquifer test, the pumpage required by additional aquifer test may cause detrimental impacts to senior water right holders