Case No. 84739

IN THE SUPREME COURT OF THE STATE OF NEVADA

Electronically Filed
Nov 08 2022 04:38 p.m.
Elizabeth A. Brown
Clerk of Supreme Court

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

Appellants,

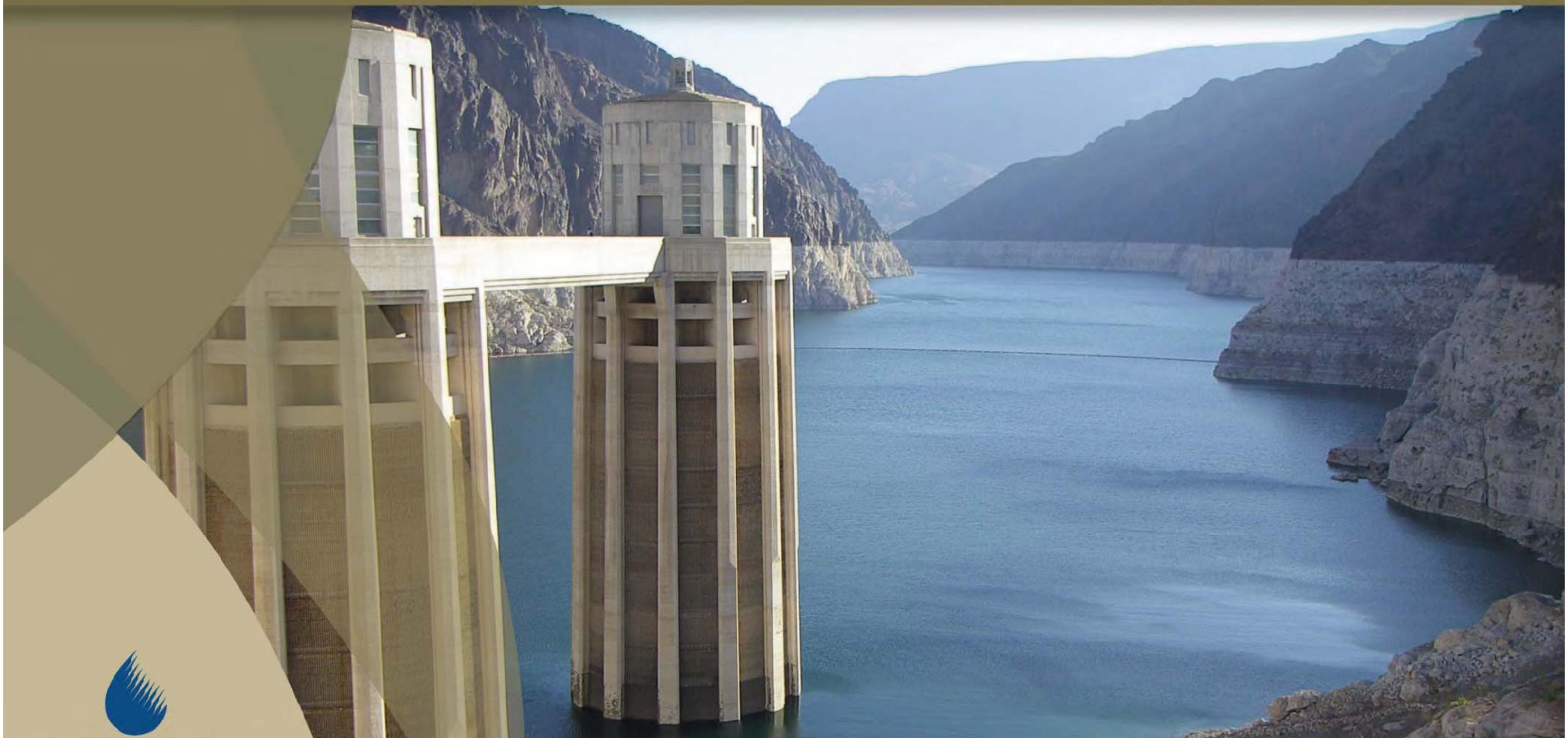
vs.

LINCOLN COUNTY WATER DISTRICT, et al.

JOINT APPENDIX

VOLUME 23 OF 49

Spring, Cave, Dry Lake and Delamar Valleys



SOUTHERN NEVADA
WATER AUTHORITY

Presentation for
Burns and Drici Testimony
October [illegible], 2011

SE ROA 39164

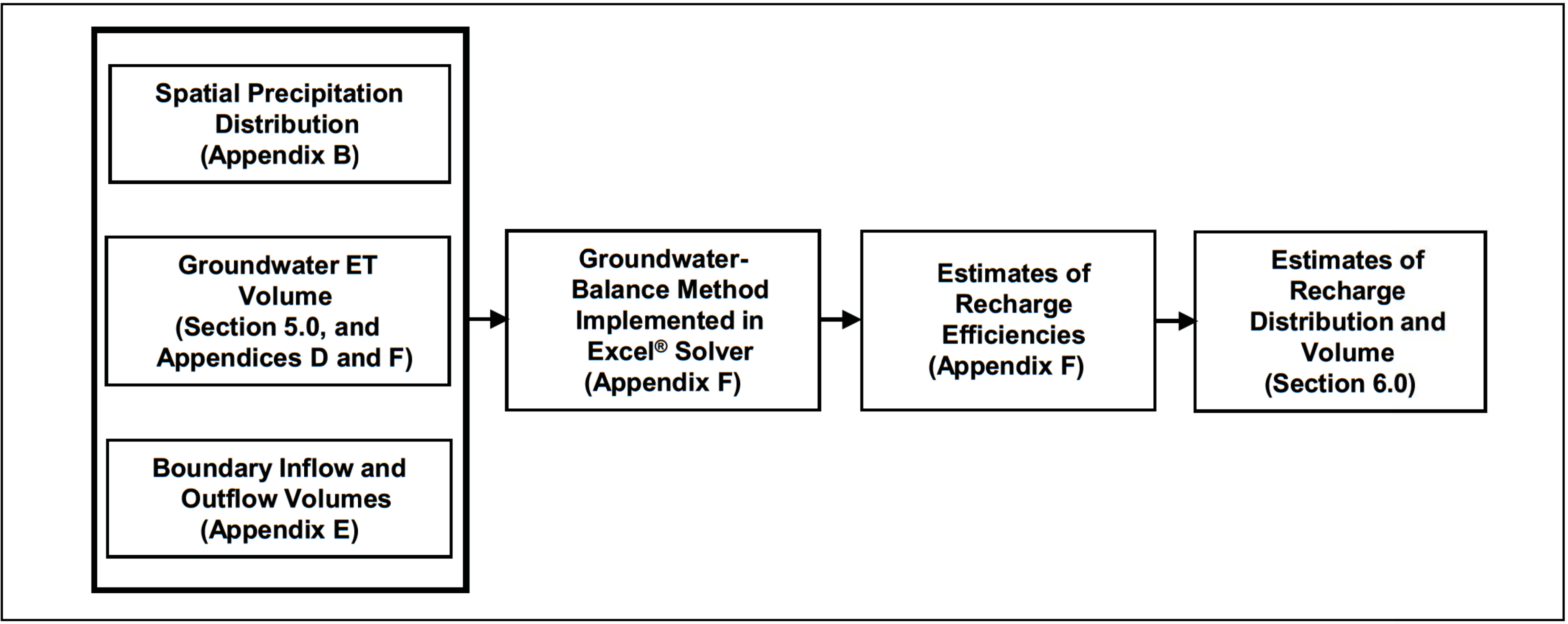


Figure 6-1
Flow Chart Showing Estimation Process of Recharge Distributions and Annual Volumes for Project Basins

SNWA Exhibit 258

SE ROA 39165

$$R_T = ET_{gw} + Outflow - Inflow \qquad \text{(Eq. F-1)}$$

where,

R_T = Total recharge (afy)
ET_{gw} = Total groundwater ET (afy)
$Inflow$ = Total groundwater inflow (afy)
$Outflow$ = Total groundwater outflow (afy)

JA_10449

[redacted]

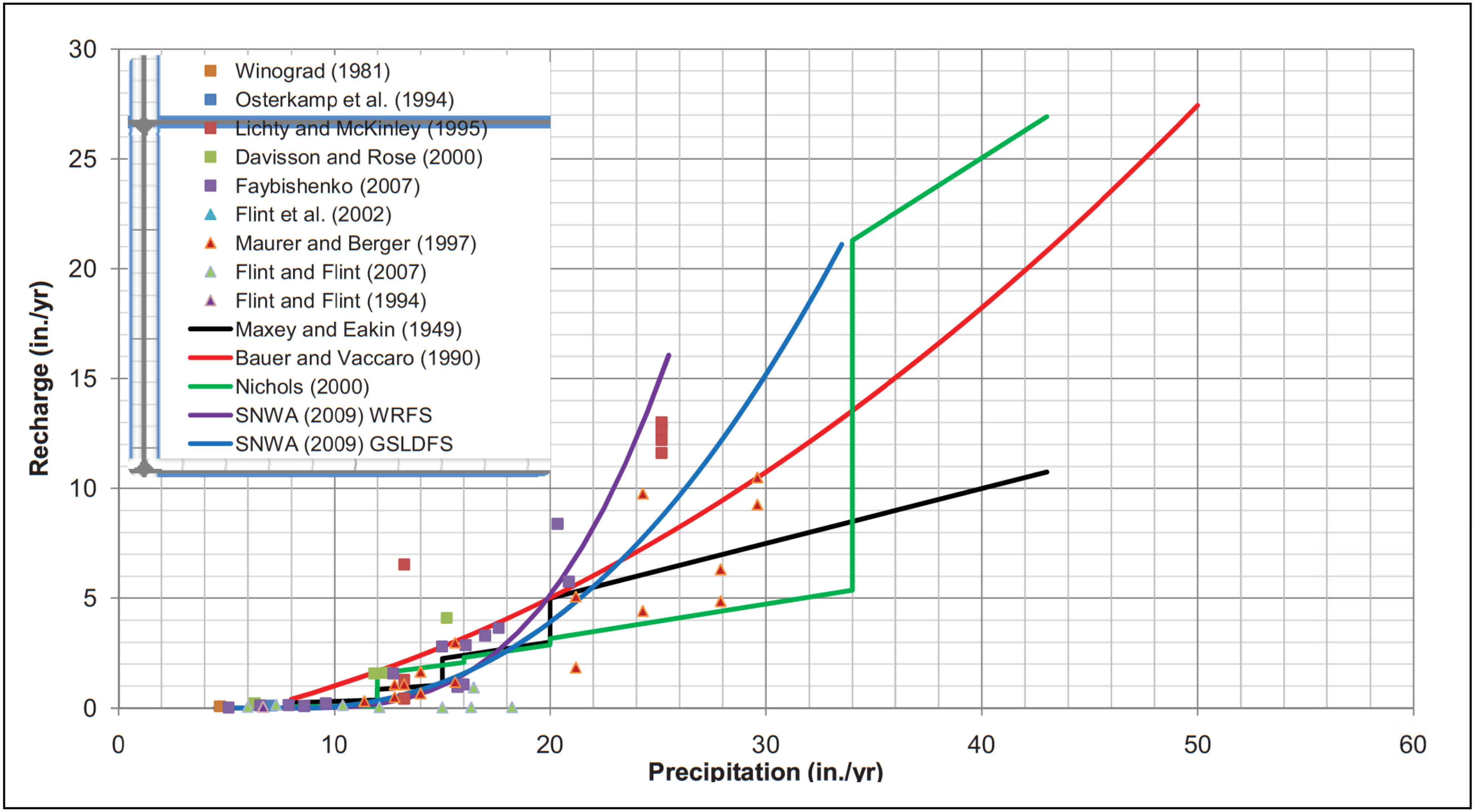


Figure F-1
Recharge-Precipitation Data

SNWA Exhibit 258

SE ROA 39168

$$R_T = ET_{gw} + Outflow - Inflow \quad \text{(Eq. F-1)}$$

where,

R_T = Total recharge (afy)
ET_{gw} = Total groundwater ET (afy)
$Inflow$ = Total groundwater inflow (afy)
$Outflow$ = Total groundwater outflow (afy)

$$Eff = \frac{\lfloor a(P-8)\rfloor}{P} \quad \text{(Eq. F-3)}$$

where,

Eff	=	Recharge efficiency or *R/P* as a fraction
a	=	Power function constant

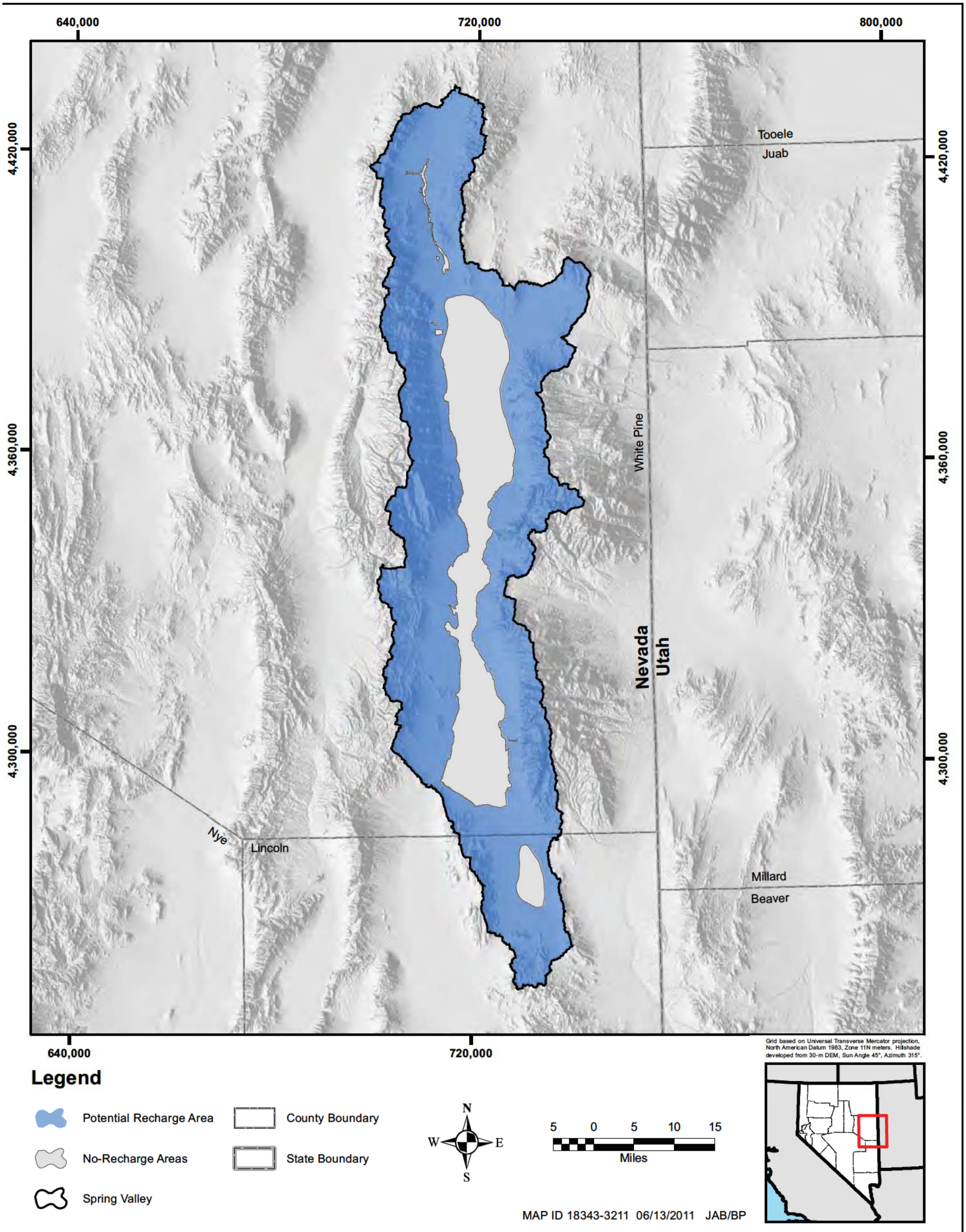


Figure F-3
Areas of Potential Recharge in Spring Valley

SNWA Exhibit 258

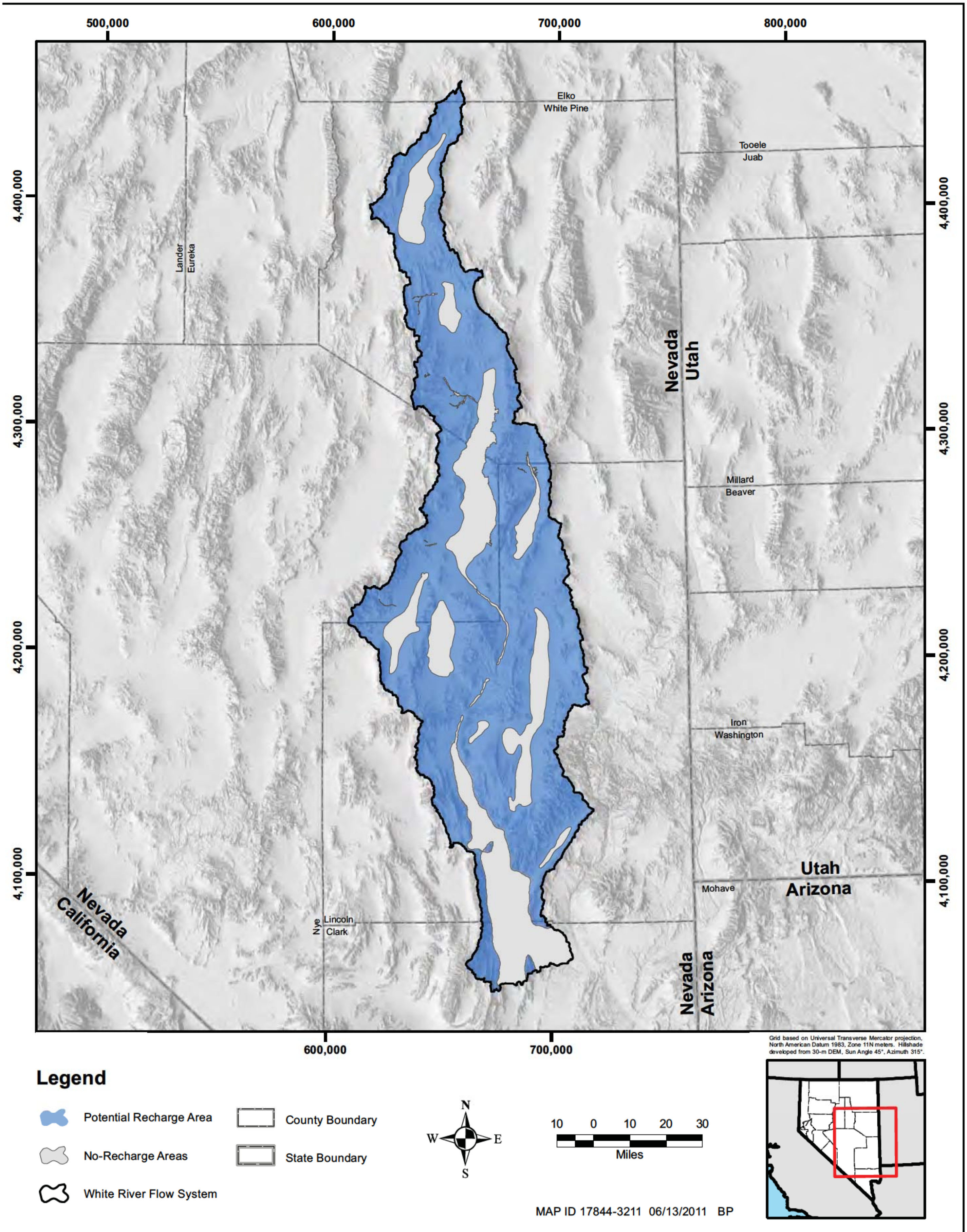


Figure F-4
Areas of Potential Recharge within the White River Flow System

SNWA Exhibit 258

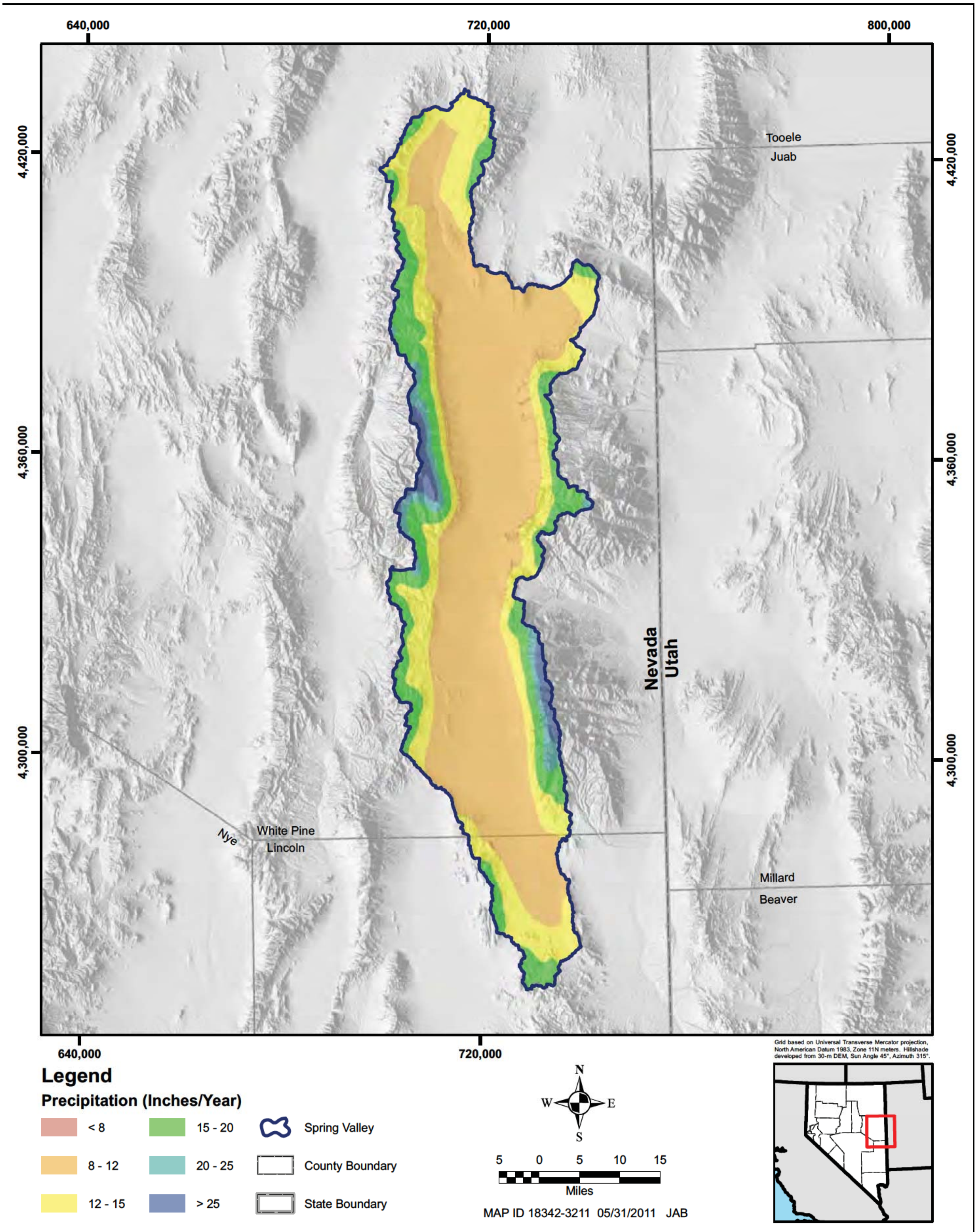


Figure F-5
Precipitation Distribution in Spring Valley

SNWA Exhibit 258

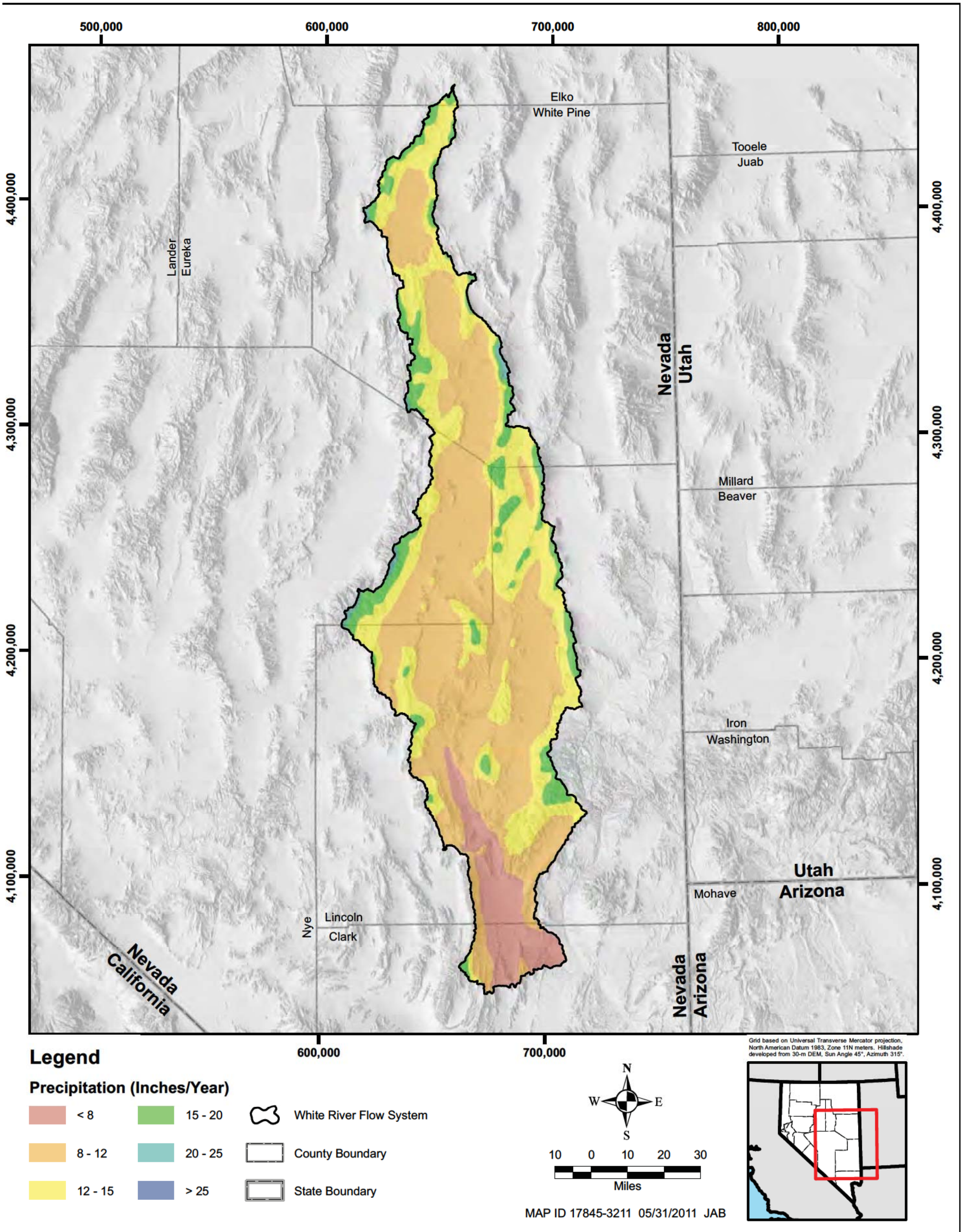


Figure F-6
Precipitation Distribution in the White River Flow System

SNWA Exhibit 258

$$R = a(P - 8)^{b} \quad \text{(Eq. F-2)}$$

where,

R	=	Recharge rate (in./yr)
a	=	Power function constant
b	=	Power function exponent
P	=	Precipitation rate (in./yr)
$P - 8$	=	Effective precipitation (in./yr)

$$Eff = \frac{[a(P-8)^b]}{P} \qquad \text{(Eq. F-3)}$$

where,

Eff = Recharge efficiency or R/P as a fraction
a = Power function constant

JA_10459

[redacted]

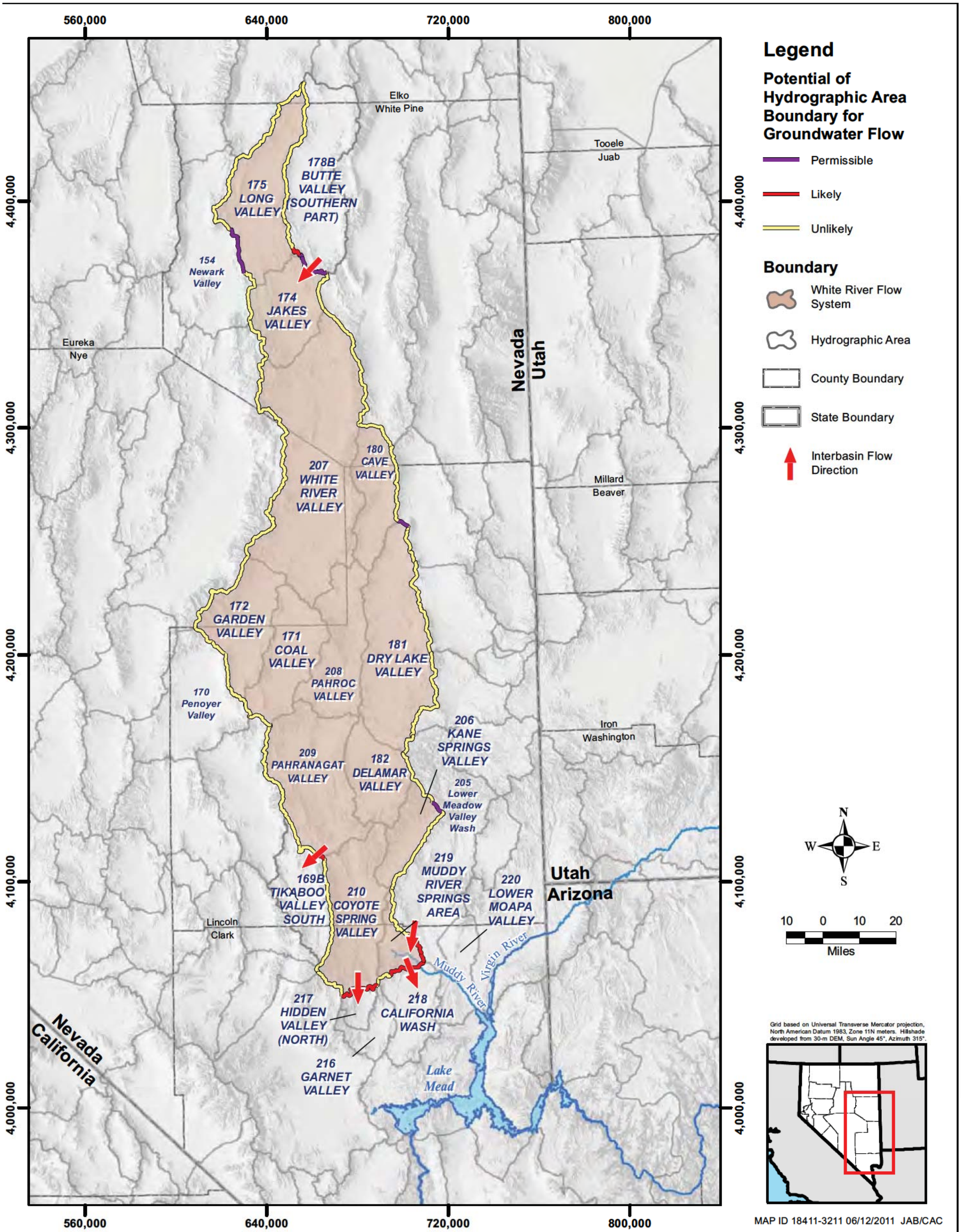


Figure E-1
Locations of Interbasin Flow for the External Boundaries

SNWA Exhibit 258

SE ROA 39178

JA_10460

$$Eff = \frac{[a(P-8)^b]}{P} \qquad \text{(Eq. F-3)}$$

where,

Eff = Recharge efficiency or R/P as a fraction
a = Power function constant

$$R = a(P - 8)^b \quad \text{(Eq. F-2)}$$

where,

R	=	Recharge rate (in./yr)
a	=	Power function constant
b	=	Power function exponent
P	=	Precipitation rate (in./yr)
$P - 8$	=	Effective precipitation (in./yr)

$$Eff = \frac{[a(P - 8)^{b}]}{P} \qquad \text{(Eq. F-3)}$$

where,

Eff	=	Recharge efficiency or *R/P* as a fraction
a	=	Power function constant

Table 6-1
Recharge Volume Calculations for Spring Valley

1-in. Precipitation Interval	Mean Precipitation Rate (in./yr)	Area (acres)	Precipitation Volume (afy)	Recharge Efficiency (Fraction of Precipitation)	Recharge Volume (afy)
8-9	8.65	4,442	3,203	0.002	5
9-10	9.55	83,615	66,542	0.008	560
10-11	10.55	158,316	139,133	0.020	2,821
11-12	11.46	132,299	126,388	0.034	4,327
12-13	12.49	99,287	103,322	0.052	5,412
13-14	13.49	78,555	88,278	0.072	6,361
14-15	14.48	69,025	83,306	0.093	7,771
15-16	15.48	53,257	68,707	0.116	7,954
16-17	16.54	44,948	61,938	0.141	8,707
17-18	17.52	31,385	45,811	0.164	7,533
18-19	18.56	17,052	26,377	0.191	5,028
19-20	19.65	11,768	19,266	0.218	4,208
20-21	20.53	8,393	14,363	0.242	3,469
21-22	21.69	7,007	12,667	0.272	3,448
22-23	22.74	6,201	11,749	0.300	3,527
23-24	23.49	5,086	9,958	0.321	3,193
24-25	24.83	4,495	9,303	0.357	3,324
25-26	25.65	4,157	8,885	0.380	3,374
26-27	26.52	3,750	8,287	0.404	3,347
27-28	27.64	3,556	8,190	0.435	3,564
28-29	28.72	3,885	9,297	0.465	4,326
29-30	29.63	2,602	6,423	0.491	3,153
30-31	30.29	1,357	3,426	0.510	1,746
31-32	31.52	989	2,599	0.544	1,415
32-33	32.37	393	1,060	0.569	603
33-34	33.47	14	38	0.600	23
				Basin Total Recharge Volume[a]	**99,200**

[a]Rounded to nearest 100 afy.

SNWA Exhibit 258

Table 6-2
Mean Annual Recharge estimated for Spring Valley and Previously-Reported Estimates

Source	Recharge (afy)
This Study	99,200
SNWA (2009a, p. 9-14)	81,339
Reconnaissance Reports and Scott et al. (1971, p. 48)	75,000
Dettinger (1989, p. 69)	61,636
Nichols (2000, p. C25)	104,000
Epstein (2004, p. 136) - Maxey-Eakin Method Evaluation	66,402
Epstein (2004, p. 136) - Nichols-1990-Method Evaluation	93,840
Epstein (2004, p. 136) - BBRM[a]	92,965
Epstein (2004, p. 136) - N-ME[b]	53,335
Epstein (2004, p. 136) - N-N[c]	139,194
Recharge (BCM-Mean Year, Flint et al., 2004, Table 1)	66,987
Recharge (BCM-Time Series, Flint et al., 2004, Table 1)	56,179
Brothers et al. (1994, p. 51)	72,000
Welch et al. (2007, p. 44)	93,000
Mizell et al. (2007, p. 18)	62,000

[a] BBRM: Bootstrap Brute-Force Model
[b] N-ME: Numeric Maxey-Eakin Method Evaluation
[c] N-N: Nichols Method Evaluation

Table 6-3
Annual Recharge Volume Calculations for Cave Valley

1-in. Precipitation Interval	Mean Precipitation Rate (in./yr)	Area (acres)	Precipitation (afy)	Recharge Efficiency (Fraction of Precipitation)	Recharge Volume (afy)
11-12	11.46	12,790	12,219	0.012	150
12-13	12.49	43,868	45,651	0.023	1,050
13-14	13.49	44,536	50,048	0.037	1,855
14-15	14.48	32,402	39,106	0.055	2,140
15-16	15.48	19,555	25,229	0.076	1,918
16-17	16.54	11,225	15,468	0.102	1,584
17-18	17.52	9,401	13,722	0.131	1,791
18-19	18.56	4,500	6,962	0.164	1,143
19-20	19.65	1,527	2,500	0.203	508
20-21	20.53	1,183	2,025	0.238	482
21-22	21.69	1,013	1,832	0.288	527
22-23	22.74	553	1,047	0.336	352
23-24	23.49	258	504	0.374	188
				Basin Total Recharge Volume[a]	**13,700**

[a]Rounded to nearest 100 afy

Table 6-4
Mean Annual Recharge estimated for Cave Valley and Previously-Reported Estimates

Source	Recharge (afy)
This Study	13,700
SNWA (2009a, p. 9-14)	15,044
Reconnaissance Reports and Scott et al. (1971, p. 48)	14,000
Kirk and Campana (1988, p. 26)	11,000-14,000
LVVWD (2001, p. 4-25) and Thomas et al. (2001, p. 6)	20,000
Epstein (2004, p. 136) - Maxey-Eakin Method Evaluation	21,838
Epstein (2004, p. 136) - Nichols-1990-Method Evaluation	32,507
Epstein (2004, p. 136) - BBRM[a]	15,166
Epstein (2004, p. 136) - N-ME[b]	13,592
Epstein (2004, p. 136) - N-N[c]	45,913
Recharge (BCM-Mean Year, Flint et al., 2004, Table 1)	10,264
Recharge (BCM-Time Series, Flint et al., 2004, Table 1)	9,380
Brothers et al. (1993, p. 45)	13,000
Welch et al. (2007, p. 44)	11,000
Mizell et al. (2007, p. 18)	33,000

[a]BBRM: Bootstrap Brute-Force Model
[b]N-ME: Numeric Maxey-Eakin Method Evaluation
[c]N-N: Nichols Method Evaluation

Table 6-5
Recharge Volume Calculations for Dry Lake and Delamar Valleys

1-in. Precipitation Interval	Mean Precipitation Rate (in./yr)	Area (acres)	Precipitation Volume (afy)	Recharge Efficiency (Fraction of Precipitation)	Recharge Volume (afy)
Dry Lake Valley					
9-10	9.55	42,476	33,804	0.002	54
10-11	10.55	110,032	96,700	0.006	551
11-12	11.46	90,888	86,827	0.012	1,064
12-13	12.49	78,086	81,260	0.023	1,869
13-14	13.48	65,684	73,814	0.037	2,735
14-15	14.48	44,805	54,075	0.055	2,959
15-16	15.48	26,477	34,159	0.076	2,597
16-17	16.54	11,091	15,284	0.102	1,565
17-18	17.52	7,892	11,520	0.131	1,503
18-19	18.56	4,086	6,321	0.164	1,038
19-20	19.65	791	1,295	0.203	263
				Basin Total Recharge Volume[a]	**16,200**
Delamar Valley					
10-11	10.55	20,091	17,657	0.006	101
11-12	11.46	47,070	44,967	0.012	551
12-13	12.49	29,624	30,828	0.023	709
13-14	13.49	24,631	27,679	0.037	1,026
14-15	14.48	20,593	24,854	0.055	1,360
15-16	15.48	11,189	14,436	0.076	1,097
16-17	16.54	9,433	12,999	0.102	1,331
17-18	17.52	2,070	3,021	0.131	394
				Basin Total Recharge Volume[a]	**6,600**
				Dry Lake and Delamar Valleys Total Recharge Volume[a]	**22,800**

[a]Rounded to nearest 100 afy.

SNWA Exhibit 258

Table 6-6
Mean Annual Recharge Estimated for Dry Lake and Delamar Valleys and Previously-Reported Estimates in afy

Source	Dry Lake Valley (HA 181)	Delamar Valley (HA 182)	Total
This Study	16,200	6,600	22,800
SNWA (2009a, p. 9-14)	16,208	6,627	22,835
Reconnaissance Reports and Scott et al. (1971, p. 48)	5,000	1,000	6,000
Kirk and Campana (1988, p. 26)	7,500	2,000	9,500
LVVWD (2001, p. 4-25) and Thomas et al. (2001, p. 6)	13,000	5,000	18,000
Epstein (2004, p. 136) - Maxey-Eakin Method Evaluation	9,159	3,119	12,278
Epstein (2004, p. 136) - Nichols-1990-Method Evaluation	28,559	12,930	41,489
Epstein (2004, p. 136) - BBRM[a]	20,187	10,248	30,435
Epstein (2004, p. 136) - N-ME[b]	8,947	3,567	12,514
Epstein (2004, p. 136) - N-N[c]	50,389	21,442	71,831
Recharge (BCM-Mean Year, Flint et al., 2004, Table 1)	10,627	7,764	18,391
Recharge (BCM-Time Series, Flint et al., 2004, Table 1)	11,298	6,404	17,702
Brothers et al. (1996, p. 45)	5,000	1,000	6,000

[a]BBRM: Bootstrap Brute-Force Model
[b]N-ME: Numeric Maxey-Eakin Method Evaluation
[c]N-N: Nichols Method Evaluation

[redacted]

JA_10470

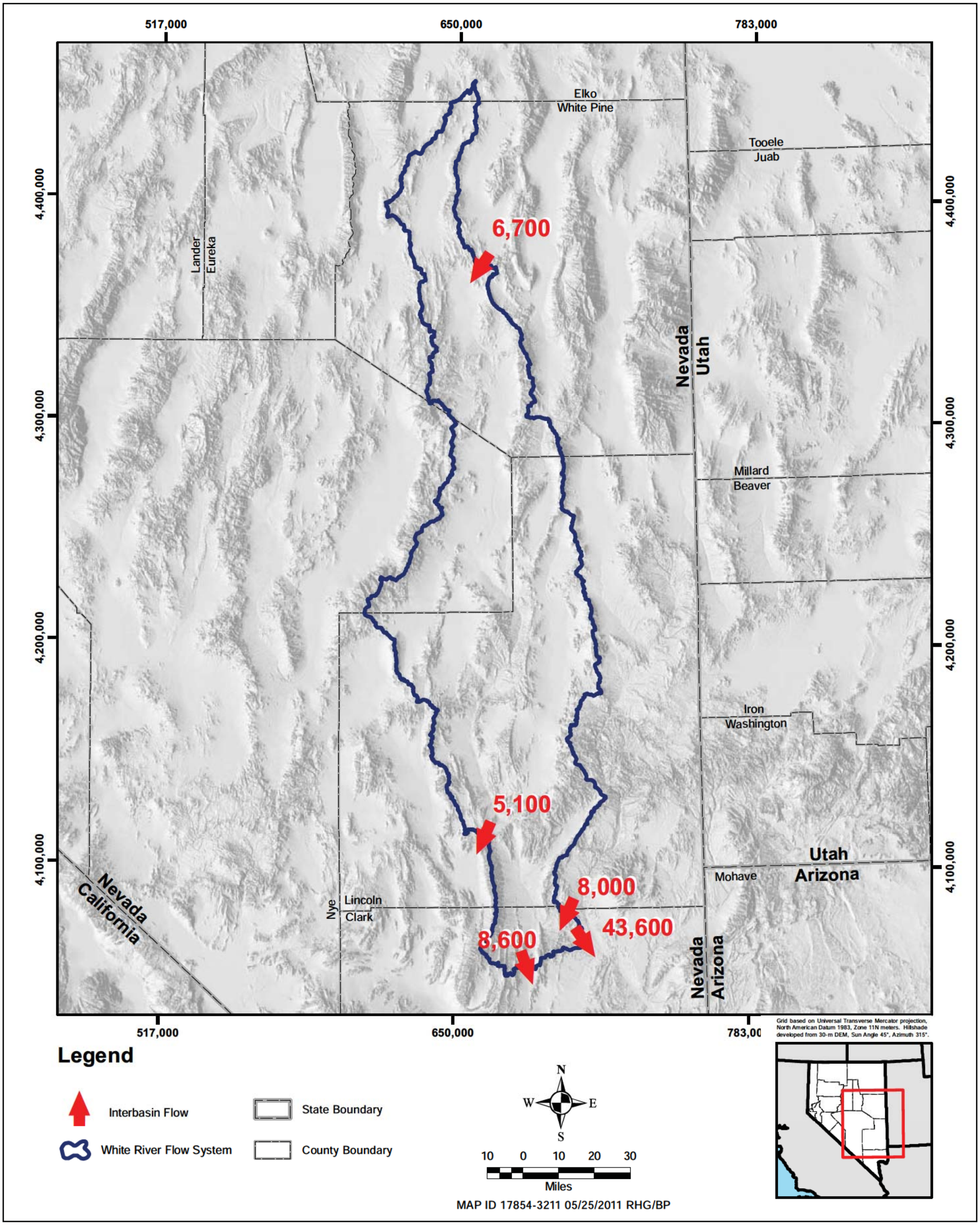


Figure F-9
Locations and Volumes of Interbasin Flow (in afy) for Boundary Segments Used as Constraints for the WRFS

SNWA Exhibit 258

SE ROA 39189

JA_10471

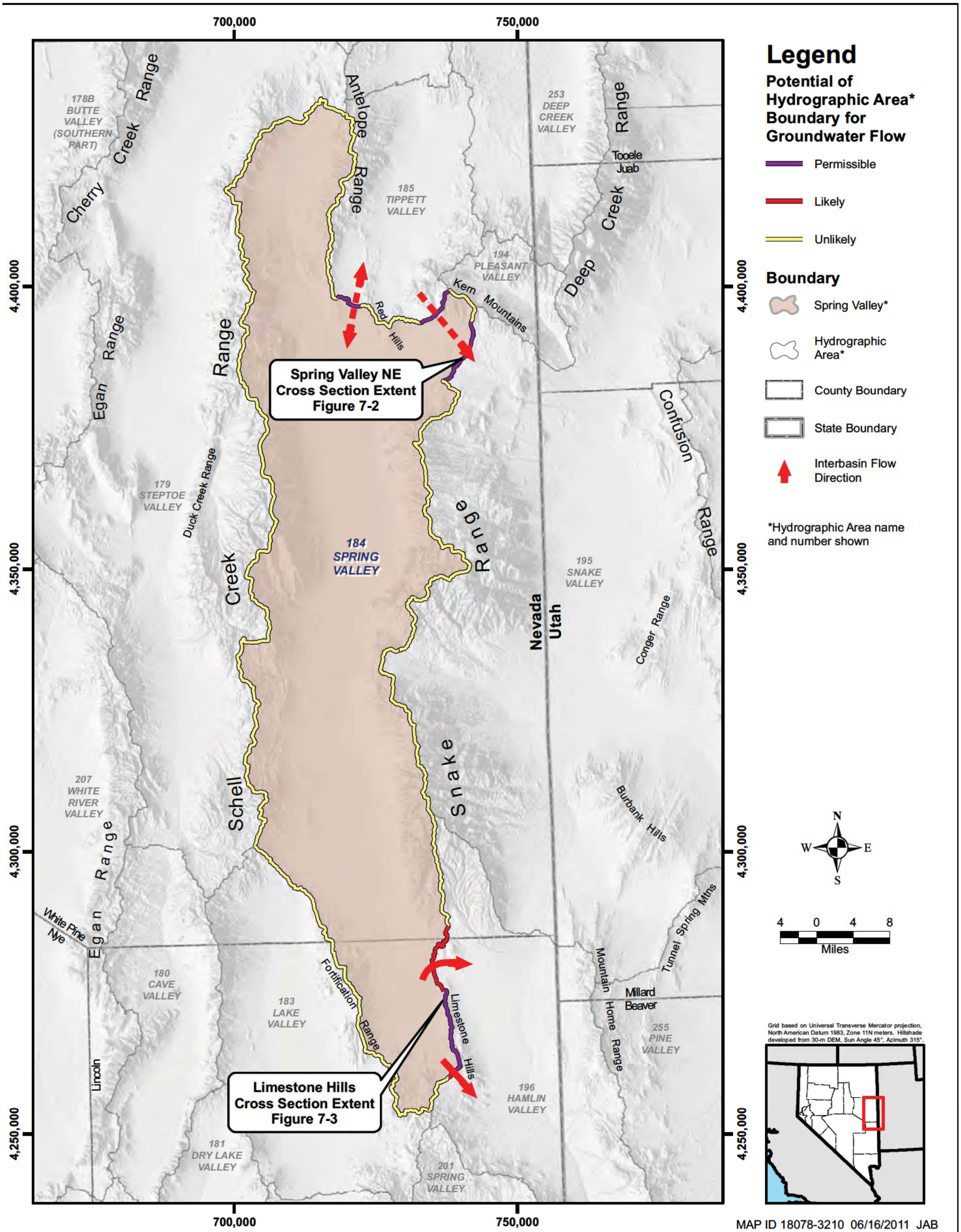
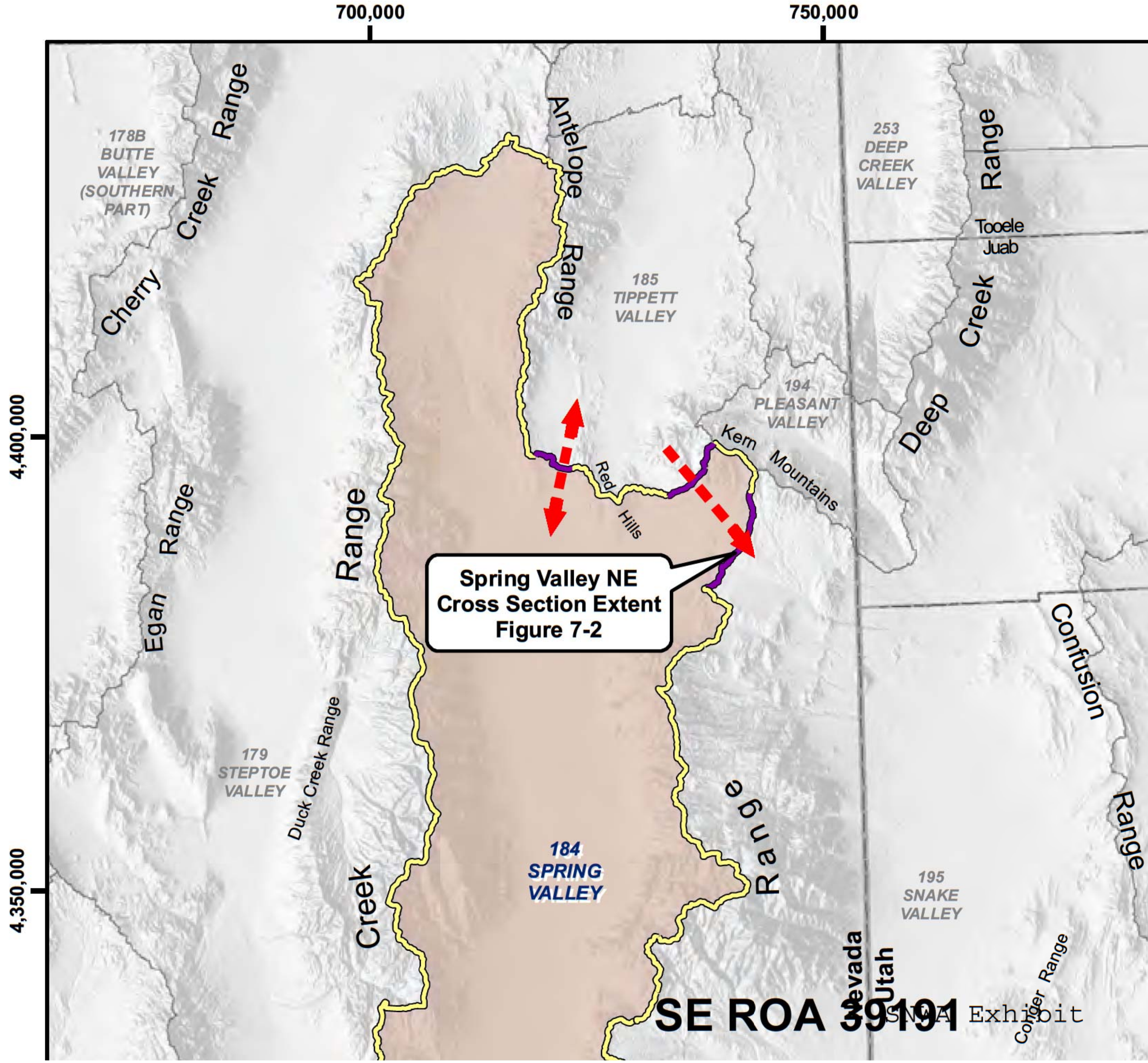


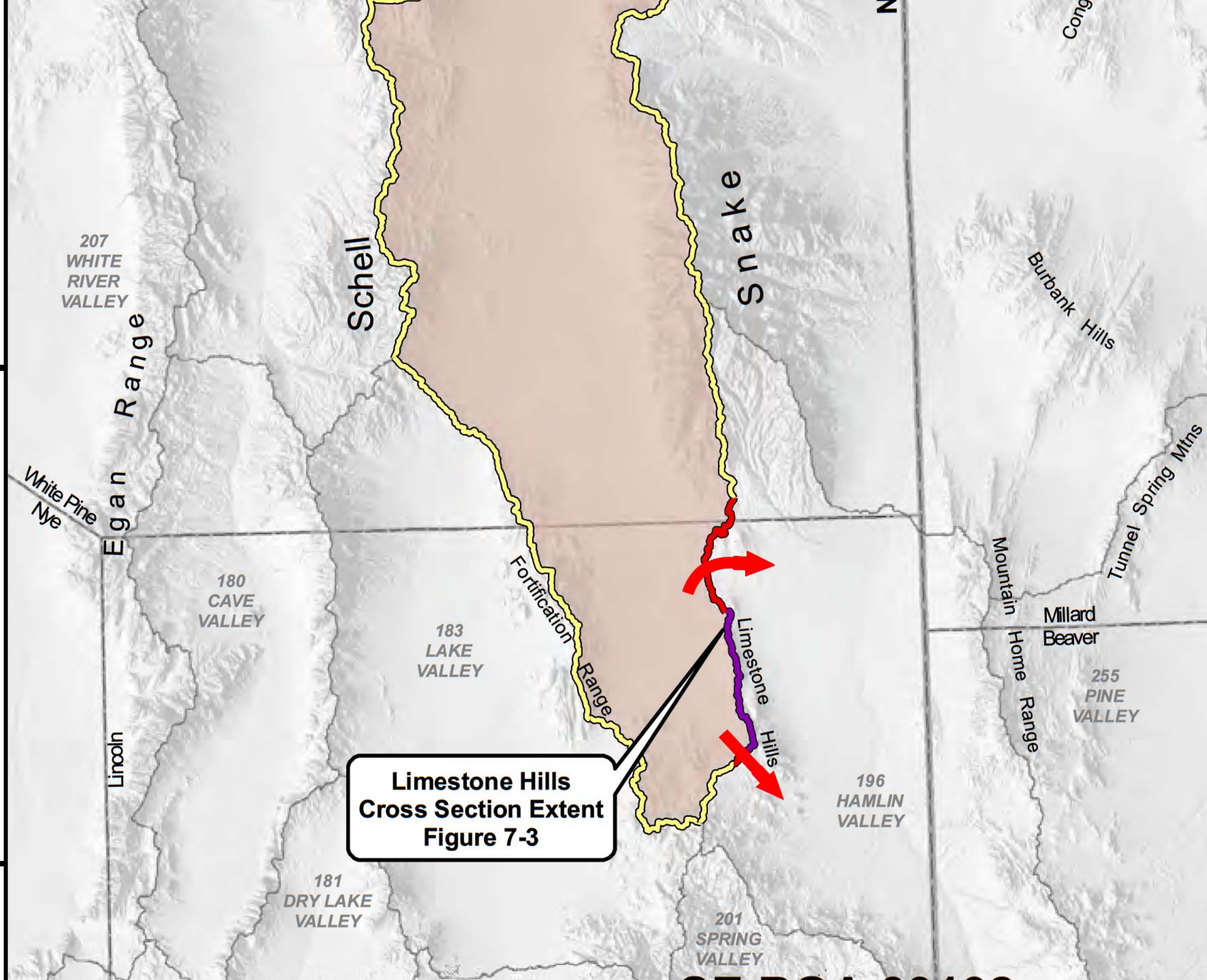
Figure 7-1
Locations of Interbasin Groundwater Flow for Spring Valley

SNWA Exhibit 258

SE ROA 39190

JA_10472


700,000
750,000
4,400,000
4,350,000
178B BUTTE VALLEY (SOUTHERN PART)
Cherry Creek Range
Egan Range
179 STEPTOE VALLEY
Duck Creek Range
Creek Range
Antelope Range
185 TIPPETT VALLEY
Red Hills
194 PLEASANT VALLEY
Kern Mountains
253 DEEP CREEK VALLEY
Deep Creek Range
Tooele
Juab
Spring Valley NE Cross Section Extent Figure 7-2
184 SPRING VALLEY
Range
Confusion Range
195 SNAKE VALLEY
Conger Range
Nevada
Utah



SE ROA 39192

SNWA Exhibit

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JA_10474

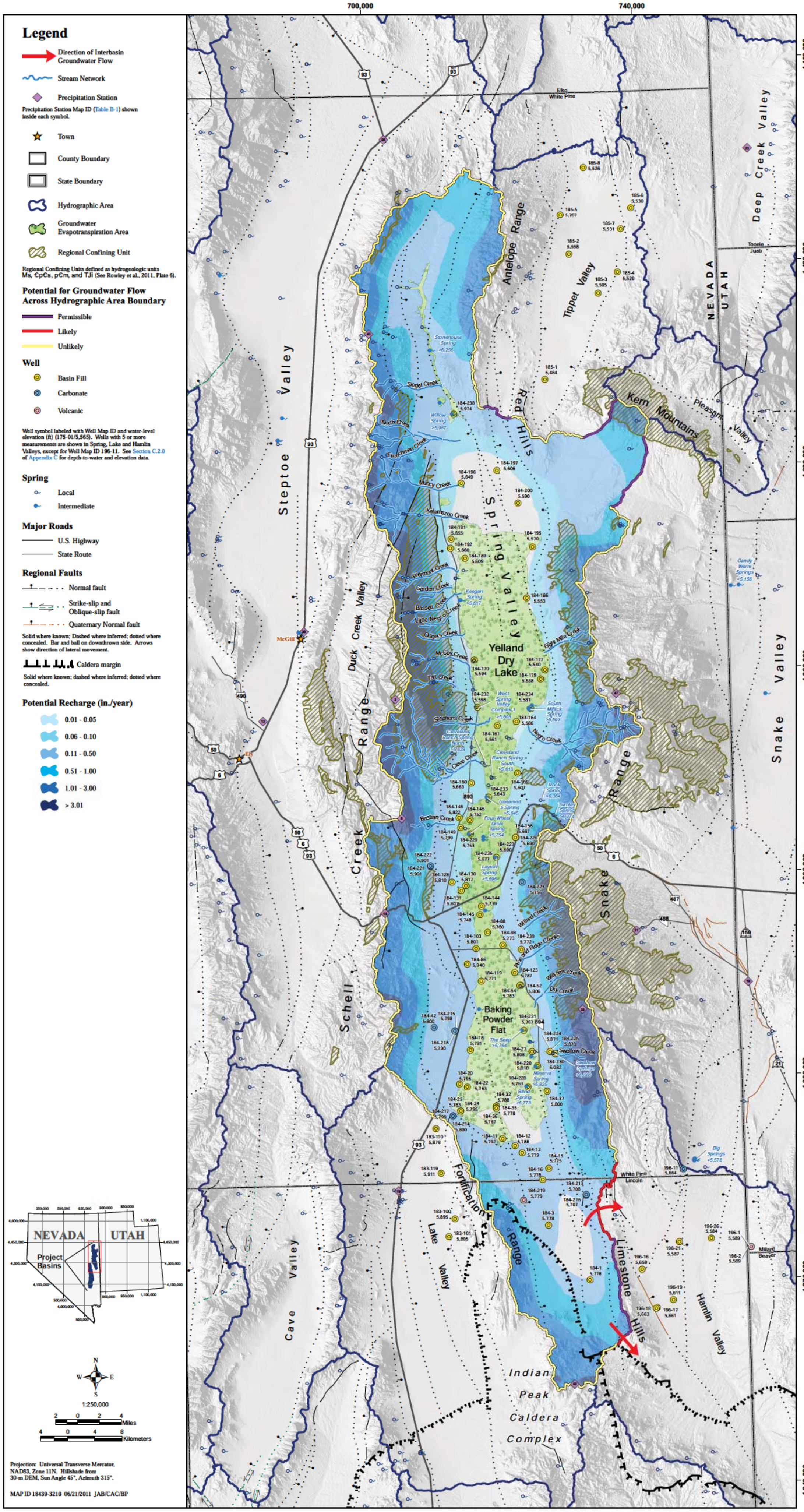
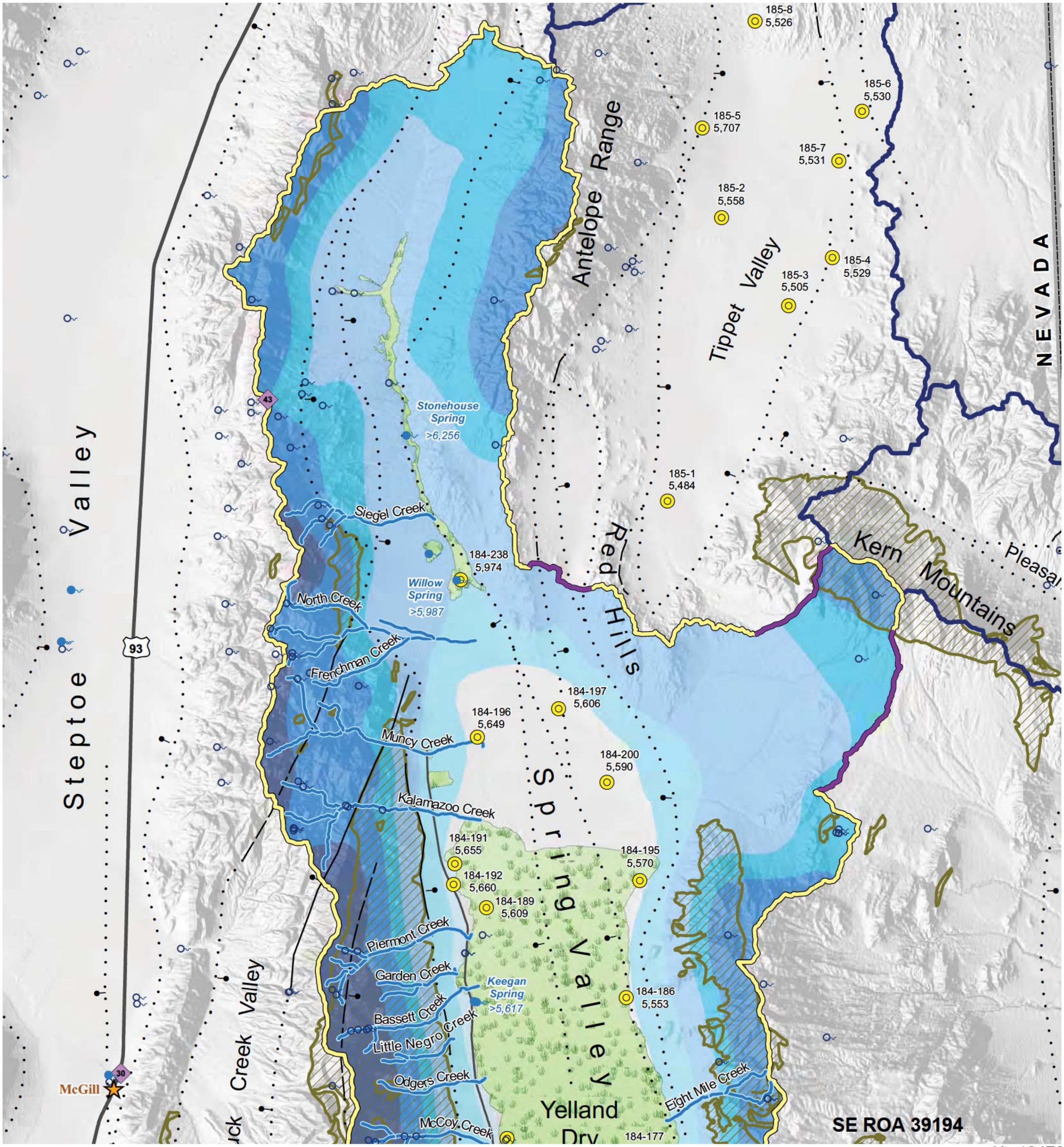


PLATE 1. MAJOR GEOLOGIC AND HYDROLOGIC FEATURES AND CONTROLS ON THE AQUIFER SYSTEM OF SPRING VALLEY AND VICINITY



185-8
5,526
185-6
5,530
185-5
5,707
185-7
5,531
Antelope Range
185-2
5,558
185-4
5,529
185-3
5,505
Tippet Valley
NEVADA
Stonehouse Spring
>6,256
185-1
5,484
Siegel Creek
184-238
5,974
Willow Spring
>5,987
Red Hills
Kern Mountains
Pleasant
North Creek
Frenchman Creek
93
43
184-197
5,606
184-196
5,649
Muncy Creek
184-200
5,590
Kalamazoo Creek
Steptoe Valley
Spring Valley
184-191
5,655
184-192
5,660
184-195
5,570
184-189
5,609
Piermont Creek
Garden Creek
Keegan Spring
>5,617
184-186
5,553
Bassett Creek
Little Negro Creek
Creek Valley
30
McGill
Odgers Creek
Eight Mile Creek
Yelland Dry
McCoy Creek
184-177
SE ROA 39194

JA_10476

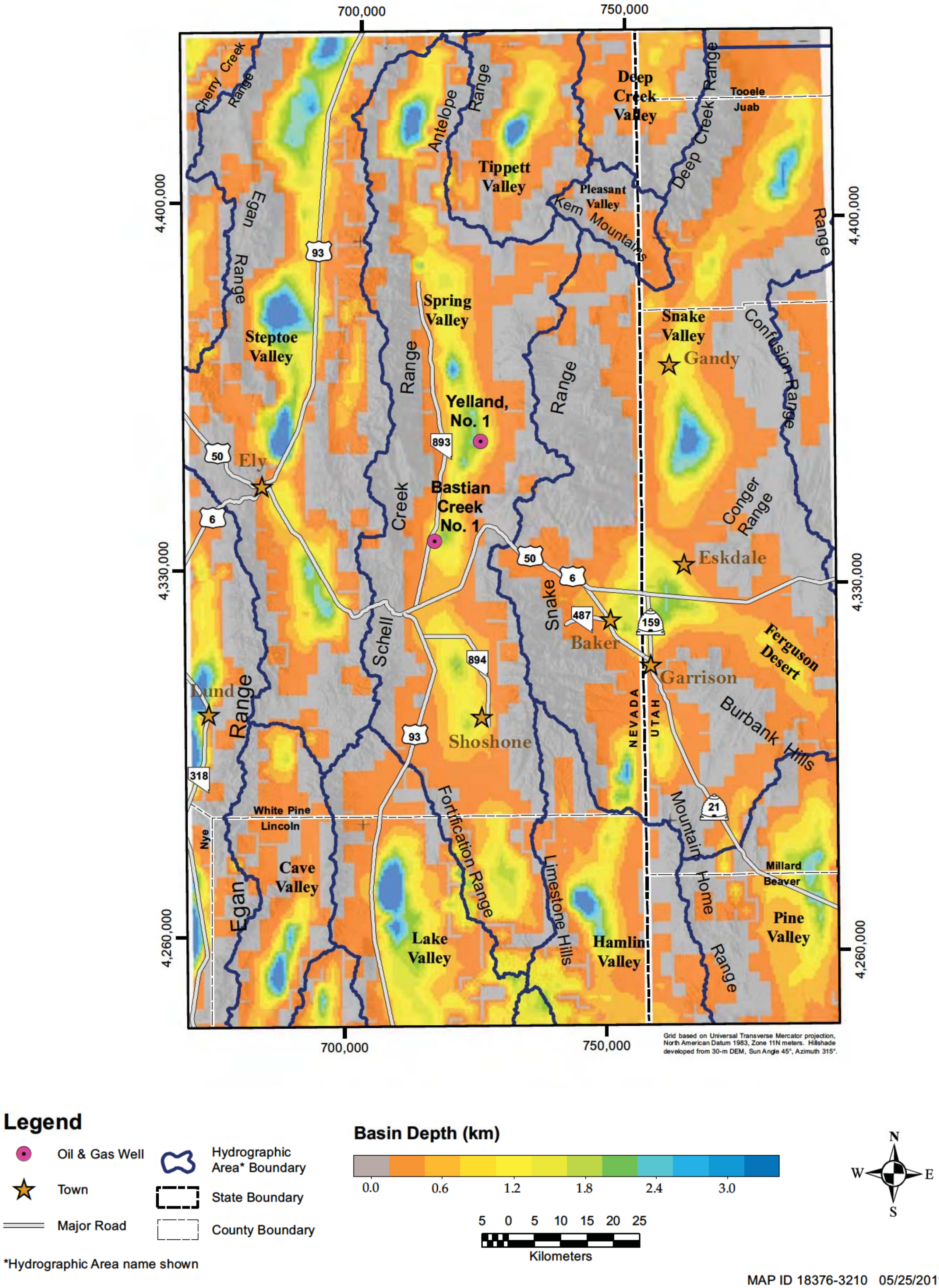
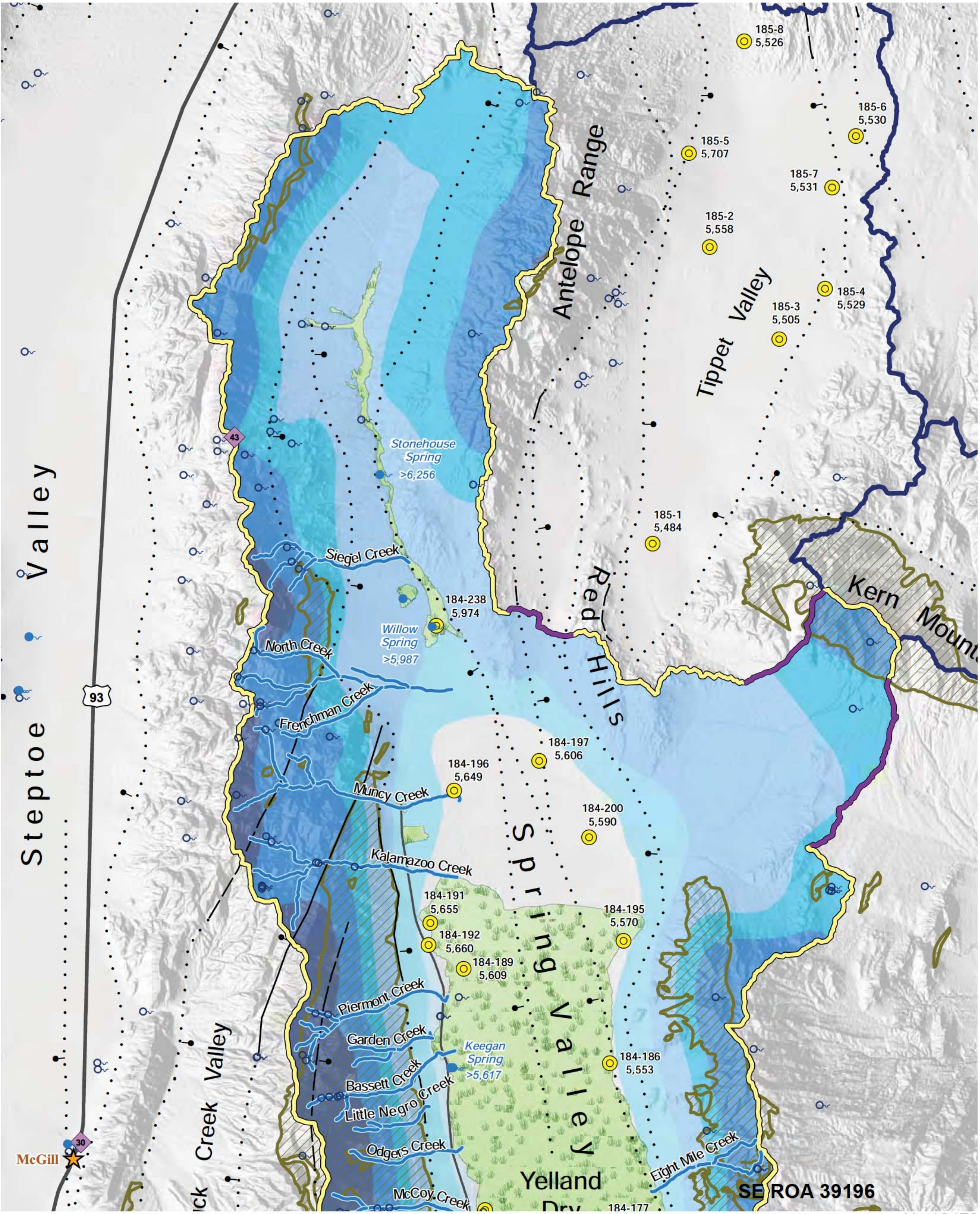


Figure 5-5
Depth to Pre-Cenozoic Basement in Spring and Snake Valleys and Vicinity, Nevada and Utah


Antelope Range
Tippet Valley
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5,526
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185-2
5,558
185-4
5,529
185-3
5,505
Stonehouse Spring
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185-1
5,484
Siegel Creek
184-238
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Willow Spring
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Red Hills
Kern Mount
North Creek
Frenchman Creek
Steptoe Valley
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Bassett Creek
Little Negro Creek
Odgers Creek
Eight Mile Creek
McCoy Creek
Yelland Dry
184-177
Creek Valley
30
McGill

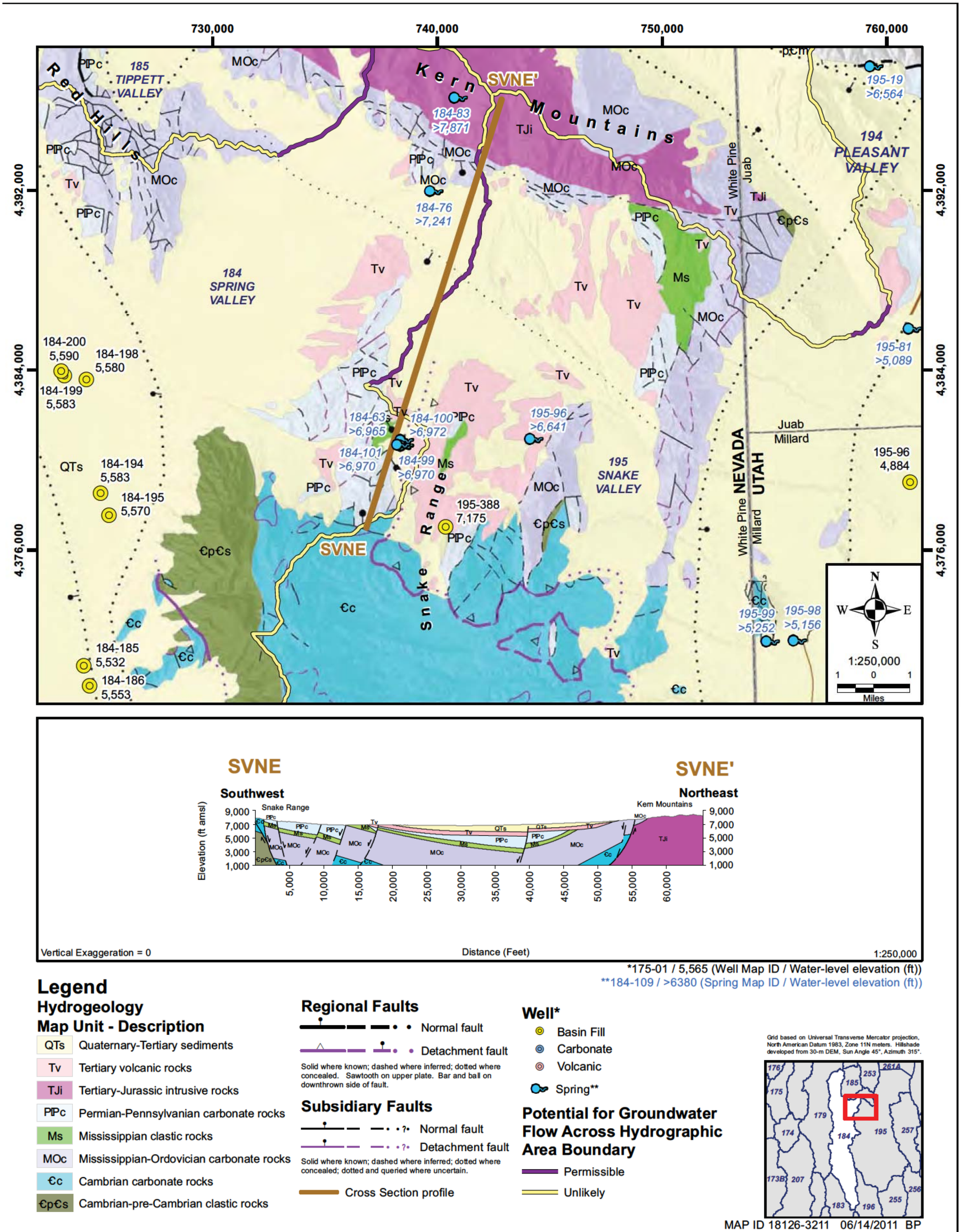
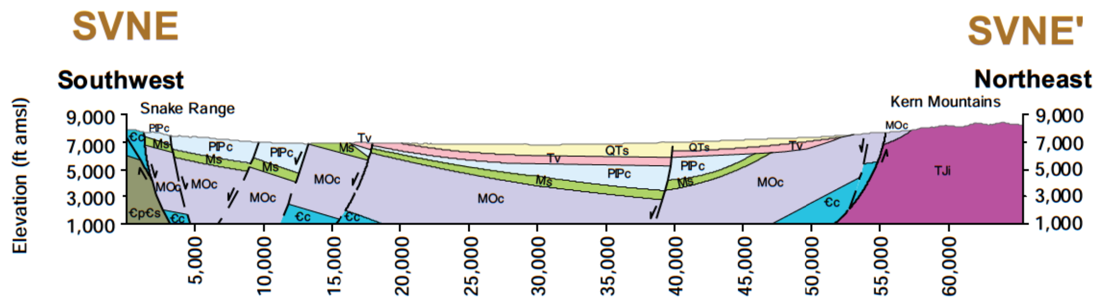


Figure 7-2
Interbasin Groundwater Flow from Spring Valley to Snake Valley

SNWA Exhibit 258

SE ROA 39197



*175-01 / 5,565 (Well Map ID / Water-level elevation (ft))
**184-109 / >6380 (Spring Map ID / Water-level elevation (ft))

Legend

Hydrogeology

Map Unit - Description

Map Unit	Description
QTs	Quaternary-Tertiary sediments
Tv	Tertiary volcanic rocks
TJi	Tertiary-Jurassic intrusive rocks
PIPc	Permian-Pennsylvanian carbonate rocks
Ms	Mississippian clastic rocks
MOc	Mississippian-Ordovician carbonate rocks
€c	Cambrian carbonate rocks
€p€s	Cambrian-pre-Cambrian clastic rocks

Regional Faults

- Normal fault
- Detachment fault

Solid where known; dashed where inferred; dotted where concealed. Sawtooth on upper plate. Bar and ball on downthrown side of fault.

Subsidiary Faults

- Normal fault
- Detachment fault

Solid where known; dashed where inferred; dotted where concealed; dotted and queried where uncertain.

- Cross Section profile

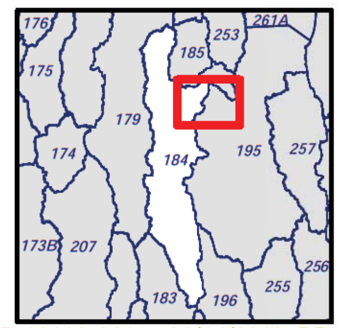
Well*

- Basin Fill
- Carbonate
- Volcanic
- Spring**

Potential for Groundwater Flow Across Hydrographic Area Boundary

- Permissible
- Unlikely

Grid based on Universal Transverse Mercator projection, North American Datum 1983, Zone 11N meters. Hillshade developed from 30-m DEM, Sun Angle 45°, Azimuth 315°.



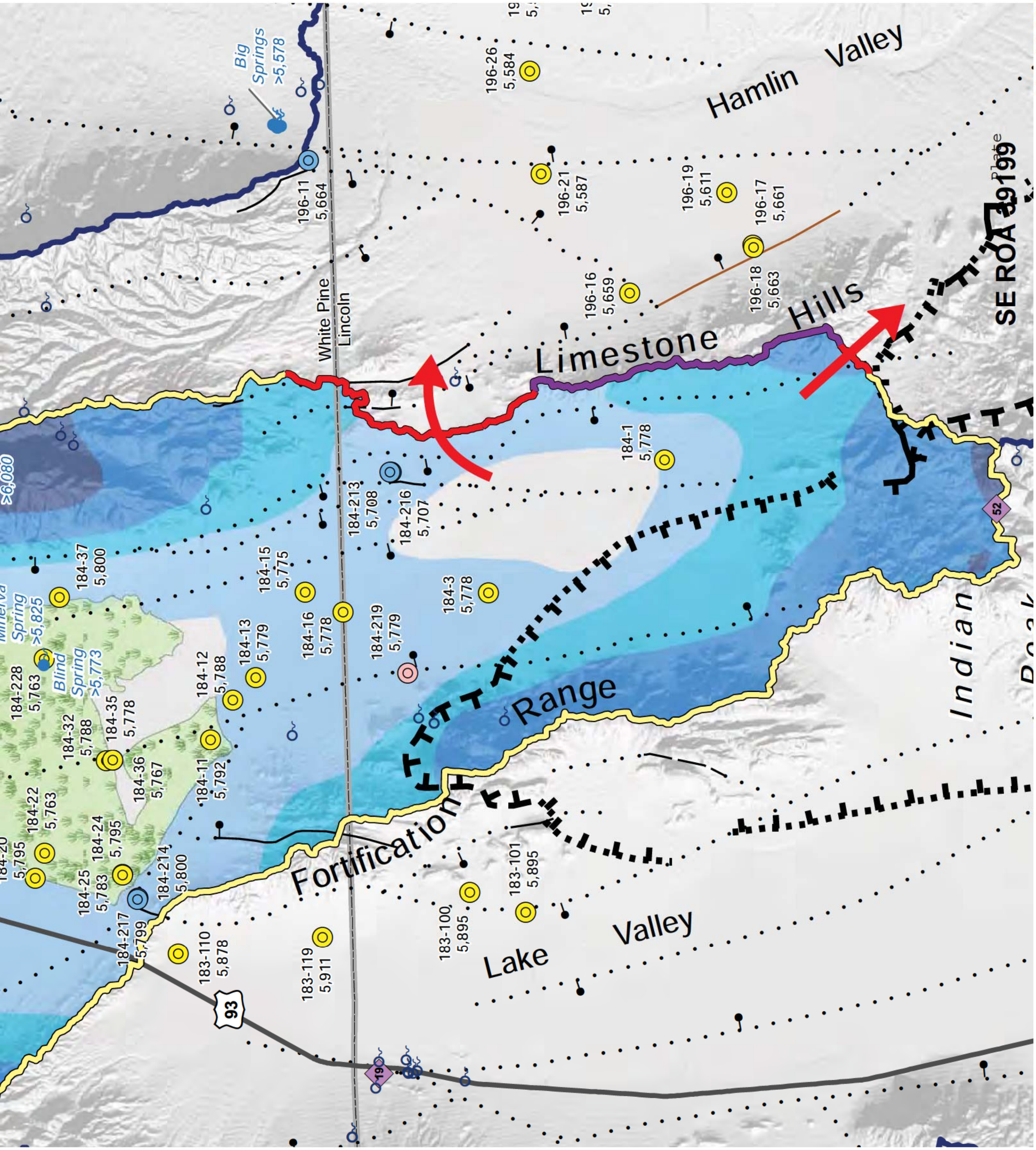
MAP ID 18126-3211 06/14/2011 BP

Figure 7-2
Interbasin Groundwater Flow from Spring Valley to Snake Valley

SE ROA 39198

SNWA Exhibit 258

JA_10480



Hamlin Valley
Limestone Hills
Fortification Range
Lake Valley
Indian
White Pine
Lincoln
Big Springs >5,578
Blind Spring >5,773
SE ROA 39199
93

JA_10481

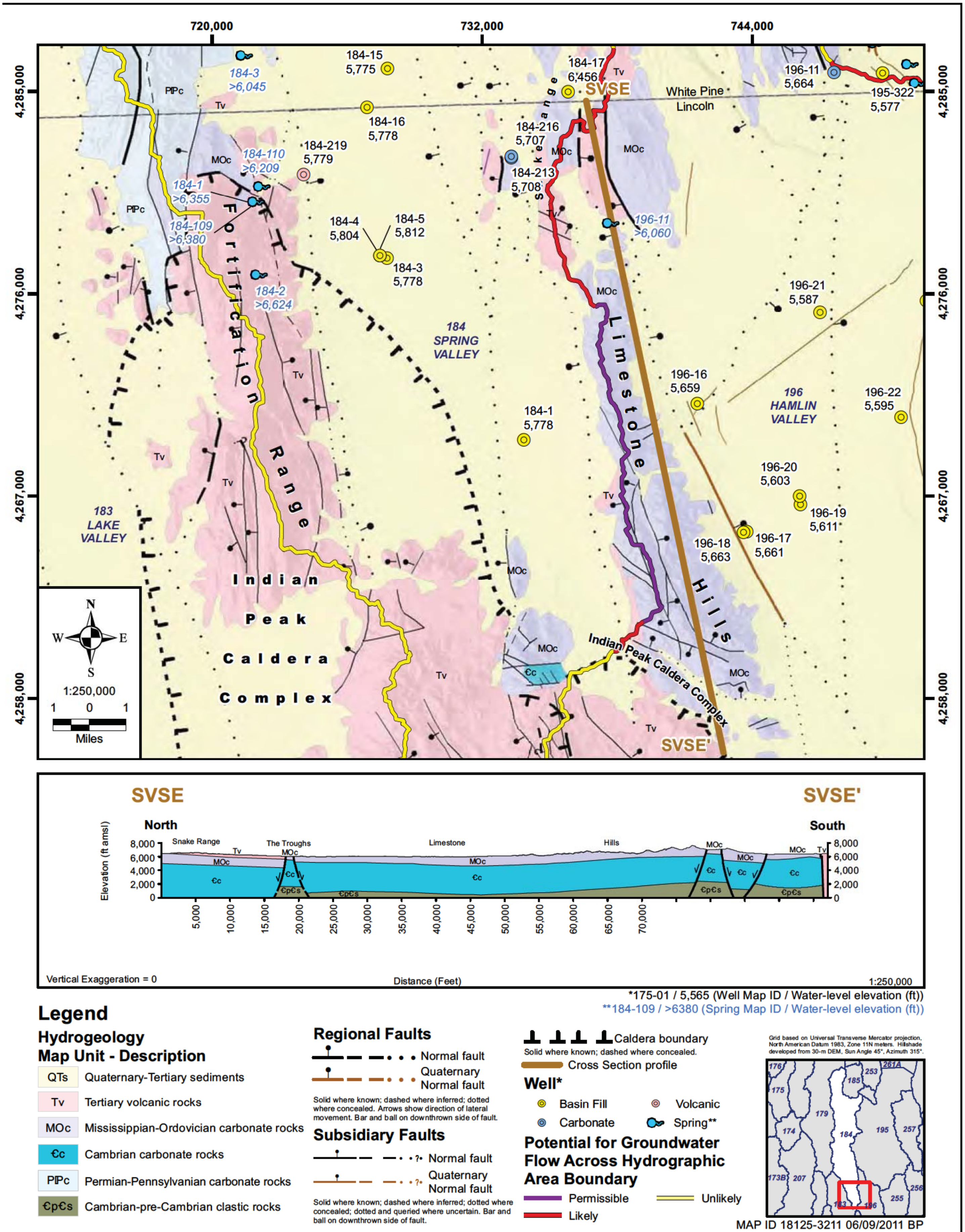
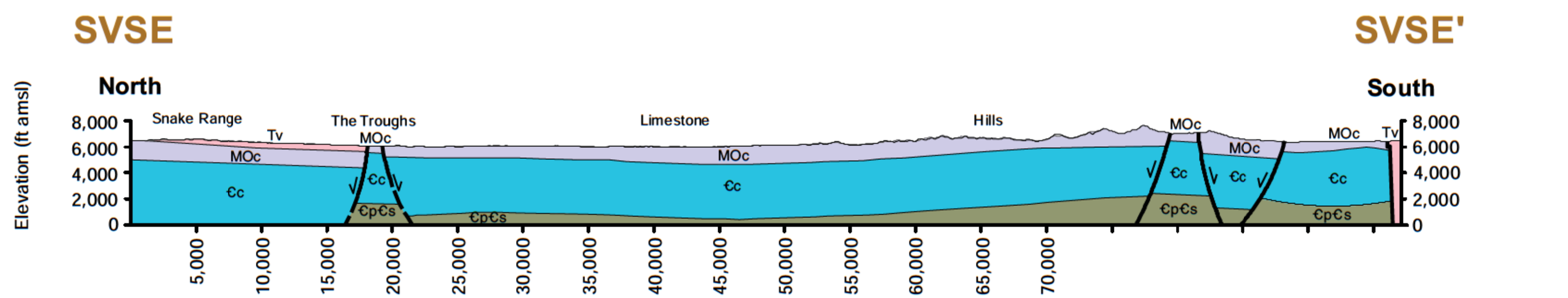


Figure 7-3
Interbasin Groundwater Flow from Spring to Hamlin Valley



*175-01 / 5,565 (Well Map ID / Water-level elevation (ft))
**184-109 / >6380 (Spring Map ID / Water-level elevation (ft))

Legend

Hydrogeology Map Unit - Description

QTs	Quaternary-Tertiary sediments
Tv	Tertiary volcanic rocks
MOc	Mississippian-Ordovician carbonate rocks
€c	Cambrian carbonate rocks
PIPc	Permian-Pennsylvanian carbonate rocks
€p€s	Cambrian-pre-Cambrian clastic rocks

Regional Faults

Normal fault
Quaternary Normal fault

Solid where known; dashed where inferred; dotted where concealed. Arrows show direction of lateral movement. Bar and ball on downthrown side of fault.

Subsidiary Faults

Normal fault
Quaternary Normal fault

Solid where known; dashed where inferred; dotted where concealed; dotted and queried where uncertain. Bar and ball on downthrown side of fault.

Caldera boundary
Solid where known; dashed where concealed.

Cross Section profile

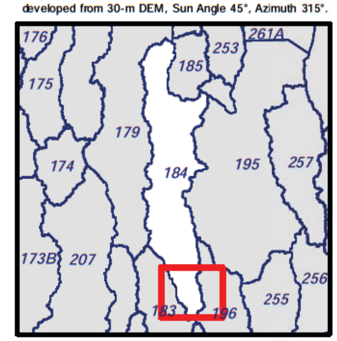
Well*

Basin Fill
Volcanic
Carbonate
Spring**

Potential for Groundwater Flow Across Hydrographic Area Boundary

Permissible
Unlikely
Likely

Grid based on Universal Transverse Mercator projection, North American Datum 1983, Zone 11N meters. Hillshade developed from 30-m DEM, Sun Angle 45°, Azimuth 315°.



MAP ID 18125-3211 06/09/2011 BP

Figure 7-3

Interbasin Groundwater Flow from Spring to Hamlin Valley

SE ROA 39201

SNWA Exhibit 258

JA_10483

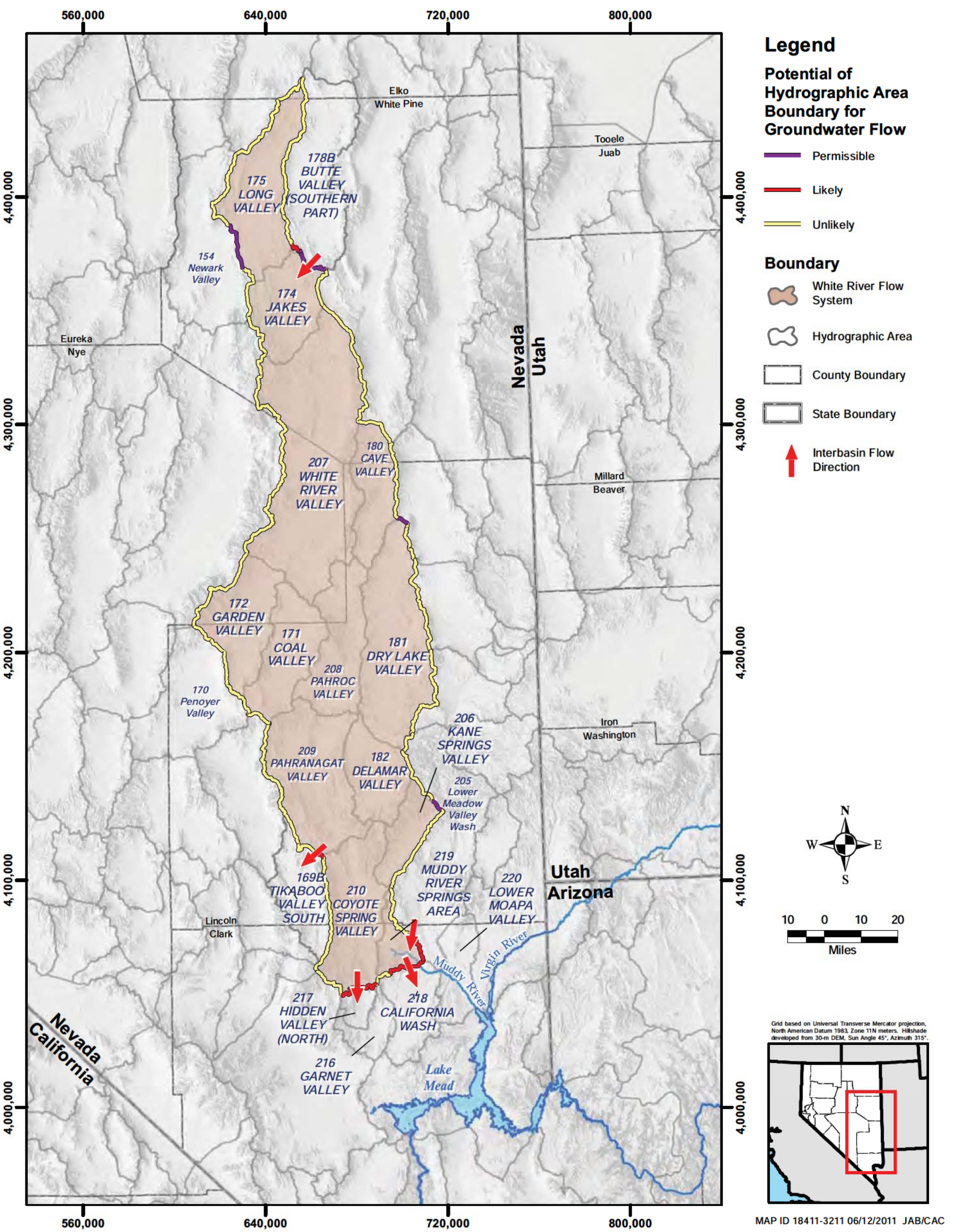
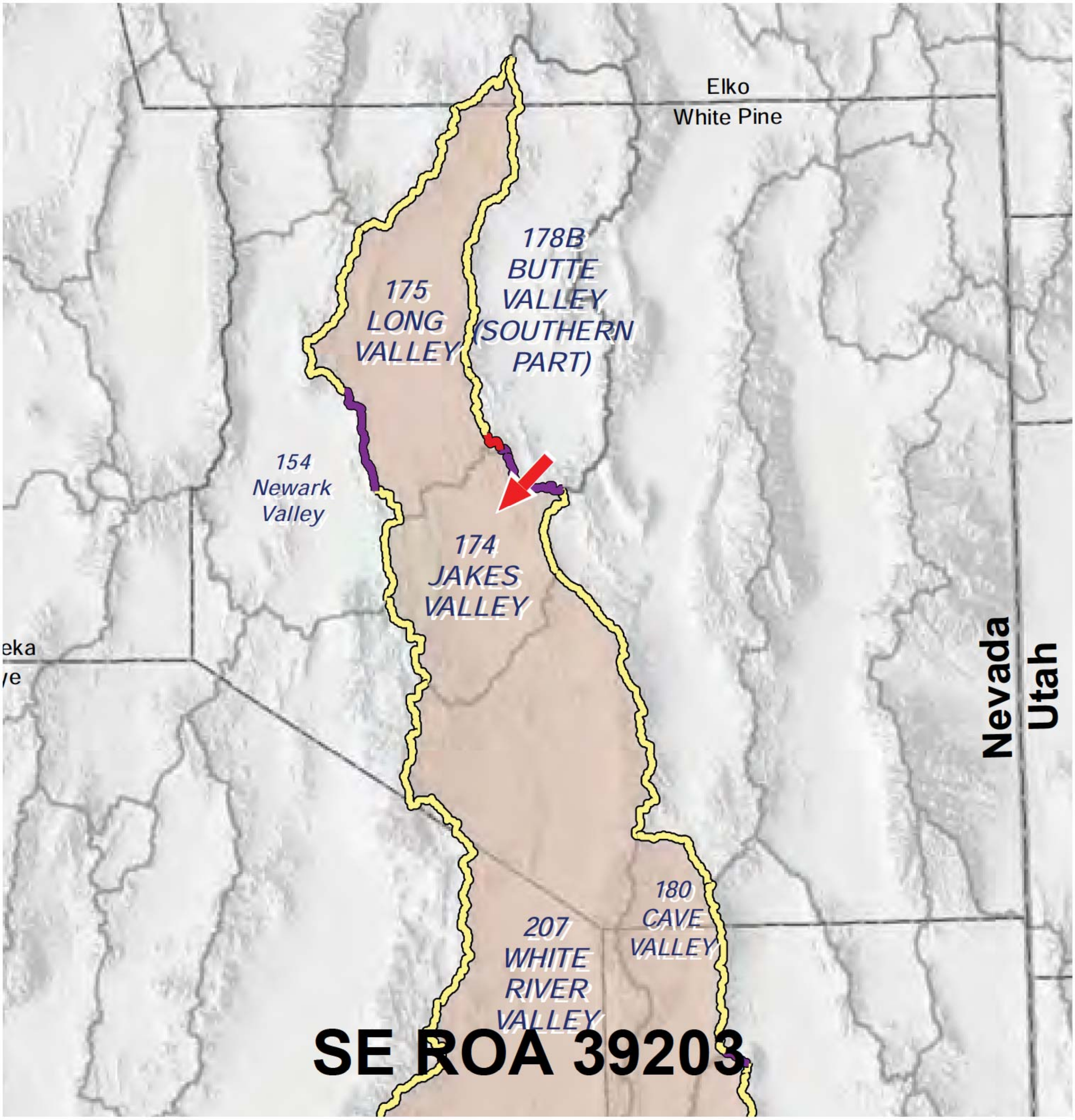
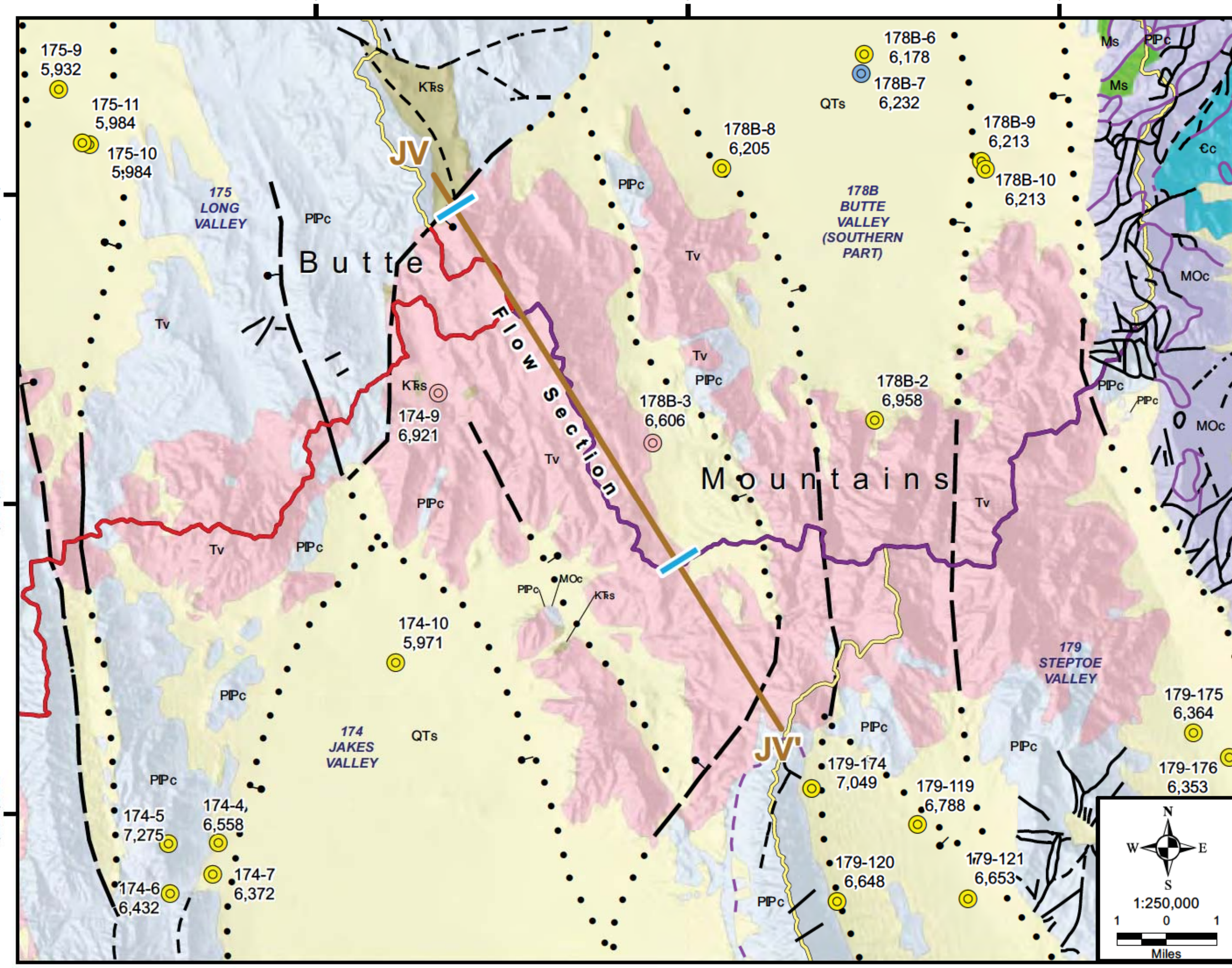
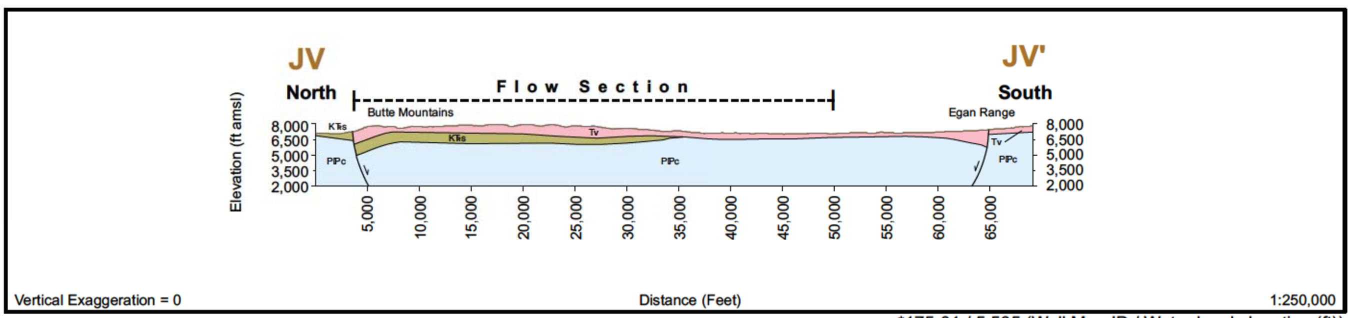


Figure E-1
Locations of Interbasin Flow for the External Boundaries


Elko
White Pine
178B
BUTTE
VALLEY
(SOUTHERN
PART)
175
LONG
VALLEY
154
Newark
Valley
174
JAKES
VALLEY
eka
ye
Nevada
Utah
180
CAVE
VALLEY
207
WHITE
RIVER
VALLEY

SE ROA 39203





*175-01 / 5,565 (Well Map ID / Water-level elevation (ft))

Legend

Hydrogeology Map Unit - Description

- QTs Quaternary-Tertiary sediments
- Tv Tertiary volcanic rocks
- KTrs Cretaceous-Triassic clastic rocks
- PIPc Permian-Pennsylvanian carbonate rocks
- Ms Mississippian clastic rocks
- MOc Mississippian-Ordovician carbonate rocks
- Єc Cambrian carbonate rocks

Regional Faults

- Normal fault
- Detachment fault

Solid where known; dashed where inferred; dotted where concealed. Bar and ball on downthrown side of fault.

Subsidiary Faults

- ? Normal fault
- ? Detachment fault

Solid where known; dashed where inferred; dotted where concealed; dotted and queried where uncertain. Bar and ball on downthrown side of fault.

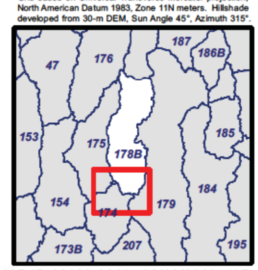
Well*

- Basin Fill
- Carbonate
- Volcanic

Potential for Groundwater Flow Across Hydrographic Area Boundary

- Permissible
- Likely
- Unlikely
- Cross Section profile

Grid based on Universal Transverse Mercator projection, North American Datum 1983, Zone 11N meters. Hillshade developed from 30-m DEM, Sun Angle 45°, Azimuth 315°.



MAP ID 18122-3211 06/13/2011 JAB

Figure E-2
Interbasin Groundwater Flow from Butte Valley (Southern) to Jakes Valley

SNWA Exhibit 258

SE ROA 39204

JA_10486

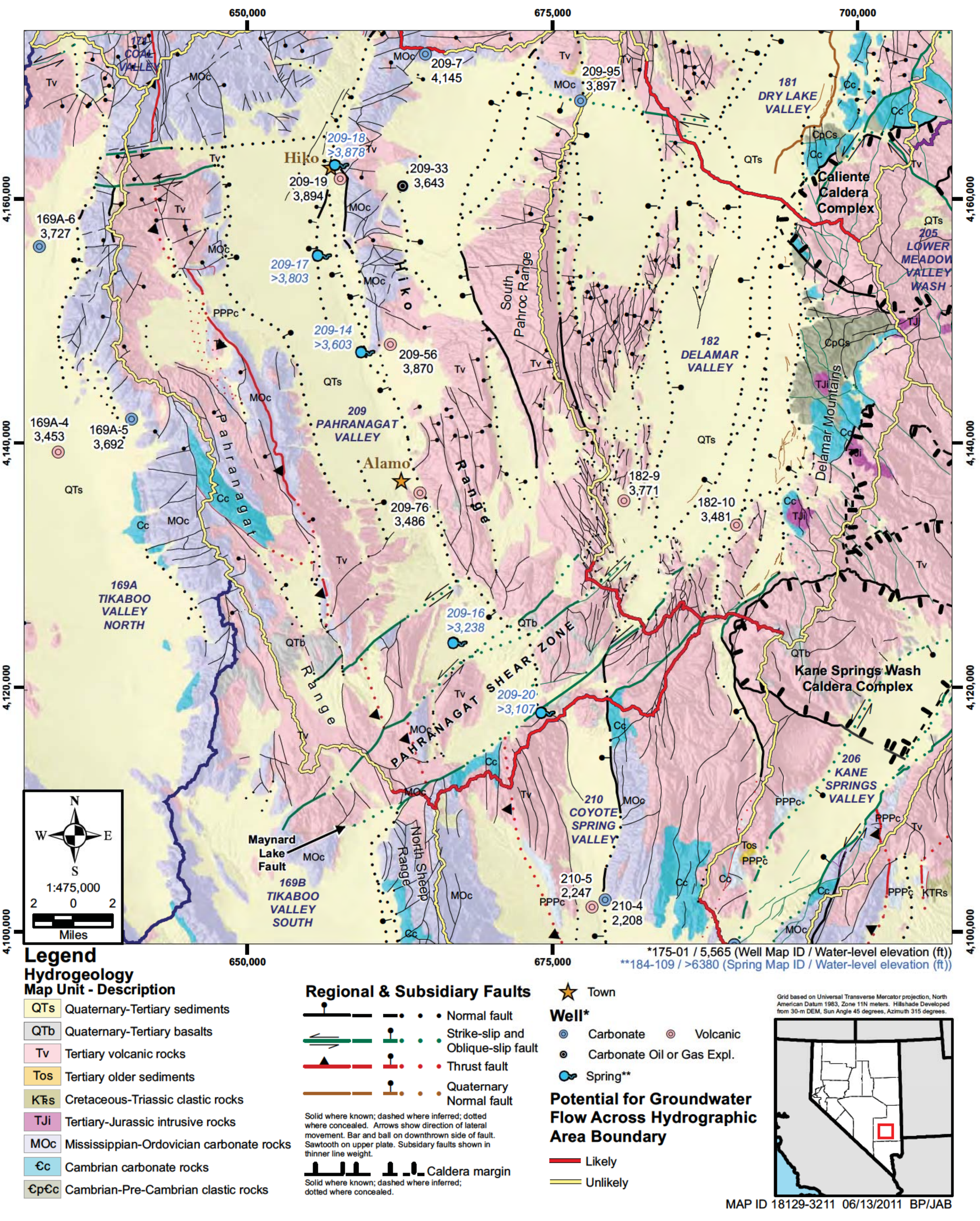
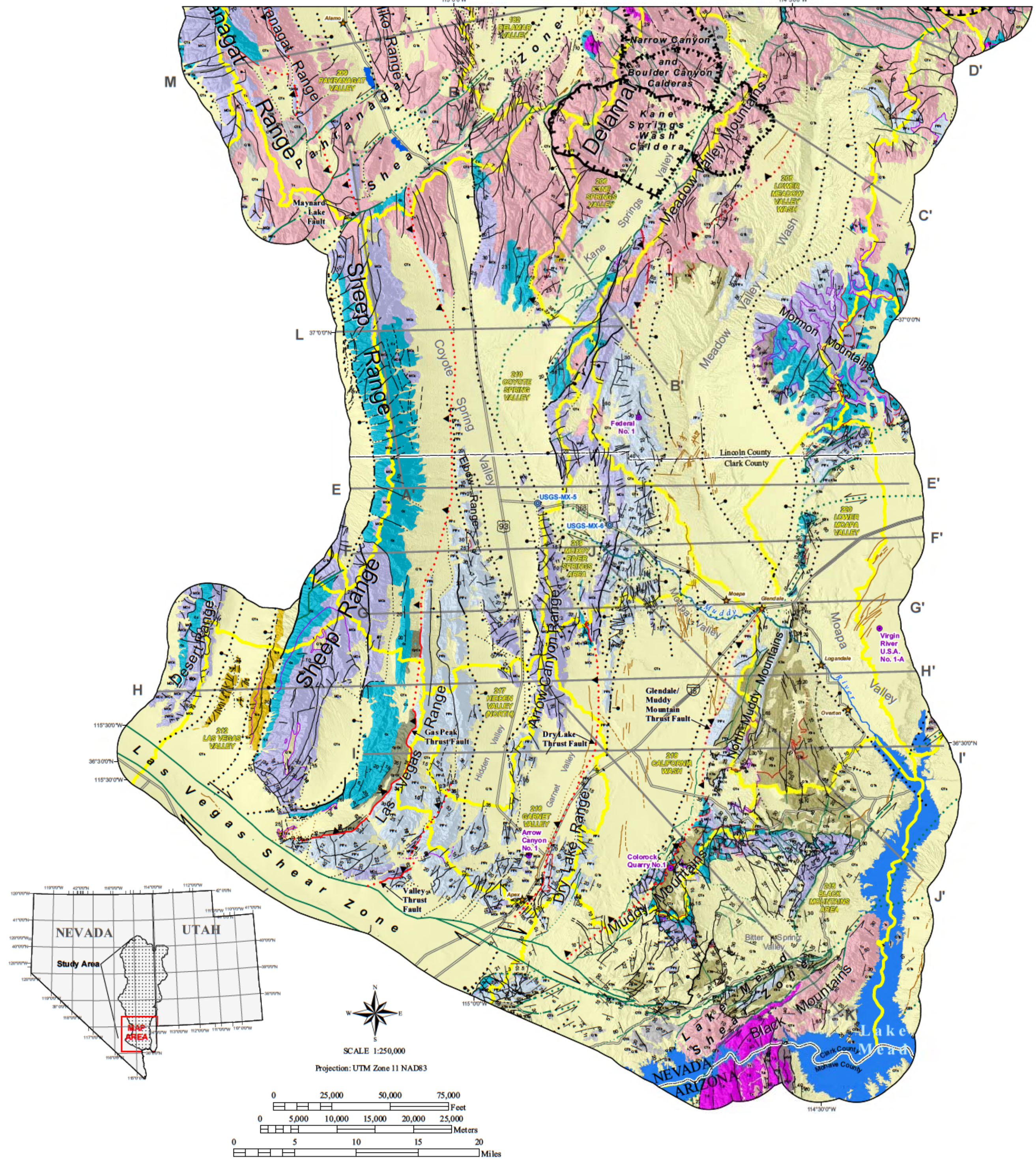


Figure 7-10
Hydrogeology of the Pahranagat Shear Zone and Vicinity



Explanation

Hydrogeologic Units

QTs	Quaternary-Tertiary sediments
QTb	Quaternary-Tertiary basalts
Tv	Tertiary volcanic rocks
Tos	Tertiary older sediments & mega breccia that is located on the western flank of the Sheep Range
TJi	Tertiary-Jurassic intrusive rocks
KTrs	Cretaceous-Triassic clastic rocks
PIPc	Permian-Pennsylvanian carbonate rocks
Ms	Mississippian siliciclastic rocks
MOc	Mississippian-Ordovician carbonate rocks
€c	Cambrian carbonate rocks
€p€s	Cambrian-Precambrian siliciclastic rocks
p€m	Precambrian metamorphic rocks
	Open water

Regional Faults

Normal Fault
Solid where known; Dashed where inferred; dotted where concealed. Bar and ball on downthrown side.

Strike-slip Fault
Solid where known; Dashed where inferred; dotted where concealed. Arrows show direction of movement.

Thrust Fault
Solid where known; Dashed where inferred; dotted where concealed. Sawteeth on upper plate.

Detachment Fault
Solid where known; Dashed where inferred; dotted where concealed. Hollow sawteeth on upper plate.

Quaternary Normal Fault
Solid where known; Dashed where inferred; dotted where concealed.

Subsidiary Faults

Normal Fault
Solid where known; dashed where inferred; dotted where concealed; dotted and queried where uncertain. Bar and ball on downthrown side.

Strike-slip Fault
Solid where known; dashed where inferred; dotted where concealed; dotted and queried where uncertain. Arrows show direction of movement.

Thrust Fault
Solid where known; dashed where inferred; dotted where concealed; dotted and queried where uncertain. Sawteeth on upper plate.

Detachment Fault
Solid where known; dashed where inferred; dotted where concealed; dotted and queried where uncertain. Hollow sawteeth on upper plate.

Quaternary Normal Fault
Solid where known; dashed where inferred; dotted where concealed; dotted and queried where uncertain. Bar and ball on downthrown side.

Caldera Boundary
Solid where known; dashed where inferred; dotted where concealed

Cross Sections (Plates 8 and 9)

Major Road

Transverse Zone (Zone of possible disruption)

Strike and Dip of Beds

Overturned Beds

Oil Well Data Used in Cross Sections
Nevada: Nevada Bureau of Mines and Geology

Well

Town

Hydrographic Basin

SOUTHERN NEVADA WATER AUTHORITY
MAP ID 18292-3211 05/17/2011 BP

PLATE 7. HYDROGEOLOGY OF SOUTHERN LINCOLN AND NORTHERN CLARK COUNTIES, NEVADA, AND ADJACENT AREAS, ARIZONA

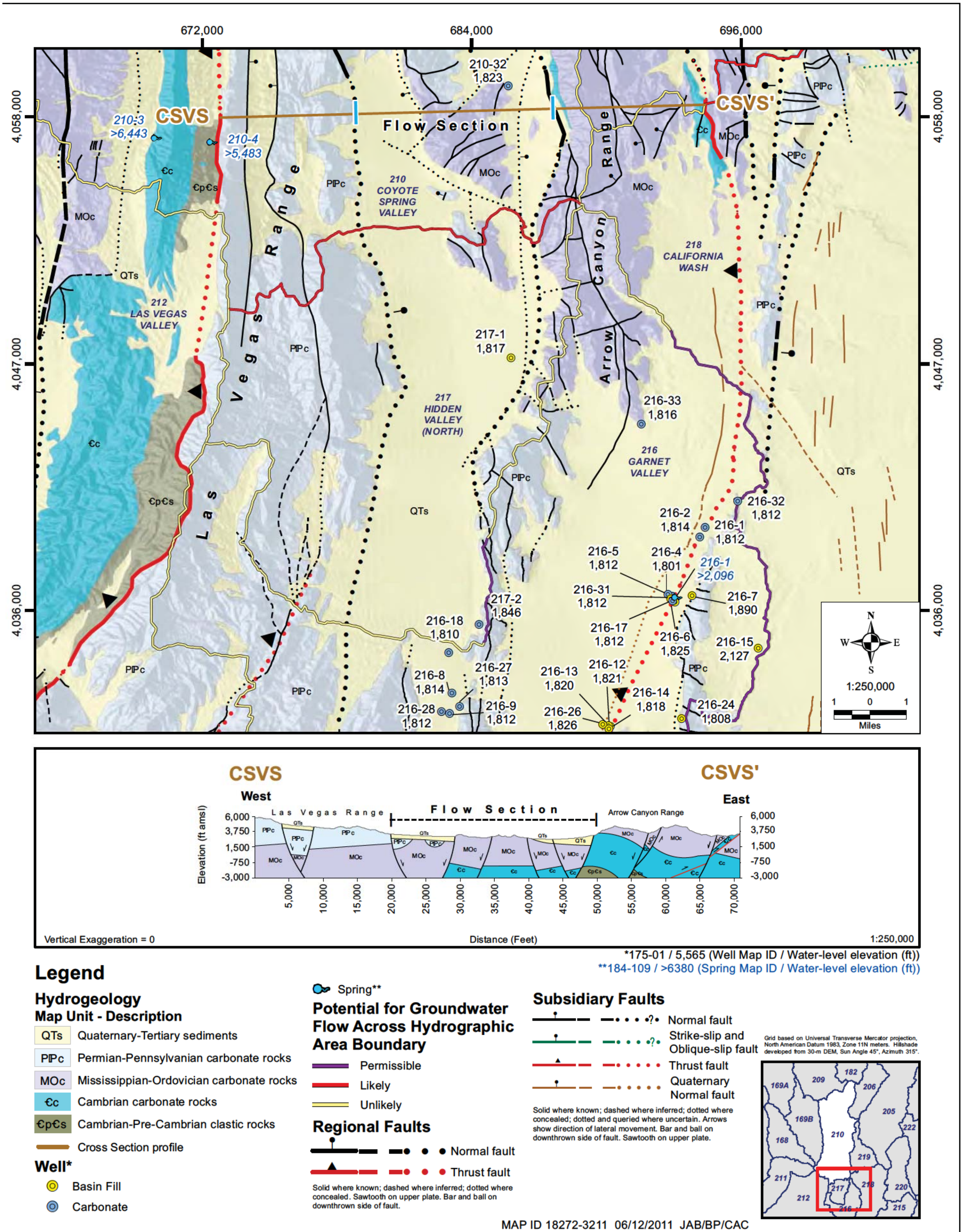


Figure E-3
Interbasin Groundwater Flow from Coyote Spring to Hidden Valley

Table E-1
Carbonate-Rock Aquifer Transmissivities

HA	Well	Transmissivity (ft^2/d)	Geometric Mean Transmissivity (ft^2/d)	Test Duration	Reference
210	MX-4	200,136	117,847	77 hours	IT Corporation (1996, App. A)
		204,440		77 hours	Belcher et al. (2001, App. A)
		40,000		5 days	Bunch and Harrill (1984, p. 119)
	MX-5	281,912	321,310	30 days	IT Corporation (1996, App. A)
		1,431,080		30 days	IT Corporation (1996, App. A)
		287,292		30 days	IT Corporation (1996, App. A)
		250,000		30 days	Ertec Western, Inc. (1981, p. 51)
		250,000		80 days	Bunch and Harrill (1984, p. 119)
		168,000		72 hours	Johnson et al. (1998, p. 5)
		290,520		326 hours	Belcher et al. (2001, App. A)
216	RW-1	404,800	404,800	72 hours	SRK Consulting (2001, Fig. 5)
	Harvey Well	411,400	411,400	72 hours	SRK Consulting (2001, Fig. 7)
218	ECP-2	109,500	109,500	7 days	Johnson et al. (2001, App. A, p. 4)
	TH-2	53,820	53,820	7 days	Johnson et al. (2001, App. A, p. 4)
219	Arrow Canyon	312,040	312,040	121 days	Belcher et al. (2001, App. A)
	EH-4	365,840	365,840	121 days	Belcher et al. (2001, App. A)

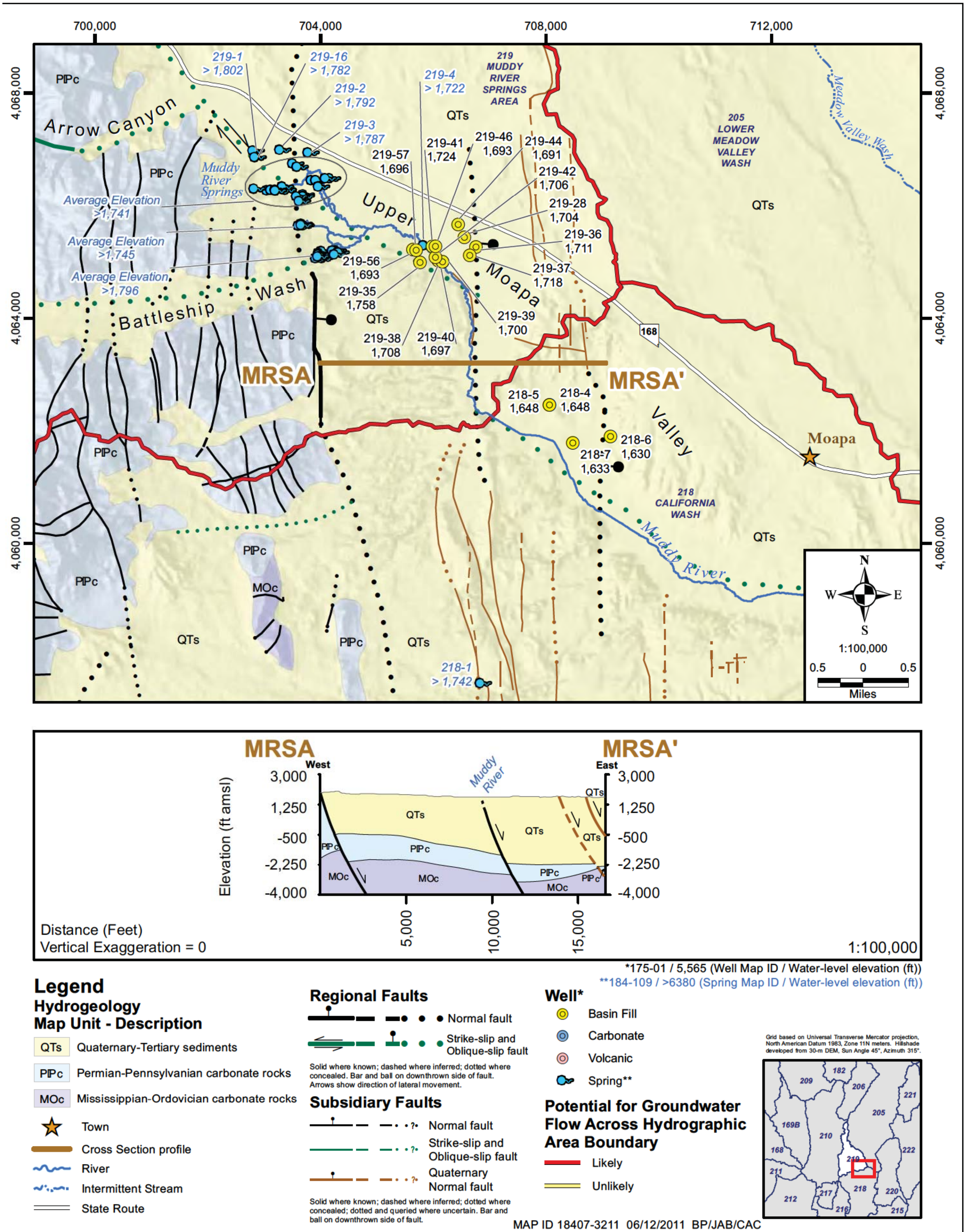


Figure E-4
Interbasin Groundwater Flow from MRSA to California Wash

Table E-2
Estimate of Transmissivity for Basin-Fill Sediments in Muddy River Springs Area

Location	Well	Transmissivity (ft^2/d)	Geometric Mean Transmissivity (ft^2/d)	Test Duration	Reference
HA 205	Well 3	23,527.8	18,585	168 hrs	URS (2001)
	Well 3	14,680.4			
	MW-1 (Casing A)	7,188	6,998	168 hrs	URS (2001)
	MW-1 (Casing A)	6,813.7			
HA 222 (Virgin River Valley)	WX-31	7,751	9,282	62 days	Burbey et al. (2006)
	WX-31	4,844			
	WX-31	15,071			
	WX-31	7,320			
	WX-31	7,751			
	Unnamed well near WX-31	19,915		NR	
	BVSMW1	5,939	5,829	72 hrs	Pompeo (2008)
	BVSMW2	5,919			
	BVSMW3	5,635			
	HWSMW1	19,465	19,957	72 hrs	Pompeo (2008)
	HWSMW2	20,462			
	HWMW-1	9,130	6,283	72 hrs	Pompeo (2008)
	HWMW-2	8,464			
	HWMW-3	4,735			
	HWMW-4	4,260			
	Well 26	20,000	22,361	48 hrs	Johnson (1995)
	Well 26	25,000			

NR = Not Reported

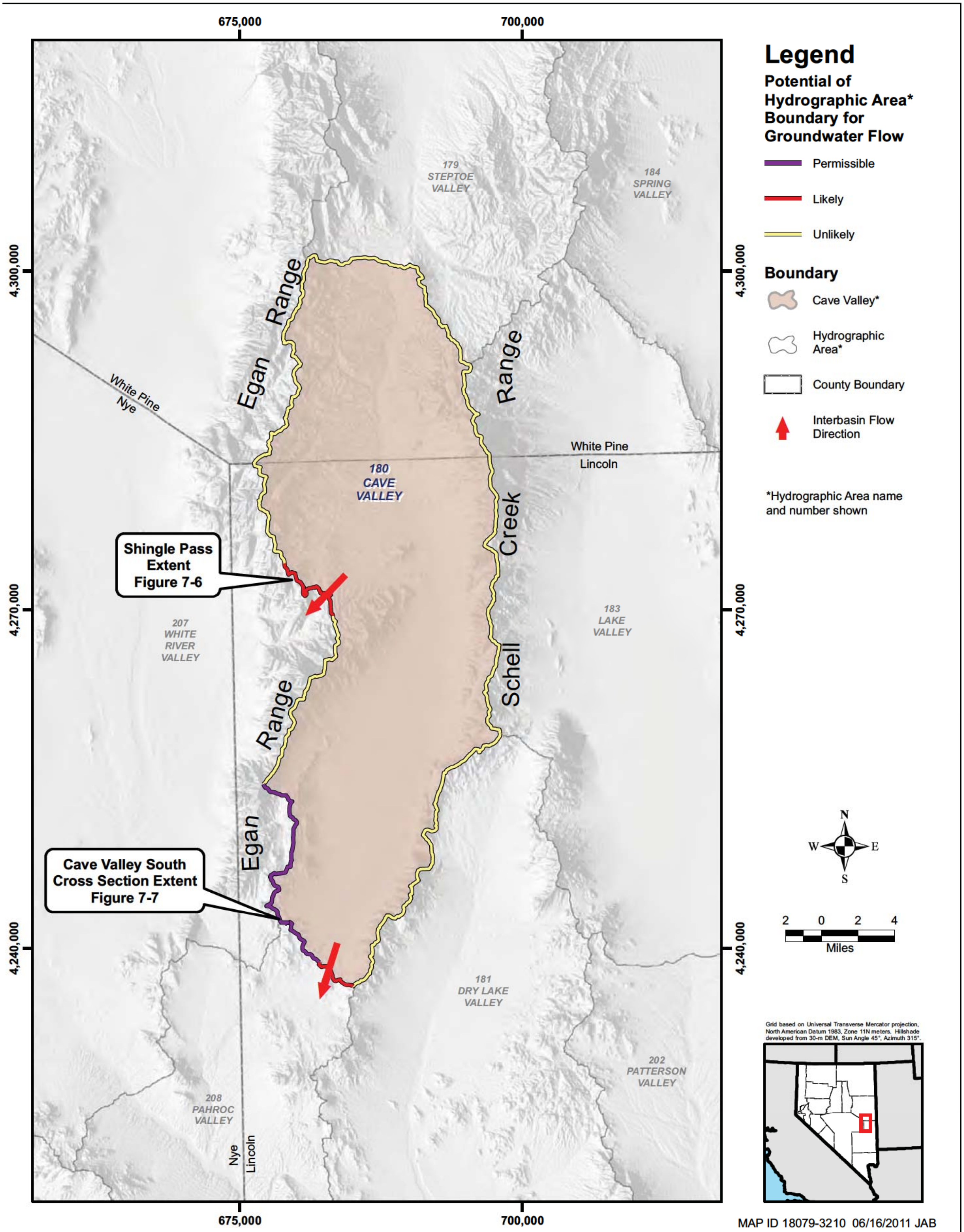


Figure 7-4
Location of Interbasin Groundwater Flow for Cave Valley

SNWA Exhibit 258

SE ROA 39211

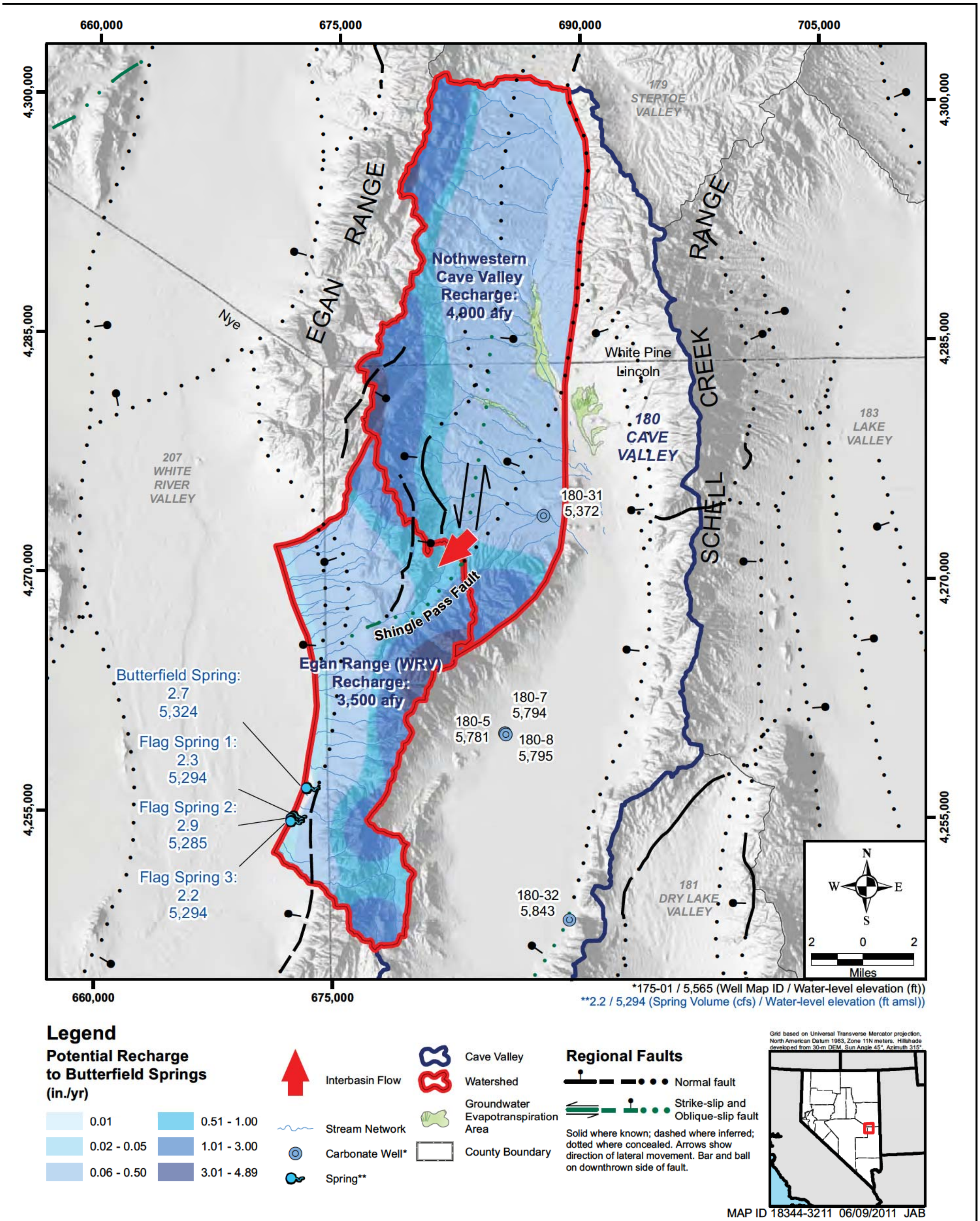


Figure 7-5
Watersheds in Cave and White River Valleys Used to Estimate Outflow through Shingle Pass

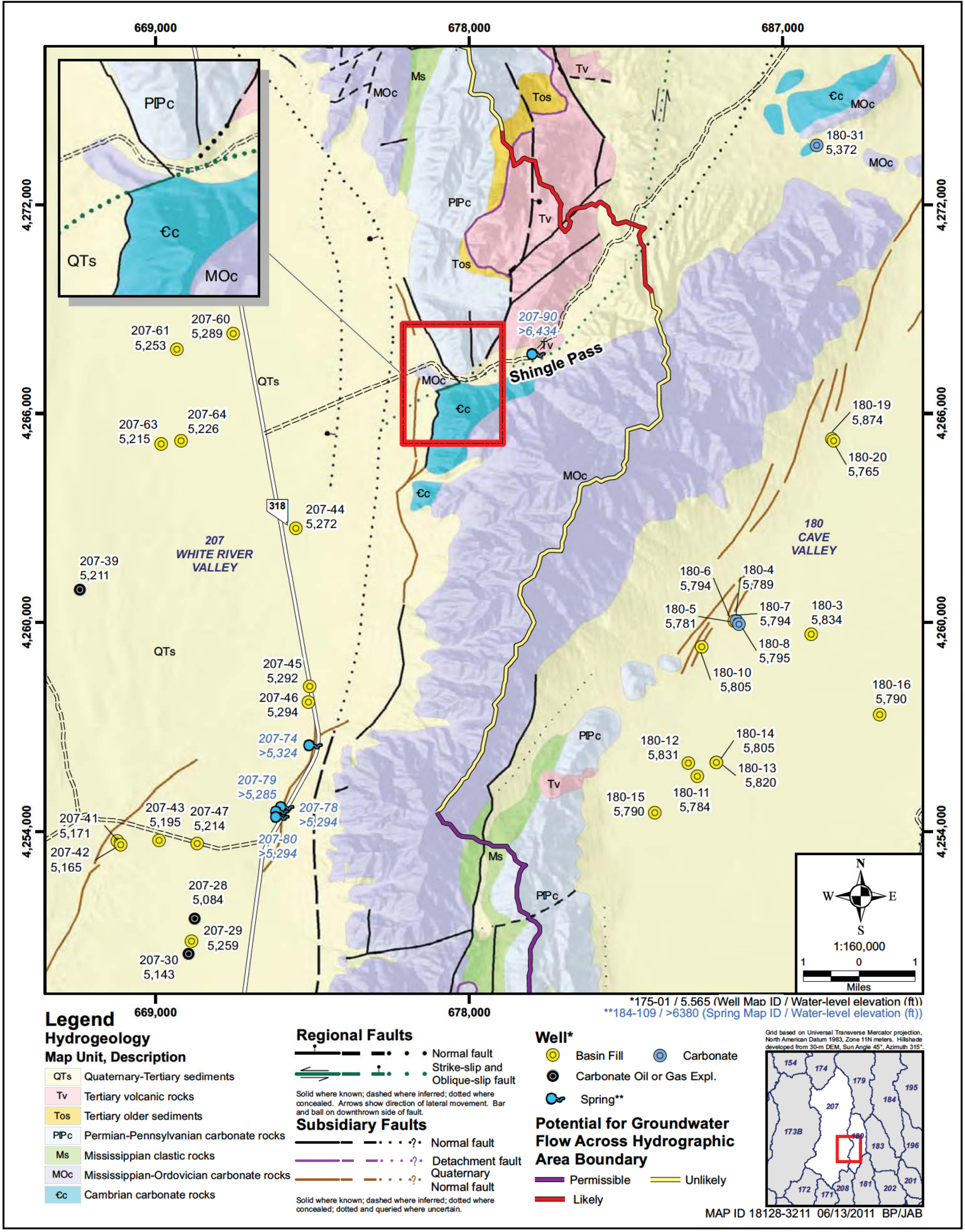


Figure 7-6
Interbasin Groundwater Flow from Cave Valley to White River Valley

SNWA Exhibit 258

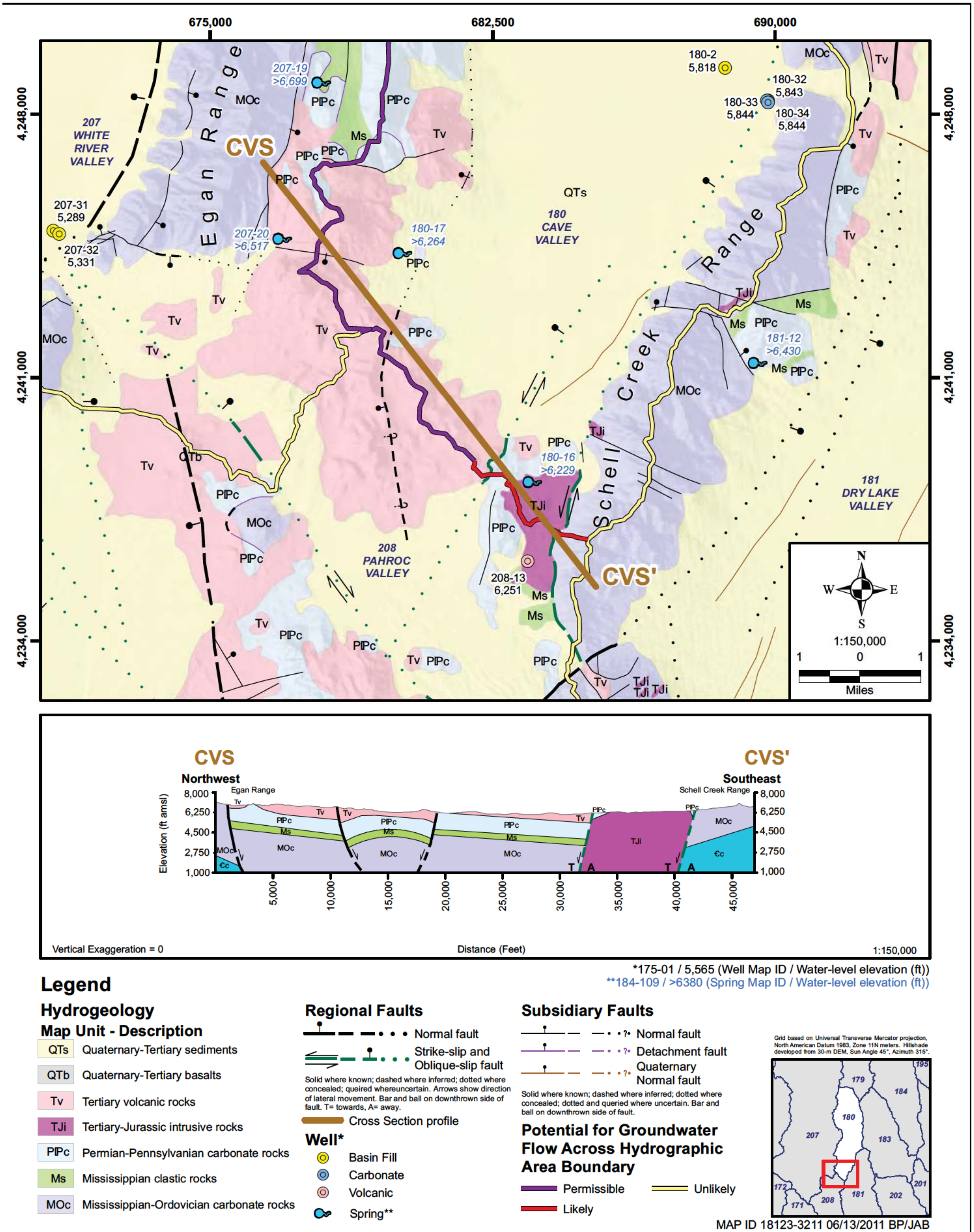


Figure 7-7
Interbasin Groundwater Flow from Cave Valley to Pahroc Valley

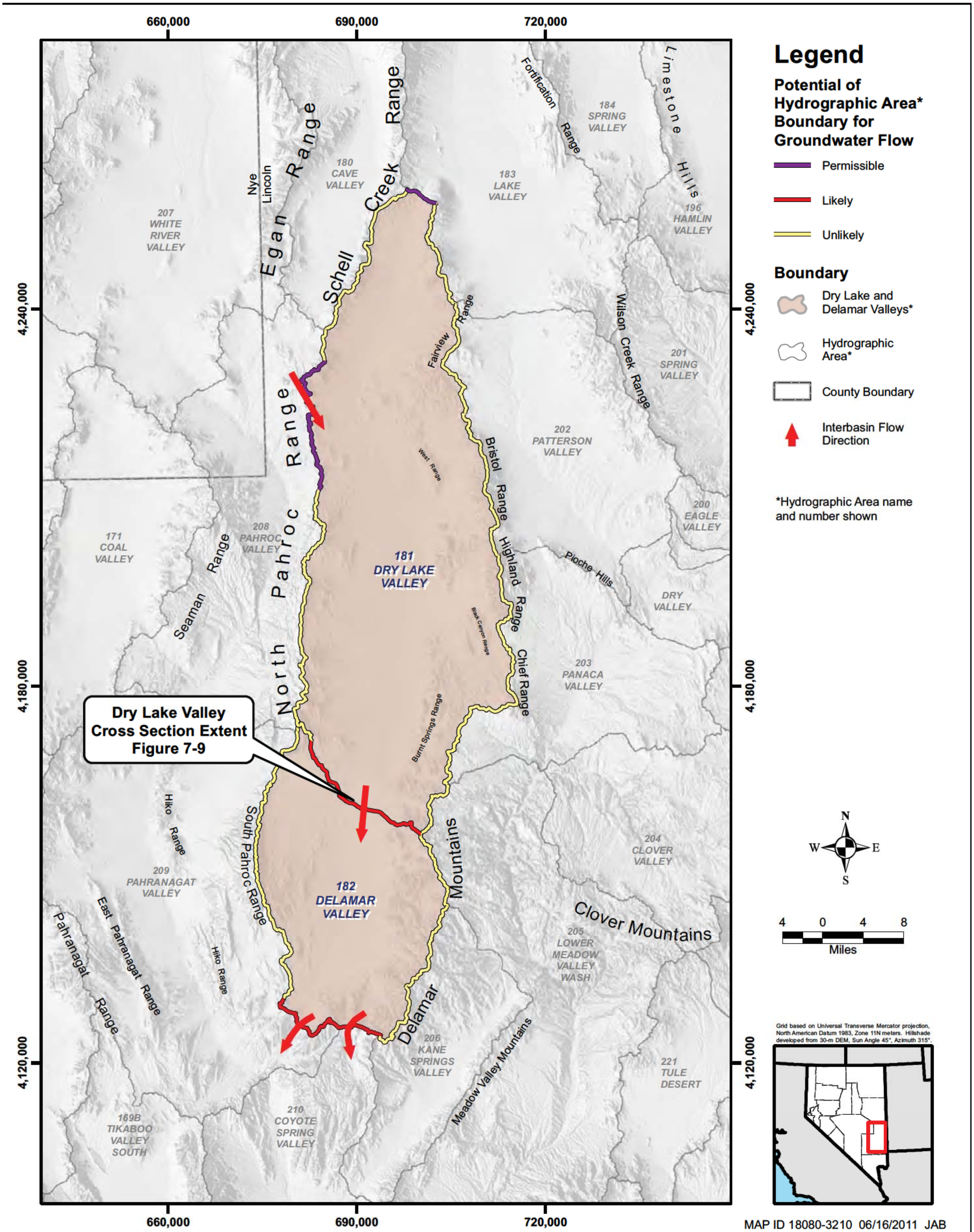
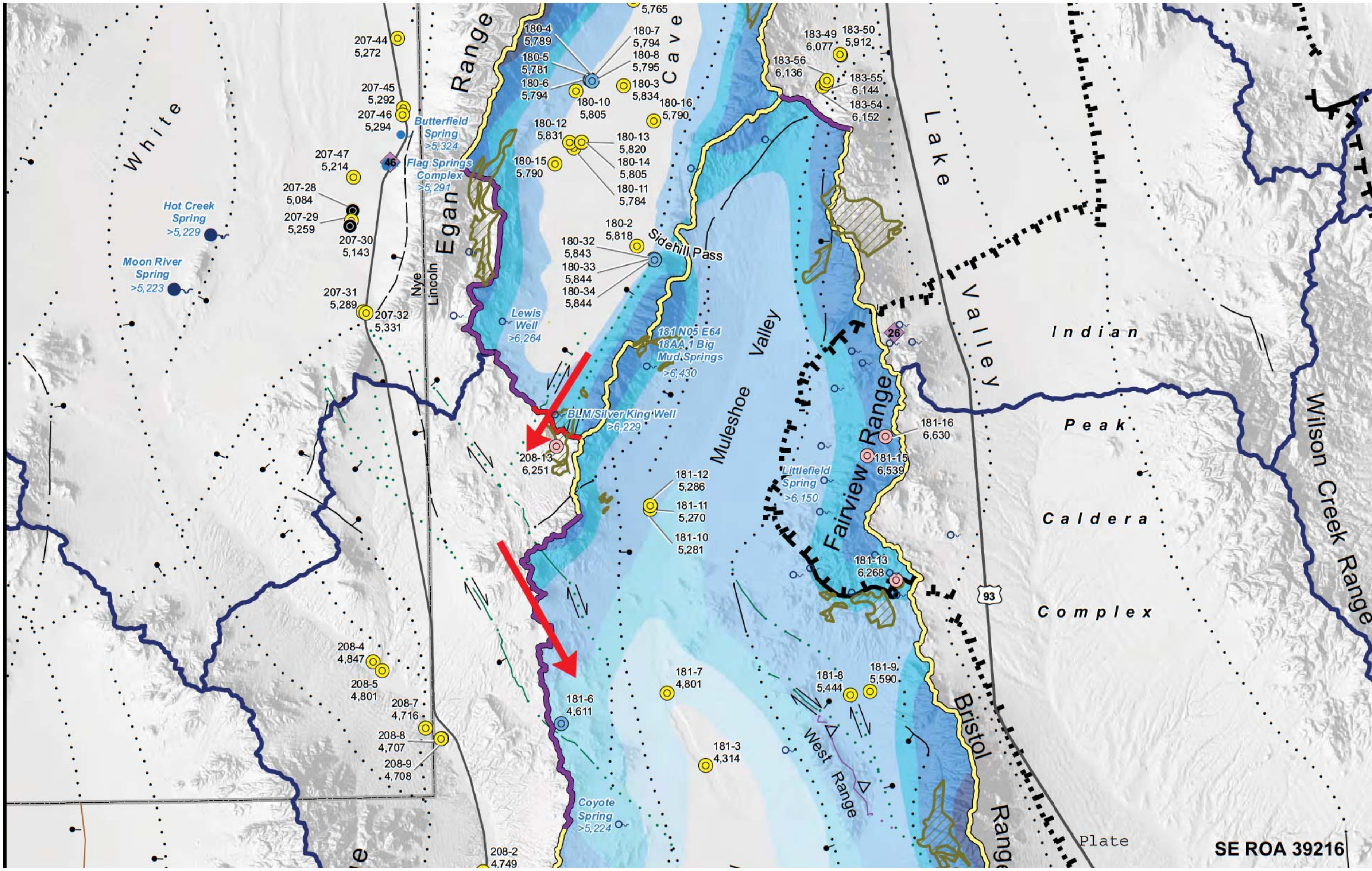
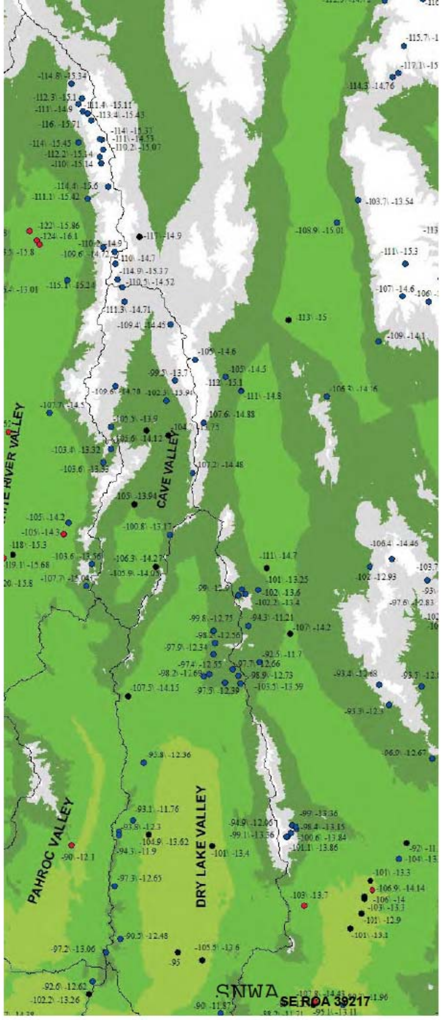


Figure 7-8
Locations of Interbasin Flow for Dry Lake and Delamar Valleys



White
Egan Range
Cave
Lake Valley
Muleshoe Valley
Fairview Range
Indian Peak Caldera Complex
Wilson Creek Range
Bristol Range
West Range
Sidehill Pass
Nye
Lincoln
Hot Creek Spring >5,229
Moon River Spring >5,223
Butterfield Spring >5,324
Flag Springs Complex >5,291
Lewis Well >6,264
181 N05 E64 18AA 1 Big Mud Springs >6,430
BLM/Silver King Well >6,229
Littlefield Spring >6,150
Coyote Spring >5,224
4,255,000
4,220,000
Plate
93
26
46


CAVE VALLEY
DRY LAKE VALLEY
PAHROC VALLEY
SNWA
SE ROA 39217

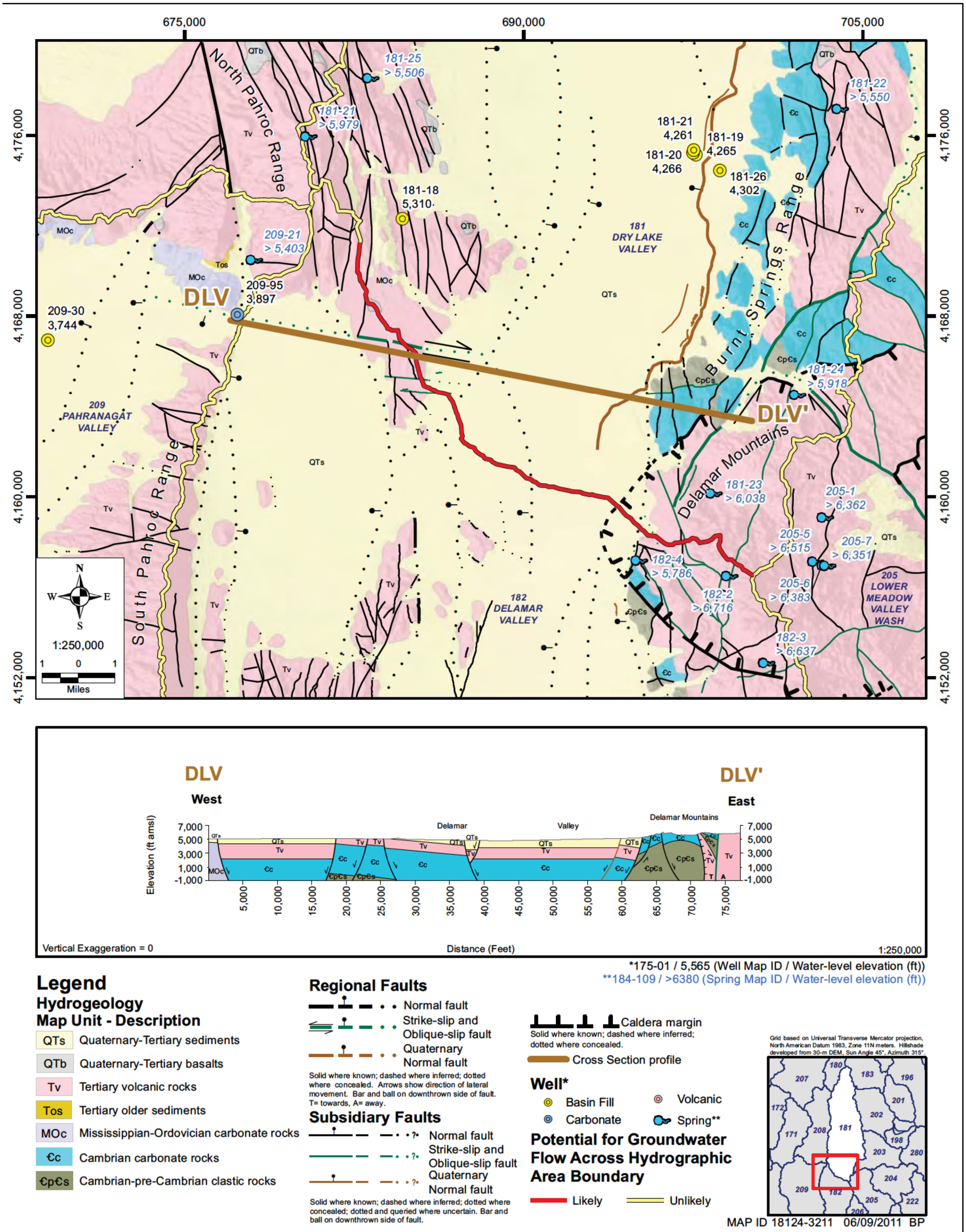


Figure 7-9
Interbasin Groundwater Flow from Dry Lake to Delamar Valley

SNWA Exhibit 258

SE ROA 39218

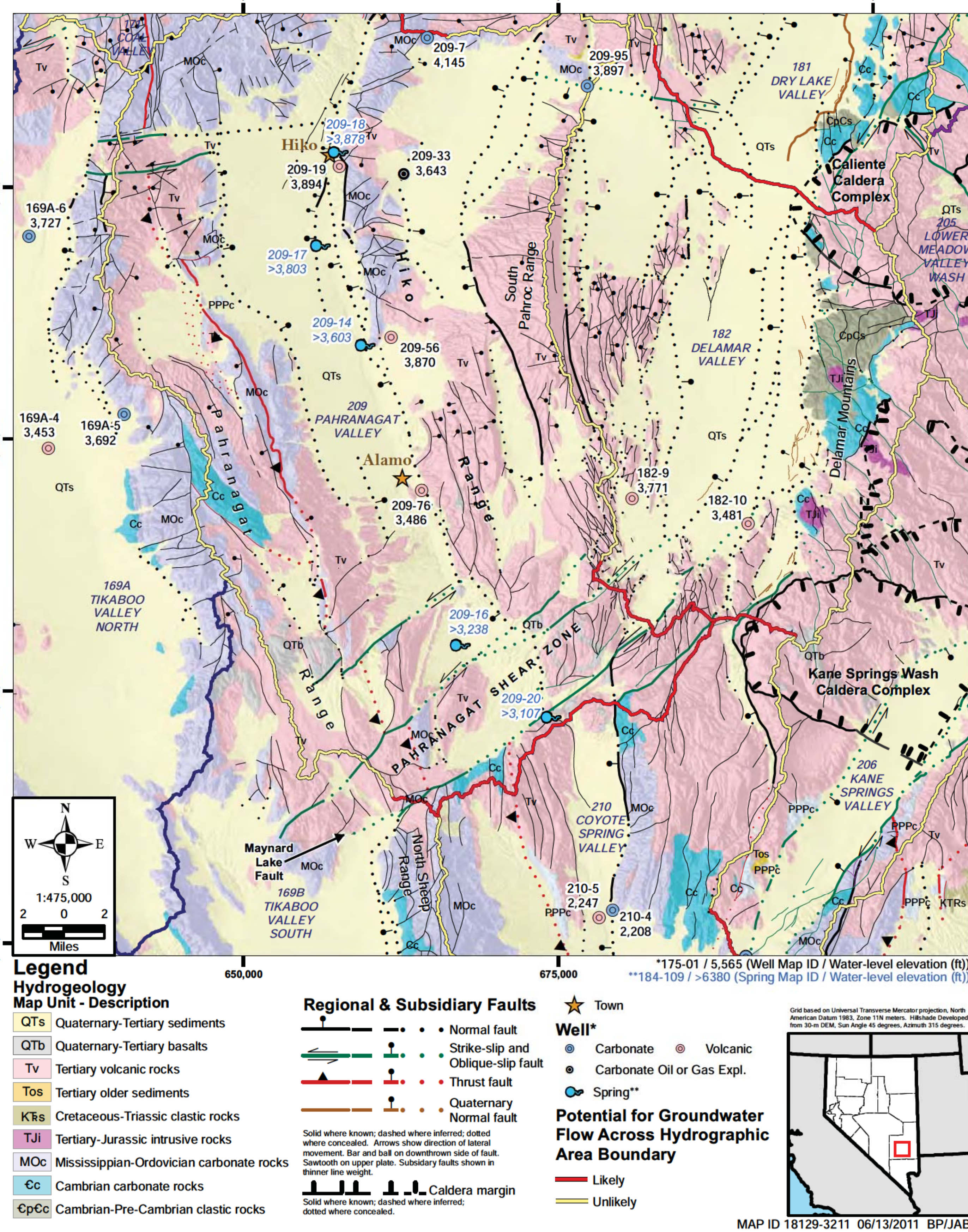


Figure 7-10
Hydrogeology of the Pahranagat Shear Zone and Vicinity

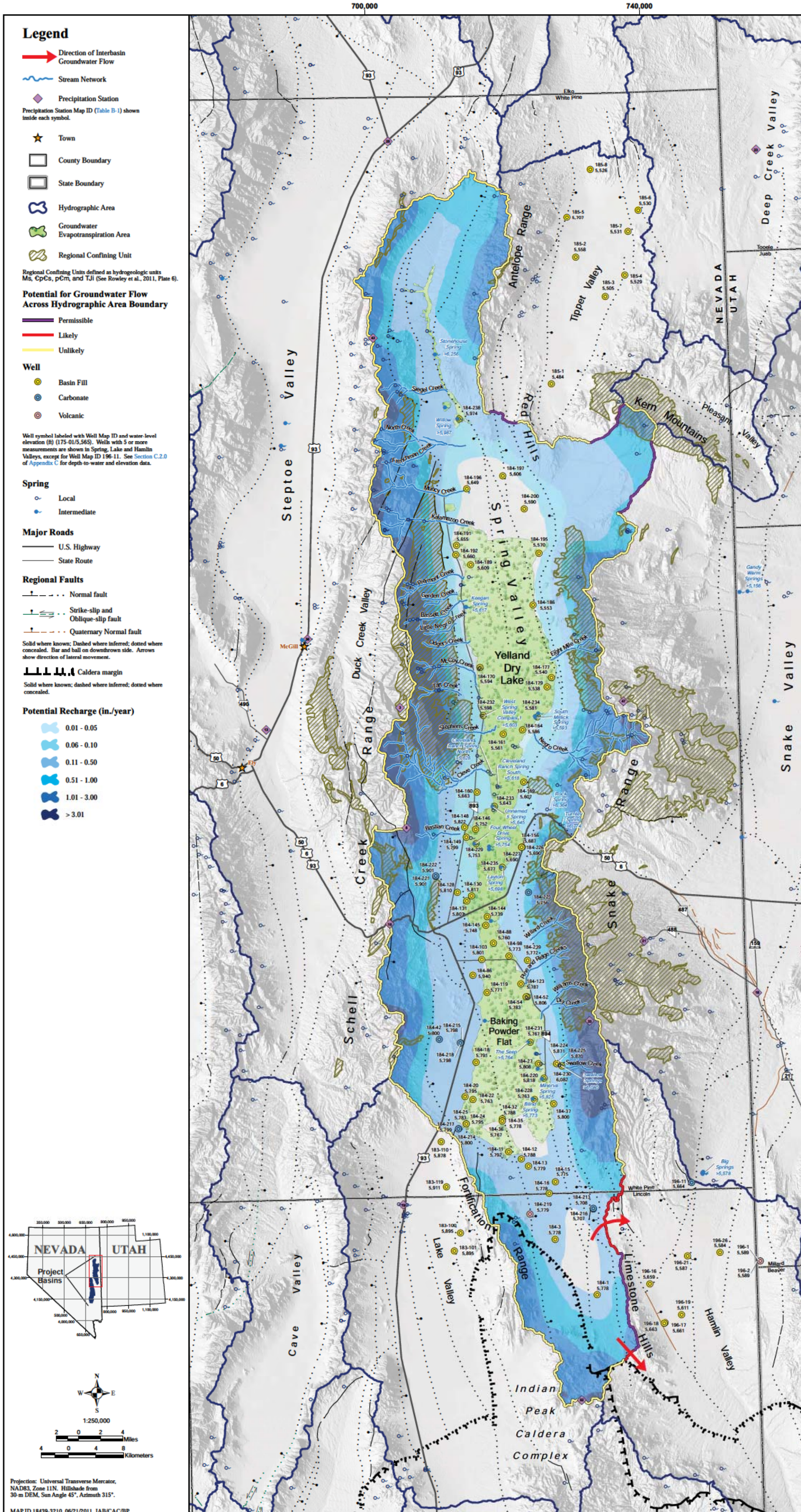


PLATE 1. MAJOR GEOLOGIC AND HYDROLOGIC FEATURES AND CONTROLS ON THE AQUIFER SYSTEM OF SPRING VALLEY AND VICINITY

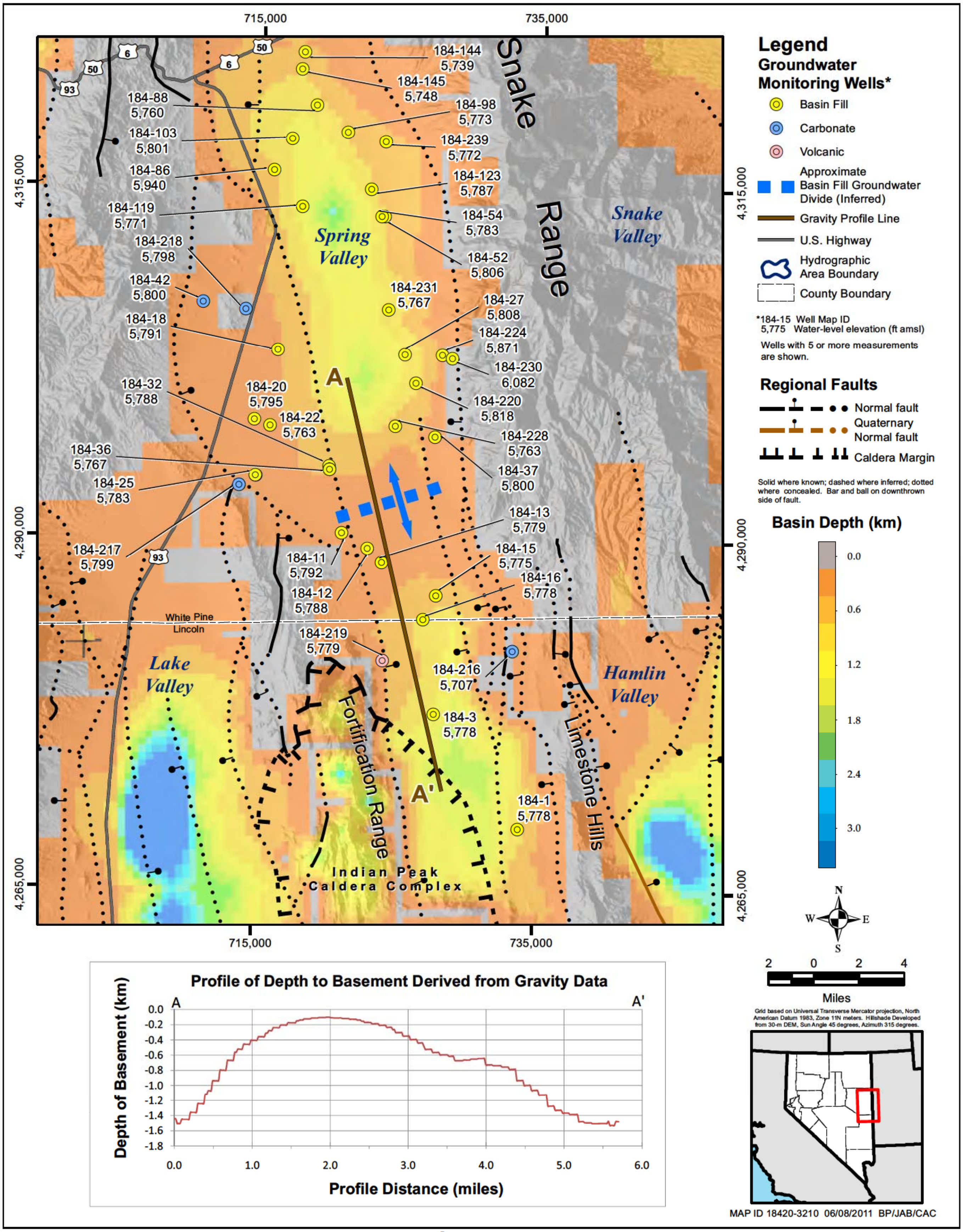
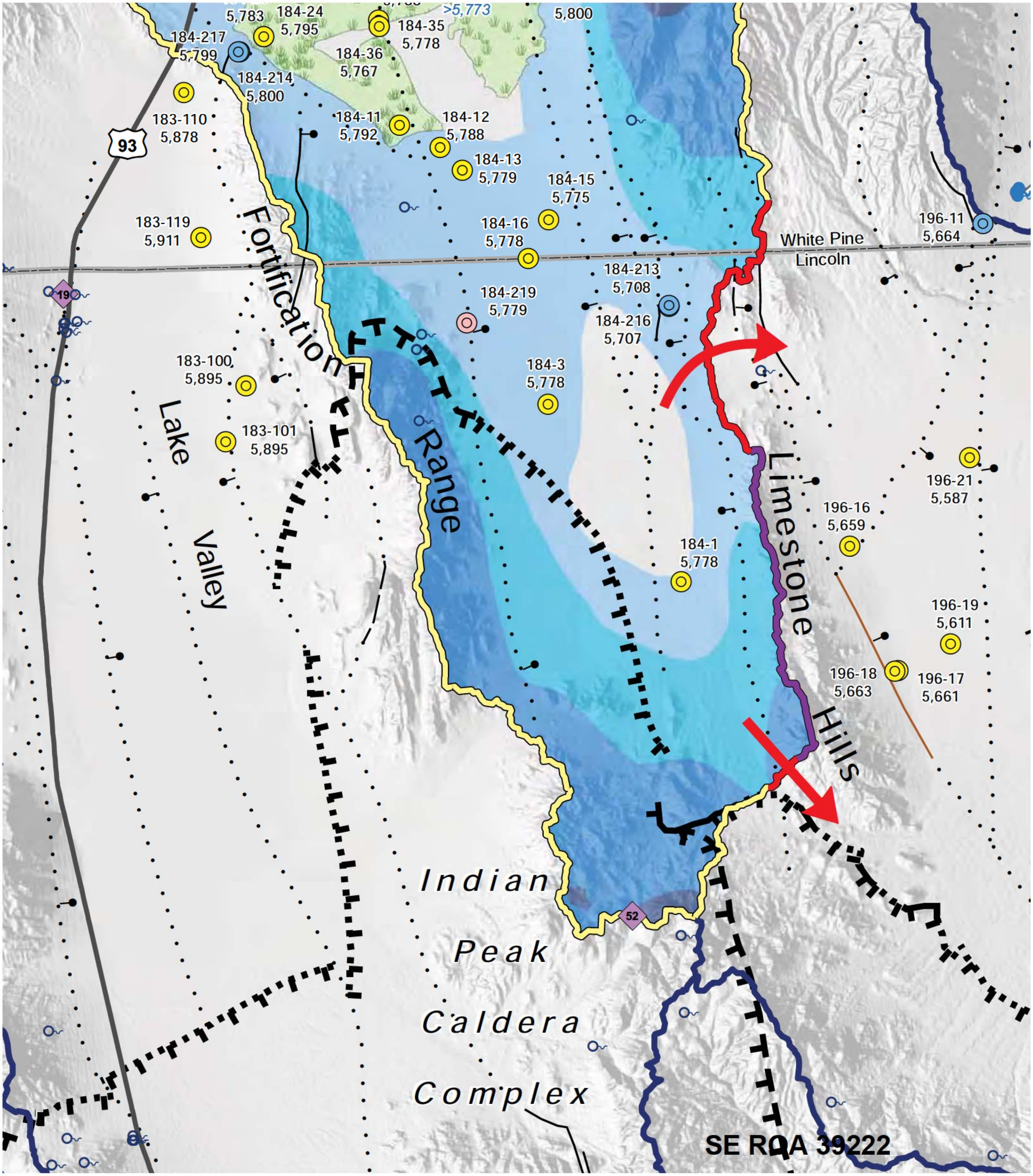
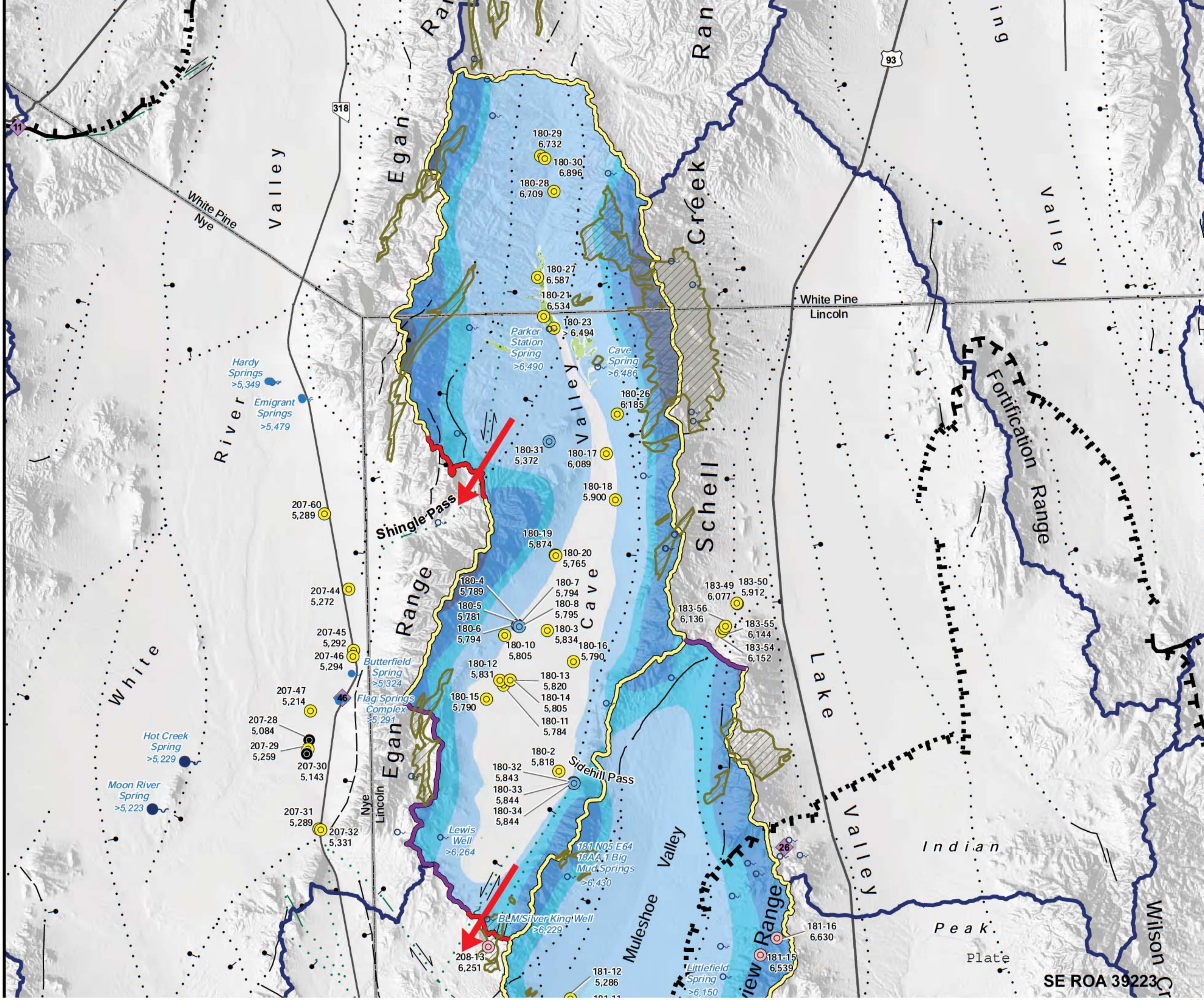


Figure 8-1
Depth to Pre-Cenozoic Basement in Southern Spring Valley and Vicinity



5,783
184-24
5,795
184-35
5,778
>5,773
5,800
184-217
5,799
184-36
5,767
184-214
5,800
183-110
5,878
93
184-11
5,792
184-12
5,788
184-13
5,779
184-15
5,775
183-119
5,911
184-16
5,778
196-11
5,664
White Pine
Lincoln
184-213
5,708
184-219
5,779
184-216
5,707
Fortification Range
183-100
5,895
184-3
5,778
Lake Valley
183-101
5,895
Limestone Hills
196-21
5,587
196-16
5,659
184-1
5,778
196-19
5,611
196-18
5,663
196-17
5,661
Indian Peak Caldera Complex
52
SE ROA 39222

JA_10504



Egan Range
Schell Creek Range
Fortification Range
Cave Valley
Lake Valley
White River Valley
Muleshoe Valley
Indian Peak
Plate
Wilson Cr
Shingle Pass
Sidehill Pass
White Pine
Lincoln
Nye
93
318
4,290,000
4,255,000
180-29
6,732
180-30
6,896
180-28
6,709
180-27
6,587
180-21
6,534
180-23
> 6,494
Parker Station Spring
>6,490
Cave Spring
>6,486
180-26
6,185
180-31
5,372
180-17
6,089
180-18
5,900
180-19
5,874
180-20
5,765
180-4
5,789
180-5
5,781
180-6
5,794
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5,794
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5,795
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180-10
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180-16
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5,805
180-11
5,784
180-15
5,790
180-2
5,818
180-32
5,843
180-33
5,844
180-34
5,844
Lewis Well
>6,264
181 N05 E64 18AA 1 Big Mud Springs
>6,430
BLM/Silver King Well
>6,229
208-13
6,251
181-12
5,286
181-16
6,630
181-15
6,539
Littlefield Spring
>6,150
183-49
6,077
183-50
5,912
183-56
6,136
183-55
6,144
183-54
6,152
Hardy Springs
>5,349
Emigrant Springs
>5,479
207-60
5,289
207-44
5,272
207-45
5,292
207-46
5,294
Butterfield Spring
>5,324
Flag Springs Complex
>5,291
207-47
5,214
207-28
5,084
207-29
5,259
207-30
5,143
207-31
5,289
207-32
5,331
Hot Creek Spring
>5,229
Moon River Spring
>5,223
11
46
26

Table 9-1
Estimated Groundwater Budgets for Project Basins

HA	HA Name	Recharge (afy)	Inflow (afy)	From	Groundwater ET (afy)	Outflow (afy)	To
184	Spring Valley	99,200	0	---	94,800	4,400	Hamlin Valley
180	Cave Valley	13,700	0	---	1,300	3,800	White River Valley
						8,600	Pahroc Valley
181	Dry Lake Valley	16,200	2,000	Pahroc Valley	0	18,200	Delamar Valley
182	Delamar Valley	6,600	18,200	Dry Lake Valley	0	24,800	Coyote Spring Valley

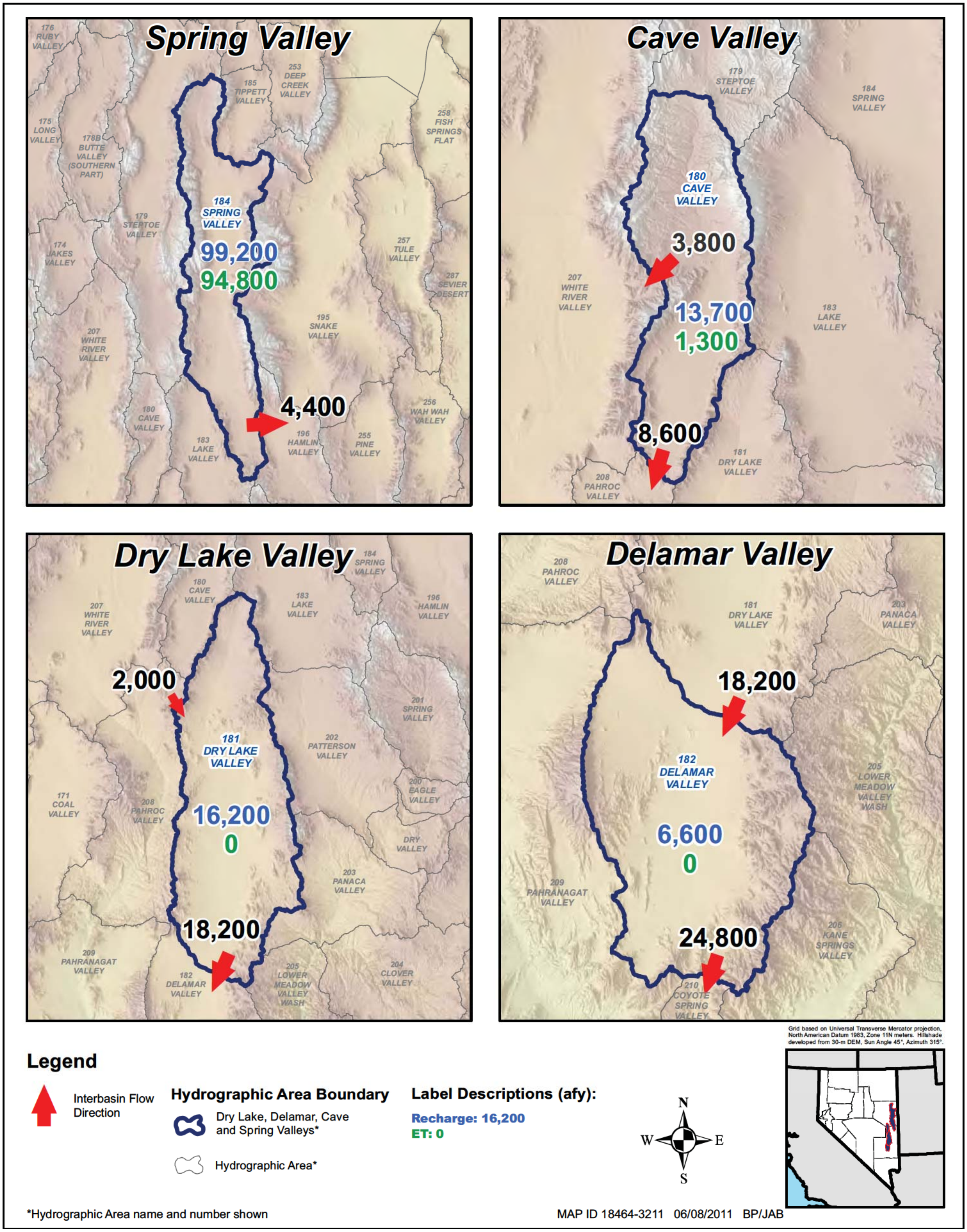


Figure 9-1
Groundwater Budgets of Spring, Cave, Dry Lake and Delamar Valleys

SNWA Exhibit 258

SE ROA 39225

JA_10507

Table 10-1
Unappropriated Groundwater Resources

HA Name	Perennial Yield[a] (afy)	Committed Groundwater Rights[b] (afy)	Unappropriated Groundwater Resources (afy)
Spring Valley	94,800	10,429.51	84,370.49
Cave Valley	13,700	17.77	13,682.23
Dry Lake Valley	16,200	61.12	16,137.74
Delamar Valley	6,600	8.95	6,591.05

[a]Annual groundwater ET for Spring Valley, annual recharge for others
[b]Committed groundwater rights with priority dates earlier than October 17, 1989 (Stanka, 2011, p. ES-3).

[redacted]

JA_10509

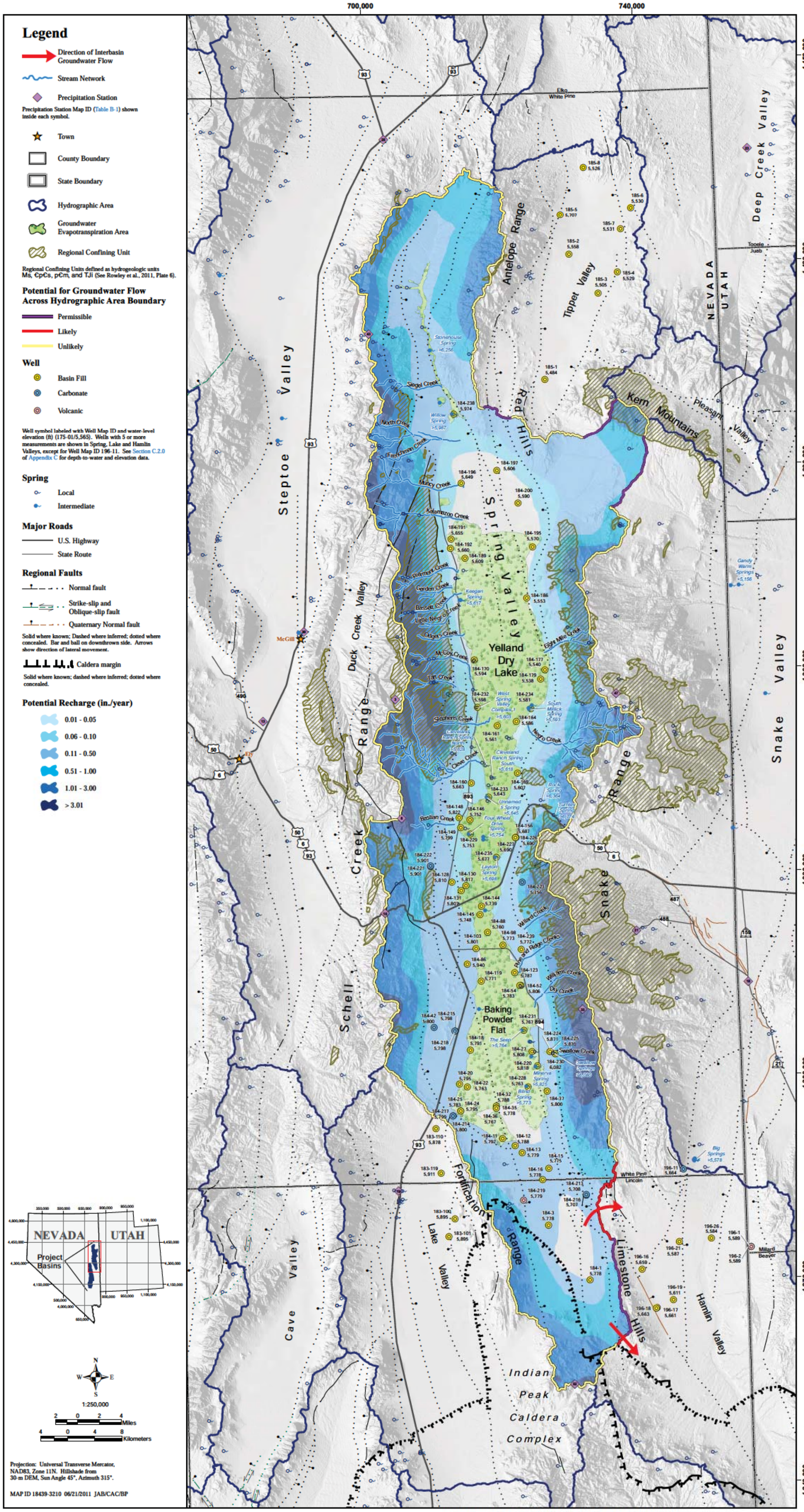
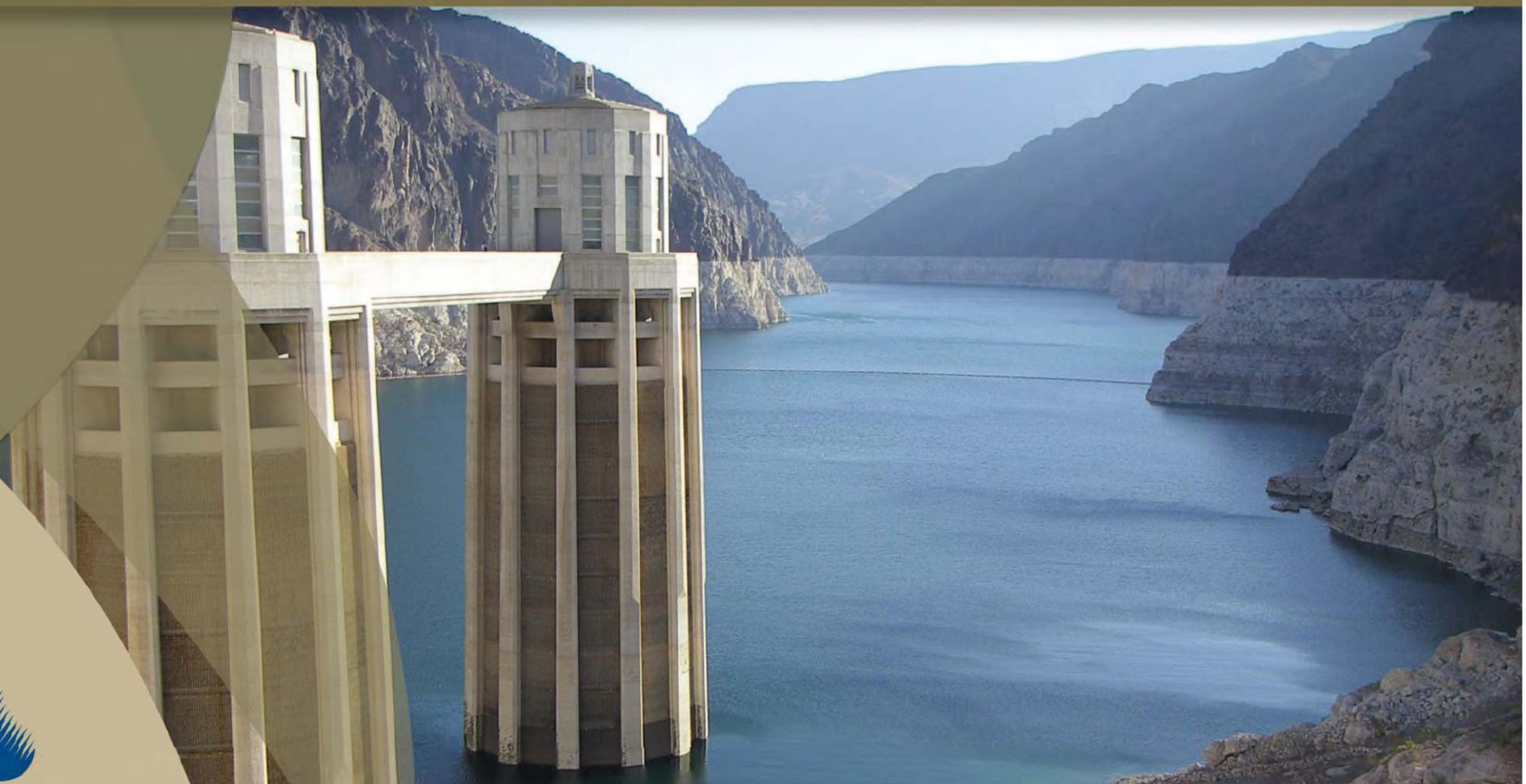


PLATE 1. MAJOR GEOLOGIC AND HYDROLOGIC FEATURES AND CONTROLS ON THE AQUIFER SYSTEM OF SPRING VALLEY AND VICINITY

Spring, Cave, Dry Lake and Delamar Valleys



SOUTHERN NEVADA
WATER AUTHORITY

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) HYDRIGRAPHIC BASIN (219), LINCOLN AND CLARK COUNTIES, NEVADA.

RECEIVED
2019 SEP -6 PM 1:17

MOAPA VALLEY WATER DISTRICT'S LIST OF WITNESSES AND DOCUMENTS PROVIDED PURSUANT TO NOTICE OF HEARING SECTION V.

MOAPA VALLEY WATER DISTRICT ("District"), by and through its counsel of record, PARSONS BEHLE & LATIMER, hereby serves its list of Exhibits and Witnesses pursuant to State Engineer's Notice of Hearing dated August 23, 2019, at Section V.

EXHIBITS

The District submits the following exhibits, Bates stamped as Exhibit Nos. MVWD 001-MVWD 469.

EXHIBIT	BATES NO.	EXHIBIT NAME
1.	MVWD 001-014	Curriculum Vitae of Jay Lazarus.
2.	MVWD 015	Resume of Joseph Davis.
3.	MVWD 016-023	District July 1, 2019 Report in response to Interim Order 1303.
4.	MVWD 024-029	District August 16, 2019 Rebuttal Report.
5.	MVWD 030-088	King, Jason, *Water Use in the Lower White River Flow System* (Presentation at July 24, 2018 Public Workshop).

. . .

6.	MVWD 089-146	Glorieta Geoscience, Inc., *Moapa Valley Water District 2014 Integrated Water Resources Plan* (June 24, 2015).
7.	MVWD 147-188	Glorieta Geoscience, Inc., *Muddy Springs Area Monitoring Report for January 2018 through December 2018* (2019).
8.	MVWD 189-463	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).
9.	MVWD 464-469	Stetson Engineers Inc., *Proposed Groundwater Pumping for the 6-Basin Area Addressed in the Nevada State Engineer's September 19, 2018 Draft Order* (Oct. 4, 2018).

WITNESSES

1. Jay Lazarus
Glorieta Geoscience, Inc.
P.O. Box 5727
Santa Fe, NM 87502

Mr. Lazarus is presented as an expert witness in the fields of geology, hydrology, groundwater basin analysis, water rights, and related matters. Mr. Lazarus has not been previously qualified as an expert by the Nevada State Engineer. Mr. Lazarus has been qualified as an expert witness in the fields for which he is offered by the District on multiple occasions in several jurisdictions, including:

- Before the Nevada State Environmental Commission in 2010 in the fields of geology, hydrology, and others;
- Before the State Engineer of New Mexico on five separate occasions, most recently in 2007, in the fields of geology, hydrology, and geohydrology;
- Before the District Courts of the State of New Mexico, most recently in 2010, in the fields of geology, hydrology, water rights, and water resource planning and management;

- Before the United States District Court for the District of New Mexico, most recently in 1997, in the fields of geology, hydrology, and geohydrology; and
- Before the New Mexico Environmental Department, most recently in 2008, in the fields of geology, hydrology, and geohydrology.

Overall, Mr. Lazarus has been qualified as an expert in the fields of geology, hydrology, and/or geohydrology on at least 19 separate occasions.

Mr. Lazarus will testify regarding the contents of the report dated July 1, 2019 and the rebuttal comments dated August 16, 2019 that he prepared on behalf of the District, including:

- The geographic boundary of the hydrologically connected groundwater and surface water systems comprising the LWRFS;
- Information obtained from the Order 1169 aquifer test;
- Quantity of groundwater that may be pumped from the LWRFS and the relationship between the location of pumping on discharge to Muddy River Springs, and capture of Muddy River flow;
- Effects of movement of water rights between alluvial wells and carbonate wells on deliveries of senior decreed rights to the Muddy River

2. Joseph Davis
Moapa Valley Water District
601 N. Moapa Valley Rd.
Overton, NV 89040

Mr. Davis is the General Manager of the Moapa Valley Water District and will testify regarding his knowledge of the following matters relevant to Interim Order 1303 and LWRFS management:

- The District's history and function as a municipal water supplier to several communities in the LWRFS;
- Municipal use as preferred uses; and

- The District's previous efforts to maintain, protect, and enhance Moapa dace habitat and Muddy River surface flows.

DATED: September 5th, 2019.

PARSONS BEHLE & LATIMER

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Attorneys for Moapa Valley Water District

CERTIFICATE OF SERVICE

I certify that I am an employee of Parsons Behle & Latimer and that on the 5th day of September, 2019, I caused a true and correct copy of the foregoing document to be delivered via email to the following:

8milelister@gmail.com;
Admin.mbop@moapabandofpaiutes.org;
andrew.burns@snwa.com;
bbaldwin@ziontzchestnut.com;
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STATE ENGINEERS OFFICE

GLORIETA GEOSCIENCE, INC.

July 1, 2019

Mr. Tim Wilson, P.E.
Acting State Engineer
Nevada Division of Water Resources
901 S. Stewart St. Suite 202
Carson City, NV 89701

Dear Mr. Wilson:

This letter, on behalf of the Moapa Valley Water District (MVWD; District), is in response to the Nevada Department of Water Resources' (DWR) request for comments on Interim Order 1303, issued on January 11, 2019 and amended May 15, 2019. The order requests comments on specific topics; the District's comments are presented in the order of the elements that were established in the Interim Order.

A. Geographic Boundary of the hydrologically connected groundwater and surface water systems comprising the Lower White River Flow System

The Kane Springs Valley Basin is part of the White River Flow System, an interconnected system of carbonate rock aquifers that extend from Long Valley (Basin 175) in the northern part of the state to the Muddy River Springs Area (Basin 219) in the south. Within the White River Flow System, water in the carbonate aquifer flows generally from north to south. Of particular importance to Interim Order 1303 is that the terminus of the Lower White River Flow System (LWRFS) is the Muddy River Springs Area, the headwaters of the Muddy River. These springs provide water that maintains habitat for the endangered Moapa dace.

Based on available data that indicate a direct connection between Kane Springs Valley (Basin 206) and Coyote Springs Valley (Basin 210), MVWD proposes that Kane Springs Valley be added to the six basins that are included in Interim Order 1303, for a total of seven basins that will be jointly administered by DWR as a single "Super Basin" comprising the Lower White River Flow System (LWRFS).

During the Order 1169 pumping test, water levels were monitored in a carbonate observation well located in Kane Springs Valley (the well is alternately referred to as KMW-1, and KSM-1 at different times by SNWA [2013]). Water level in this carbonate observation well decreased approximately 0.5 ft over the duration of the pumping test (SNWA, 2013, Fig. C-53), indicating a direct connection between the Coyote Springs Valley and Kane Springs Valley.

In State Engineer Ruling 5712 (Joint Applications 72218, 72219,72220 and 72221 by Lincoln County and Vidler Water Company, Inc. to Appropriate Water in the Kane Springs Valley Hydrographic Basin 206), the State Engineer concluded that geochemical evidence and ground-water gradient data indicate that groundwater from the Kane Springs Valley flows into Coyote

Spring Valley. Reductions in the amount of groundwater available in Coyote Springs Valley will impact all downgradient LWRFS basins, as well as discharge to Muddy River Springs.

The Las Vegas Valley Water District (LVVWD, 2001, Table 6-1) presented estimates of inter-basin groundwater flow in the White River Flow System which included approximately 6,000 ac-ft of groundwater flowing from Kane Springs Valley into Coyote Springs Valley.
The physical hydrology and hydrochemistry both support the conclusion that Kane Springs Valley is hydrologically connected to Coyote Springs Valley. Pumping in the Kane Springs Valley will therefore affect water levels in the Coyote Springs Valley and the interconnected basins of the LWRFS, ultimately resulting in impacts to spring discharge in the Muddy River Springs area. For these reasons, MVWD requests that Kane Springs Valley Hydrographic Basin 206 be added to the "Super Basin".

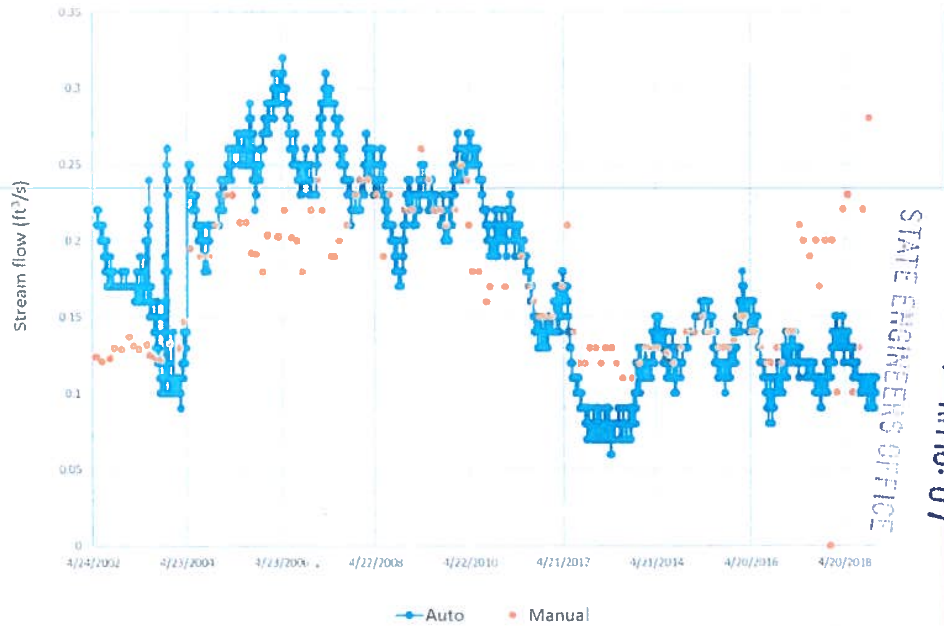
B. Information obtained from the Order 1169 aquifer test and subsequent to the test and Muddy River headwater spring flow as it related to aquifer recovery since the completion of the aquifer test

Post-Testing Water Level Recovery
MVWD agrees with DWR's statement in Interim Order 1303 that, "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." (Order 1303 p. 10).

In a 2006 Memorandum of Agreement (2006 MOA), trigger levels were established to protect the Moapa Dace habitat and senior water rights holders. The signatories to the 2006 MOA are MVWD, Southern Nevada Water Authority (SNWA), Coyote Springs Investment, LLC (CSI), United States Fish and Wildlife Service (USFWS), and the Moapa Band of Paiutes (MBOP). Since 2006, no actions have been taken by the 2006 MOA signatories to adjust trigger levels. Although water levels and spring discharge have remained fairly constant since cessation of the Order 1169 pumping test, water levels and spring discharges have not recovered to pre-1169 test levels or discharges.

Manual measurements of Pederson East Spring flows by the USGS are higher than discharge reported from automated readings (see graph below). As a result, all surface water gages maintained by the US Geological Survey should have regular hand measurement for data validation and verification, and interpretations based on automated stream flow measurements should be adjusted accordingly.

Pederson E Springs: Manual and Automatic Stream Flow Measurements



<u>Influence of Climate</u>

Above-average precipitation in 2004-2005 and 2013 was documented by Stetson Engineers (2018, Fig.1). Hydrographs for Pederson Spring, Pederson Spring East and Warm Springs West all show an increase in carbonate spring discharge after above average precipitation in 2004 and 2005. Water levels in carbonate monitoring wells EH-4, EH-5B, CSV-2 and CE-DT-4 rose after the 2004-2005 recharge event (GGI, 2019).

The hydrograph for alluvial well Lewis North shows a rise in water levels after the above-average precipitation in 2004-2005. Hydrographs for Lewis 1 and Lewis 2 show annual cyclical water level changes in response to alluvial pumping and any recharge from the 2004-2005 above average precipitation was not observed or was masked by pumping cycles. Hydrographs for both Lewis 1 and Lewis 2 show a water level rise and a fairly constant water level after alluvial pumping was reduced beginning in 2015 and ceased in 2017. The hydrograph for Perkins Old shows a rise in water levels after alluvial pumping was reduced and ceased (GGI, 2019).

Climate and climatic cycles are an important part of any long-term aquifer recovery. Recharge is episodic, not a constant, annual occurrence. The bulk of aquifer recharge occurs in wet years such as 2005. These slugs, or pulses of recharge, contribute to a cyclical water budget for the carbonate aquifer. Long term spring discharge projections and water level trends are affected both by climate and pumping.

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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

MVWD agrees with DWR's statement in Interim Order 1303 that, "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." (Order 1303 p. 10). It is possible that the carbonate aquifer system is reaching somewhat of a steady-state condition at current pumping rates, but additional data is required to verify this conclusion.

MVWD agrees with SNWA (2013) and Johnson (2019) that the alluvial wells are in direct hydrologic communication with the Muddy River and directly capture Muddy River flows, adversely affecting senior water right holders. Additional carbonate pumping in excess of current diversions in the 7-basin flow system will likely accelerate spring depletions. To maintain carbonate diversions at current volumes, no new subdivision parcel maps should be approved that will require increased pumping.

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

Impact of carbonate and alluvial pumping on Muddy River Flows
The decline in gage flow at the Moapa gage is approximately equal to the alluvial groundwater pumping and surface-water diversions (SNWA, 2013). Figure 28 in the 2013 SNWA analysis of the 1169 pumping test is a graph titled "Comparison Between Decline in Flow at the Moapa Gage and Alluvial vs. Carbonate Groundwater Pumpage and Surface-Water Diversions". SNWA's conclusion after analyzing the graph was: "***This clearly demonstrates that nearby carbonate pumping is not influencing Muddy River flows at the Moapa gage and is therefore not influencing senior Muddy River surface-water rights***" (emphasis added).

Johnson (2019) analyzed data from various carbonate pumping tests and determined that pumping from the carbonate aquifer, specifically from MVWD Arrow Canyon Wells, impacts spring flows but has no measurable impact on flows in the Muddy River, whereas pumping from the alluvial aquifer, primarily by Nevada Power Company, had direct impacts on Muddy River flows. Furthermore, Johnson (2019) found that water levels in the nearby carbonate monitoring well EH-4 had fully recovered within 3 months of the end of pumping, and no cumulative drawdown effects remained.

MVWD agrees with SNWA (2013) and Johnson (2019) that the alluvial wells are in direct hydrologic communication with the Muddy River and directly capture Muddy River flows, adversely affecting senior water right holders.

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The timing and magnitude of carbonate pumping effects on spring discharge is dependent on the volume of water pumped and the proximity of a pumping center to the springs – the closer it is, the sooner it will occur; the further away it is, the longer it will take to show effects, but in any case, all cumulative carbonate pumping in the 7 interconnected basins will eventually cause depletions on the Muddy River Springs.

Spring discharge from the carbonate aquifer provides water for Moapa dace habitat. Alluvial pumping does not have an effect on spring discharge from the carbonate aquifer. Transfer of alluvial water rights to the carbonate aquifer will increase and accelerate spring depletions. Pumping from the carbonate aquifer in volumes greater than currently being pumped will increase and accelerate spring depletions and adversely impact dace habitat. Conversely, if carbonate water rights are transferred to the alluvial aquifer there will be depletions to Muddy River flows and impacts to senior Muddy River water right owners.

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

Municipal Use as the Preferred Use in the LWRFS basins

The District supports the language in Interim Order 1303 recognizing the need 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 or may rely on that water supply in the future.

NRS 534.120 authorizes the State Engineer to make rules, regulations and orders when groundwater is being depleted in designated areas and to designate preferred uses of water. NRS 543.120(2) states "In the interest of public welfare, the State Engineer is authorized and directed to designate preferred uses of water within the respective areas so designated by the State Engineer and from which the groundwater is being depleted, and in acting on applications to appropriate groundwater, the State Engineer may designate such preferred uses in different categories with respect to the particular areas involved within the following limits:

(a) Domestic, municipal, quasi-municipal, industrial, irrigation, mining and stock-watering uses; and

(b) Any uses for which a county, city, town, public water district or public water company furnishes the water.

MVWD provides water service to approximately 8500 people with 3175 metered service connections. DWR Rulings 6259 and 6261 both denied the District's applications for new appropriations from the carbonate aquifer. Denial of the District's applications is causing the District to seek costly alternative sources of supply to accommodate growth scenarios calculated in the District's 2014 Integrated Water Resources Plan (GGI, 2015). Protection of municipal water rights for municipal-type providers is essential for the long-term economic and social well-being of the communities served by the District. The District supplies water to the Moapa Band of

Paiutes in addition to its non-Indian customers. Curtailment of the District's water supply and water rights will have an adverse effect on the Indian and non-Indian communities that the District is legally obligated to serve.

The District carefully planned for development of additional water resources that were severely curtailed by Orders 1169 and 1169A. As such, the District's long-term plans require additional wells. The District trusts the State Engineer will recognize its carbonate wells are irreplaceable sources for the District. To protect all of its customers, the communities it serves, and to plan for orderly growth, the District is requesting:

- the State Engineer designate municipal use of water as the most protected and highest use of water in the 7-basin flow system;
- the State Engineer immediately recognize the quantities of water put to beneficial use by the District from its wells and springs in Basin 219;
- the District will have the perpetual right to divert 6791 acre-ft/yr of permitted and certificated rights from its carbonate aquifer wells;
- the State Engineer designate municipal certificated and permitted water rights as a preferred use regardless of priority;
- the State Engineer give preferred use designation to municipalities or water districts with a 50 Year Water Resource Plan;
- MVWD can add diversion only permits in the carbonate aquifer or other aquifers;
- when transferring a Point of Diversion, the priority date of the base right will be retained; and
- transfers of carbonate water rights from Arrow Canyon to other basins not in the "Super Basin" should be allowed and encouraged.

Requests for extension of time to file proof of beneficial use for non-municipal permittees should be approved only when a permittee shows diligent and active development of the right. The State Engineer should consistently exercise the discretion he was given pursuant to NRS 533.380(3) by elevating the "good cause" standard. Senior permit holders not actively developing rights should be required to submit proofs of beneficial use, regardless of the extent of historic beneficial use, and certificates issued on those water rights that have been put to beneficial use. Extensions of time to submit proof of beneficial use for non-municipal or quasi-municipal uses should be limited to one year. For municipal water providers, a 50-year water development plan can meet the standard for active development.

<u>Protection of Dace Habitat and Senior Water Rights</u>

In the 2006 MOA, the District agreed to dedicate 1 cfs of flow from Pipeline Jones Spring to provide in stream flow to support recovery of the Moapa dace. The 1 cfs represents approximately 724 ac-ft or approximately 25% of the District's current diversions. The 2006 MOA and DWR Rulings 6259 and 6261 have resulted in a loss of 724 ac-ft/yr in addition to a significant reduction in the District's developable carbonate groundwater supply from existing wells. With dedication of 1 cfs from Pipeline Jones Spring for habitat enhancement, the District mitigated effects its carbonate pumping on the dace habitat 13 years ago. 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.

Thank you for the opportunity to comment on the Interim Order 1303. MVWD reserves the rights to supplement these comments in a rebuttal submittal. 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
General Manager
Moapa Valley Water District

Sincerely,

Jay Lazarus
Pres. /Sr. Geohydrologist
Glorieta Geoscience, Inc.

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STATE ENGINEERS OFFICE

References

Glorieta Geoscience, Inc. (GGI), 2015, Moapa Valley Water District 2014 Integrated Water Resources Plan, 58p.

Glorieta Geoscience, Inc., (GGI) 2019, Muddy Springs Area Monitoring Report for January 2018 through December, 2018, 42p.

Johnson, C. 2019, Procedure for Establishing Arrow Canyon Well Pumping Drawdowns at EH-4 and with this Proxy, Predicting Pumping-Related Discharge Reductions at the Refuge Springs, Mifflin & Associates, Inc. Unpublished Consulting Report, May 20, 2019.

Las Vegas Valley Water District, 2001, Water Resources and Ground-Water Modeling in the White River and Meadow Valley Flow Systems, Clark, Lincoln, Nye and White Pine Counties, Nevada, 275p.

Southern Nevada Water Authority, 2013, Nevada State Engineer Order 1169 and 1169A Study Report, 264p.

Stetson Engineers, Inc., 2018, Memorandum 100418.0 to Coyote Springs Investment, LLC, Proposed Groundwater Pumping for the 6-Basin Area Addressed in the Nevada State Engineer's September 18, 2019 Draft Order, 6p.

GLORIETA GEOSCIENCE, INC

August 16, 2019

Mr. Tim Wilson, P.E.
Acting State Engineer
Nevada Division of Water Resources
901 S. Stewart St. Suite 202
Carson City, NV 89701

Dear Mr. Wilson:

This letter on behalf of the Moapa Valley Water District (MVWD; District) provides rebuttal comments on reports received in response to the Nevada Department of Water Resources' (DWR) request for comments on Interim Order 1303, issued on January 11, 2019 and amended May 15, 2019. MVWD is not providing rebuttal comments for all of the reports submitted and lack of rebuttal to other reports should not be interpreted as implied agreement by MVWD with the conclusions reached in those reports.

In addition to rebuttal comments, MVWD is including errata for the District's July 1, 2019 response letter as follows:

Errata: In Section E of the District's July 1, 2019 response, MVWD stated:

"MVWD provides water service to approximately 8500 people with 3175 metered service connections." The correct number of metered service connections in the District is **3,250**.

Also in Section E, the language should read (correction is **bolded**):
"the State Engineer designate **current/existing** municipal use of water as the most protected and highest use of water in the 7-basin flow system and **current/existing** municipal use..........

"the State Engineer designate **current/existing** municipal certificated and permitted water rights as a preferred use regardless of priority

Rebuttal

Comments on Lincoln-Vidler-Zonge Report

The Lincoln County Water District, Vidler Water Company, and Zonge International Inc. report entitled Lower White River Flow System Interim Order #1303 Report Focused on the Northern Boundary of the Proposed Administrative Unit is hereafter referred to as the LVZ (2019) report to facilitate references to the report.

Section 3.1.2 KMW-1 and CSVM-4 Groundwater Level Data

> "What is also striking regarding the hydrographs from both these wells [KMW-1 and CSVM-4] is the consistency in their trends, suggesting that they are related and again how KSV [Kane Springs Valley] and northern CSV [Coyote Spring Valley] 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." (LVZ, 2019, p. 3-4).

The hydrographs referred to do not demonstrate a separation of the Northern CSV and KSV from the rest of the LWRFS and, on the contrary, show that there is a strong connection between the basins. A review of hydrographs from carbonate wells completed in the LWRFS (SNWA, 2018) shows that the majority of wells that were monitored before, during, and after the Order 1169 pumping test show a similar trend to what is described by LVZ (2019) for carbonate wells in the northern CSV and in KSV. The anomalously high recharge in 2005 resulted in nearly universal water level rises for (generally) one-and-one-half to two years, followed by two to three years of declining water levels as the system equilibrated. From approximately 2008 to the start of the Order 1169 pumping test in late 2010, water levels in the majority of wells (including CSVM-4 and KMW-1) were generally stable, with minor seasonal fluctuations. From the start of the Order 1169 pumping test until the end of the test in December 2013 the majority of carbonate wells (including KMW-1 and CSVM-4) show water levels declining at rates higher than observed at any other time in the historic record. After the test ended, water levels stabilized or recovered slightly, with seasonal fluctuations overprinted on a generally stable or rising water level trend.

The similarity in groundwater trends in monitoring wells completed throughout the LWRFS and in KSV before, during, and after the Order 1169 pumping test demonstrates a strong connection between Kane Spring Valley, the northern Coyote Springs Valley and the other basins in the LWRFS. Water levels in both KMW-1 and CSVM-4 showed a response to pumping during the Order 1169 pumping test that cannot be explained solely by above normal precipitation in 2005.

Variability of Heads in Monitoring Wells

Throughout the LVZ (2019) report, reference is made to the difference in heads between wells drilled in the Northern CSV and in KSV, with the implication (implied or directly stated) that these head differences show a break between northern CSV/KSV and the remainder of the LWRFS resulting from a buried structure. Some examples are provided below and the District's rebuttal of these quotes follows.

LVZ, 2019, p. 1-1:

"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."

Page 2-3: LVZ (2019) cite State Engineer Order 5712 in support of the argument that KSV and northern CSV are separate from the rest of the LWRFS and include the following quote from Order 5712:

> "...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." (LVZ, 2019, p. 2-3)

The LVZ (2019) report omits the opening portion of the paragraph as written in Order 5712, which reads as follows:

> "The State Engineer finds the evidence indicates a strong hydrologic connection between Kane Springs Valley and Coyote Springs Valley, specifically, that ground water flows from Kane Springs Valley into Coyote Spring Valley. However, carbonate water levels...[continued as above]" (State Engineer Order 5712, p. 21)

LVZ (2019, p. 3-1): "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."

LVZ (2019, p. 6-1): "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."

MVWD response: Heads in wells in KSV and northern CSV are, in fact, higher than wells further south in the LWRFS. However, the difference in heads does not necessitate the presence of a buried structure that partitions the basins. When the groundwater gradient (change in water level elevation over a distance) is examined, rather than the absolute elevation values, the data show that there is very little (negligible) difference between the gradient in KSV/Northern CSV 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 x 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 x 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 x 10^{-4} ft/ft and 7.6 x 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
Pres. /Sr. Geohydrologist
Glorieta Geoscience, Inc.

References

Lincoln County Water District, Vidler Water Company, and Zonge International, Inc. (LVZ), 2019, Lower White River Flow System Interim Order #1303 Focused on the Northern Boundary of the Proposed Administrative Unit, 48p plus Figs and Appendices

Southern Nevada Water Authority (SNWA), 2018, Assessment of Water Resource Conditions in the Lower White River Flow System

Office of the Nevada State Engineer, 2007, Ruling #5712

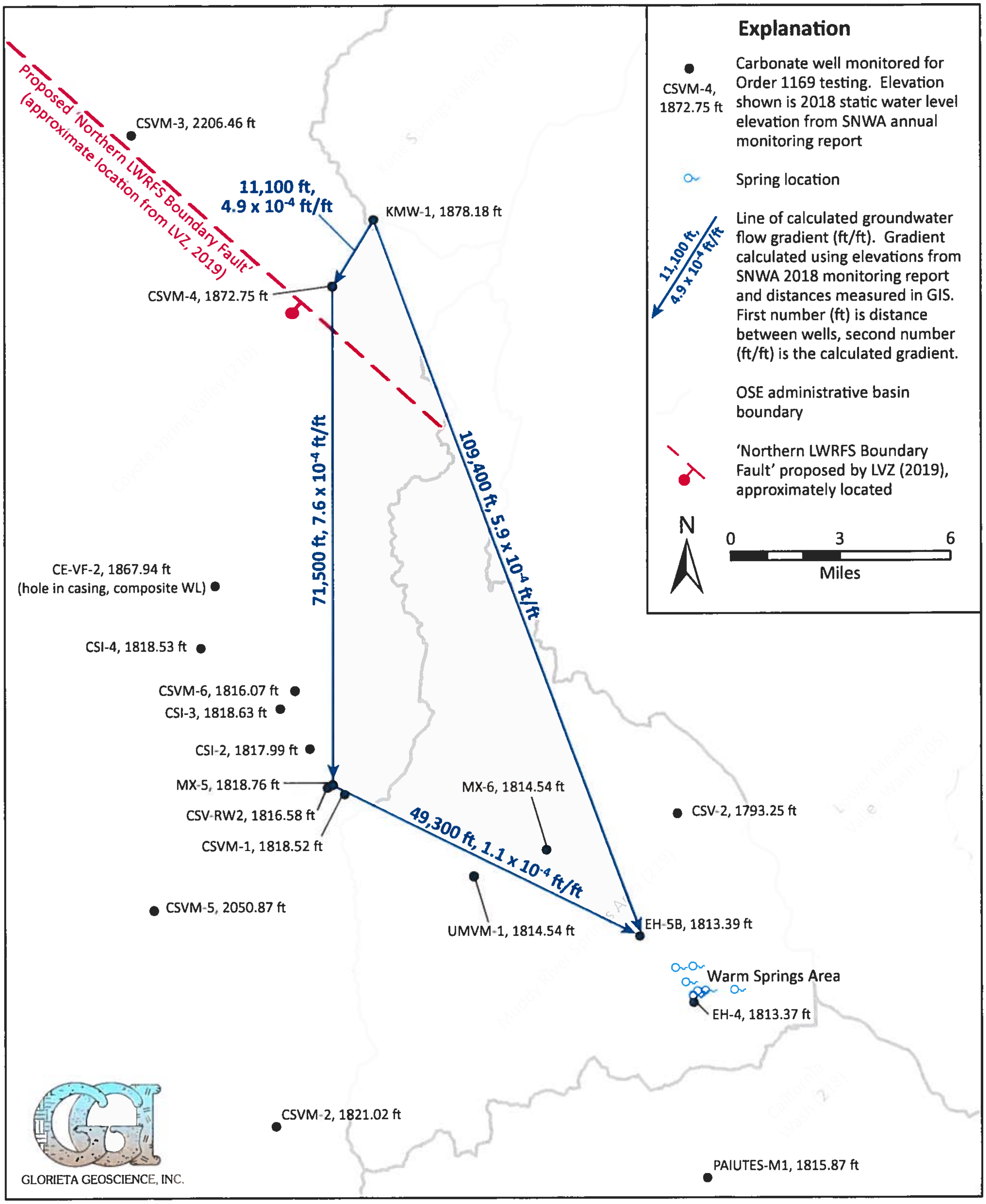


Figure 1. Map of lower Kane Spring Valley, Coyote Spring Valley, and Muddy River Springs Area administrative basins showing consistency of groundwater gradient between basins and across the 'Northern LWRFS Boundary Fault' proposed by LVZ (2019).

Division of
WATER RESOURCES

Public Workshop

Moapa Valley Community Center

Jason King, P.E.
State Engineer

July 24, 2018

DEPARTMENT OF
CONSERVATION & NATURAL RESOURCES

Water Use in the Lower White River Flow System

Topics

Impacted Area & Why We Are Here	Water Law and Water Management	Lower White River Flow System (LWRFS)	Management Options

Impacted Area

LWRFS

- Coyote Spring Valley
- Muddy River Springs Area (MRSA)
- California Wash
- Hidden Valley
- Garnet Valley
- Black Mountains Area (northwest portion)

Why Are We Here?

- >40,000 acre-feet in committed groundwater rights in the LWRFS
- Two year carbonate aquifer test of 10,200 acre-feet annually caused unprecedented
  - decline in high altitude springs, and
  - decline in groundwater levels

Why Are We Here?

- 5-year recovery data since the aquifer test shows water levels are relatively flat
  - 5-year pumping from carbonate wells has averaged ~7,000 af
- Based on the aquifer test, subsequent data collection and current development pressures, it is critical that a management strategy be implemented

Why Are We Here?

More Complications

The LWRFS is the *ONLY* region in the state where, because of the close hydrologic connectivity between basins, our office has determined that all the basins need to be managed as one.

Water Law and Water Management

Nevada Water Law

- Prior Appropriation
  - First in time, first in right
- Priority Date
  - Date application filed for new appropriation
  - Date domestic well completed
  - Date pre-statutory right first placed to beneficial use

Nevada Water Law

Application

↓

Permit

↓

Certificate

Nevada Water Law

- Beneficial Use
  - The basis, the measure and the limit of the water right.
- Use it or lose it:
  - Cancellation
  - Forfeiture
  - Abandonment

Management Tools for Over-Appropriated Basins

- NRS 534.110(6)—Regulation by priority ("curtailment")
- NRS 534.110(7)—Critical Management Area
  - Approvable Water Management Plan
  - Or, after 10 years, curtailment

Management Tools

- NRS 534.030— Basin Designation

- NRS 534.120— Orders and Rules for Designated Basins

Statutory Directives

- NRS 533.024(1)(c)—Best available science
- NRS 533.024(1)(e)—Conjunctive management
- NRS 534.020—Groundwater management

Perennial Yield

State Engineer’s estimate of PY is used to help determine the amount of groundwater available in a hydrographic basin.

Perennial Yield

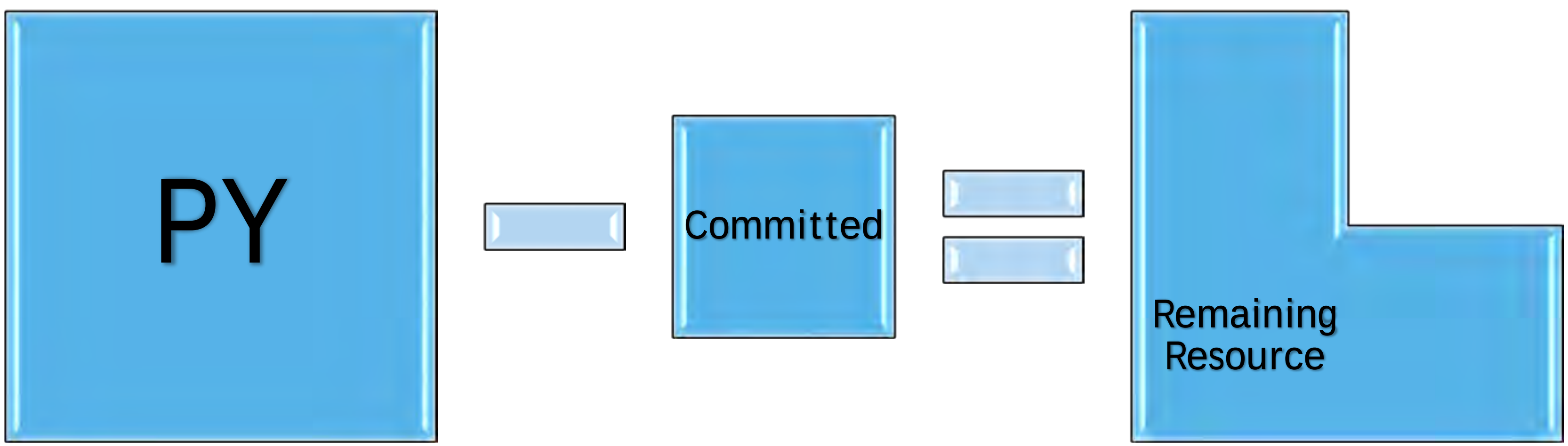
- The maximum amount of groundwater that can be withdrawn each year over the long term without depleting the groundwater reservoir.

- The goal is to **<u>not</u>** approve more groundwater rights and the drilling of domestic wells than the basin's perennial yield.

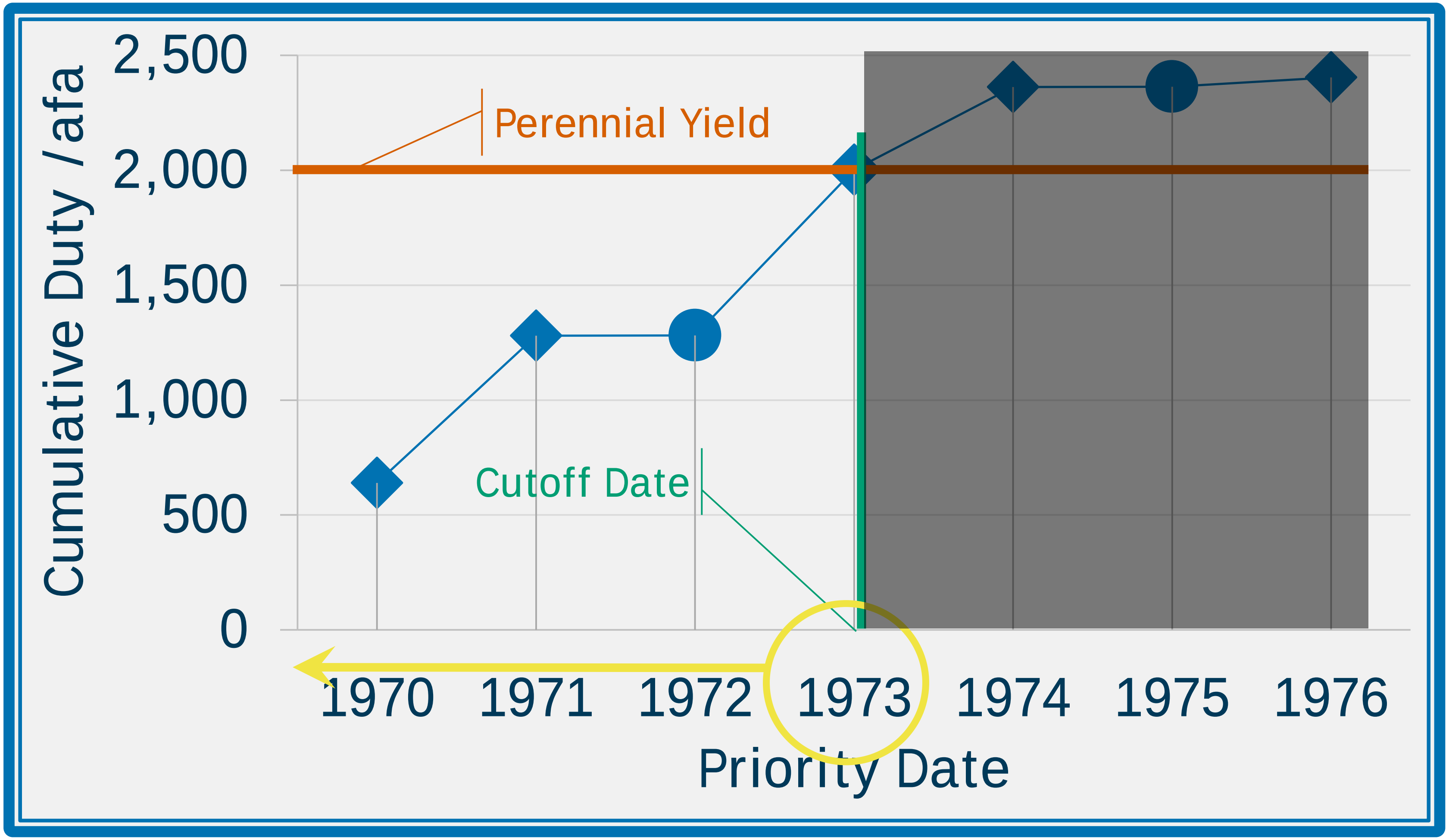
Groundwater Management

–Basin-by-basin basis

(but remember, the LWRFS consists of 5^{+})



Prior Appropriation



SE ROA 39289

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Surface and Underground

NRS 533

- General provisions
  - Adjudications
  - Appropriations
- Focused on surface water

NRS 534

- Groundwater specific
- Well drilling
- Domestic wells
- Designation

Conjunctive Management

NRS 533.024(1)(e)

"It is the policy of this State...[t]o manage conjunctively the appropriation, use and administration of all waters of this State, regardless of the source of the water."

Lower White River Flow System (LWRFS)

LWRFS

- Coyote Spring Valley
- Muddy River Springs Area (MRSA)
- California Wash
- Hidden Valley
- Garnet Valley
- Black Mountains Area (northwest portion)

SE ROA 39293

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Carbonate and Alluvial Aquifers

Carbonate Aquifer

- Old (~400 million years) sedimentary rocks composed of carbonate minerals
- Limestone and dolomite
- Much of the bedrock and mountain ranges of Eastern Nevada are formed from carbonate rocks
- The rock itself is almost impermeable but fractures or solution cavities can be large and highly productive

Alluvial Aquifer

- Young (<5 million years) unconsolidated material deposited by flowing water
- Sands/gravels/clays
- Valley floors are generally composed of alluvium, forming the aquifers for most shallow wells.
- Variable permeability depending on composition

Our office did NOT distinguish between aquifers when issuing water rights!

Early Water Resource Studies

- Eakin (Bulletin 33, 1966)
  - Estimated water budget for the WRFS
  - Inflow to MRSA 37,000 af
  - Subsurface outflow nil
- Rush (Recon 50, 1968)
  - Local recharge and water budgets in the LWRFS

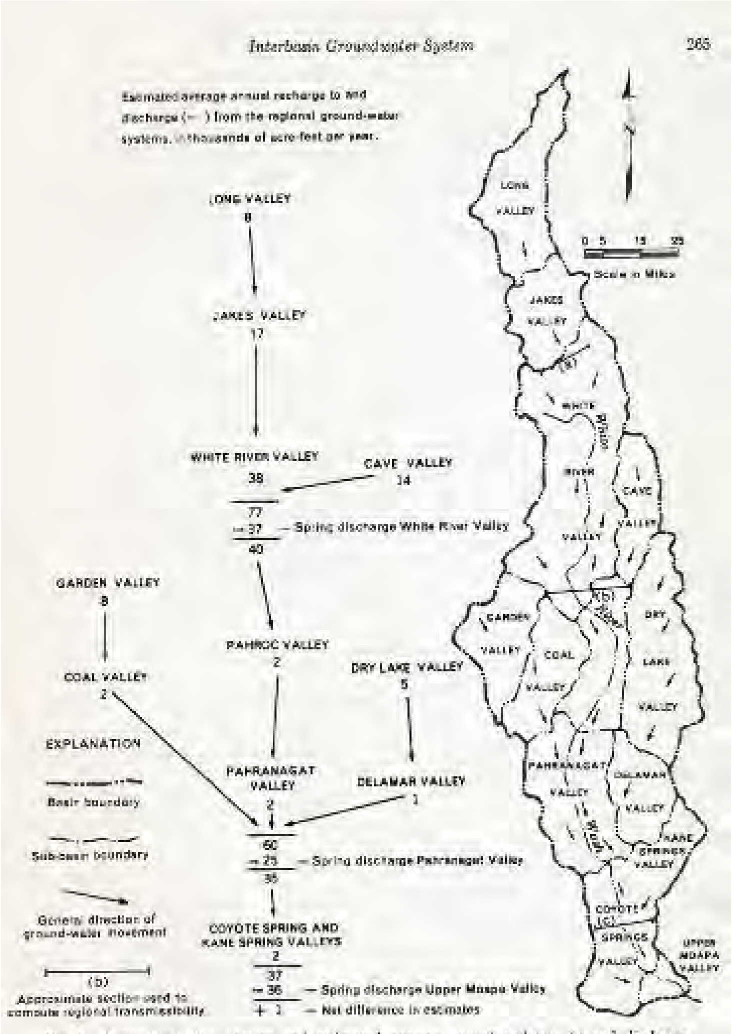

Fig. 6. Generalized flow pattern and estimated average annual recharge to and discharge from the regional groundwater system.

SE ROA 39295

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LWRFS Carbonate Aquifer

In the 1980s and 1990s, water managers in Nevada were hopeful that the carbonate-rock aquifer system in the LWRFS would provide a new, abundant source of groundwater that could be used to address Southern Nevada's water shortage.

LWRFS Carbonate Aquifer

- Because the prospect of the LWRFS carbonate was great, nearly 100 water right applications for over 300,000 acre-feet were filed in our office.

- July and August 2001 hearings on water right applications.

Order 1169 and 1169A

- March 8, 2002
  - Order 1169
  - Hydrographic Basin Nos. 210, 215, 216, 217, 219, & 220
  - Groundwater applications held pending aquifer test
- April 18, 2002
  - Ruling 5115 added Basin 218

Order 1169 and 1169A

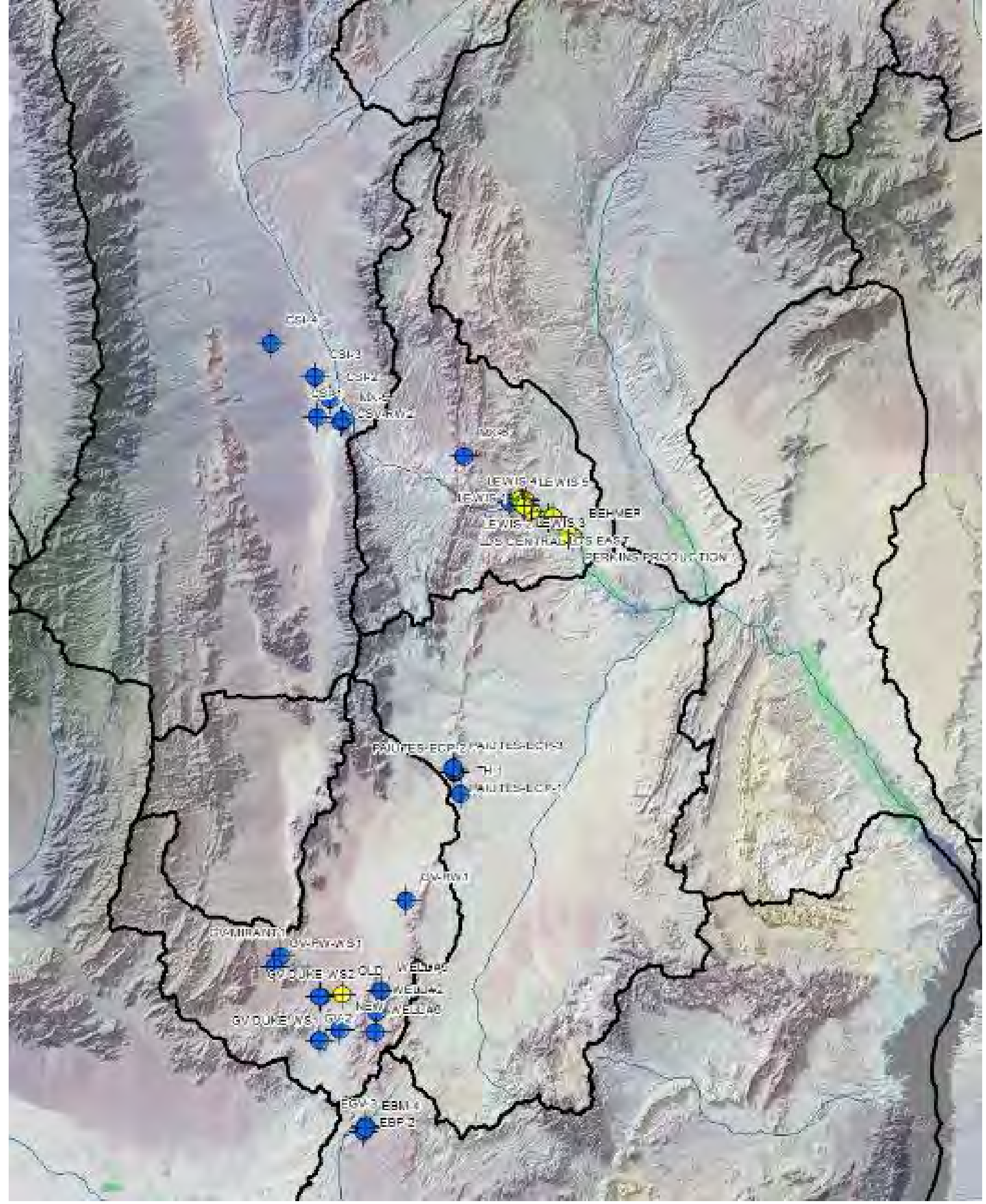
- November 15, 2010
  - Aquifer test begins
- December 21, 2012
  - Order 1169A
  - Test completed on December 31, 2012
    - 25½ months
  - Report filings by June 28, 2013

Order 1169 and 1169A

- Participants in the Aquifer test
  - Southern Nevada Water Authority/LVVWD
  - Moapa Valley Water District
  - Coyote Springs Investments, LLC
  - Moapa Band of Paiutes
  - Nevada Power Company

Pumping Areas

- 5,300 afa in Coyote Spring Valley
- 10,200 afa total carbonate pumping
- 3,700 afa alluvial pumping

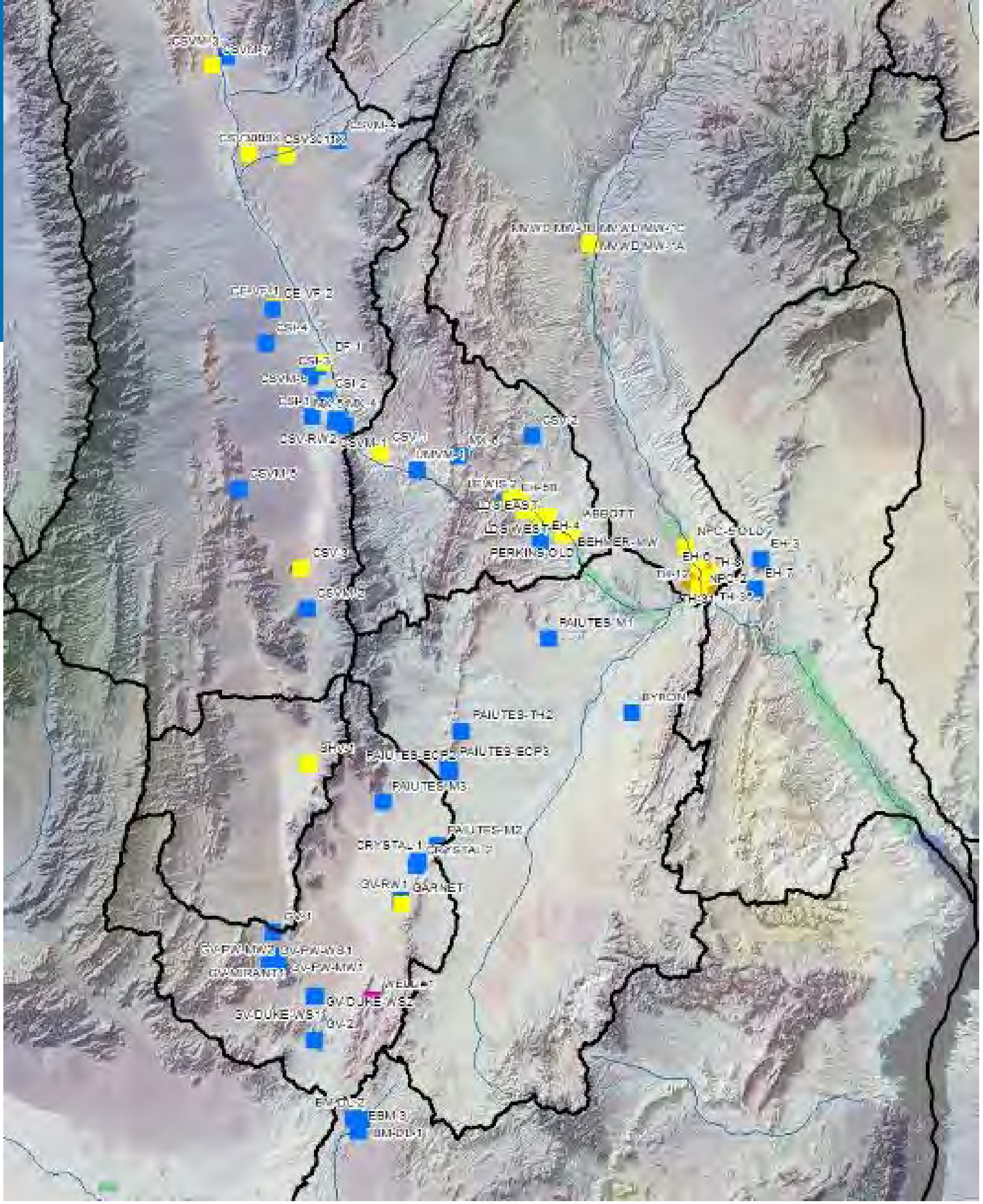


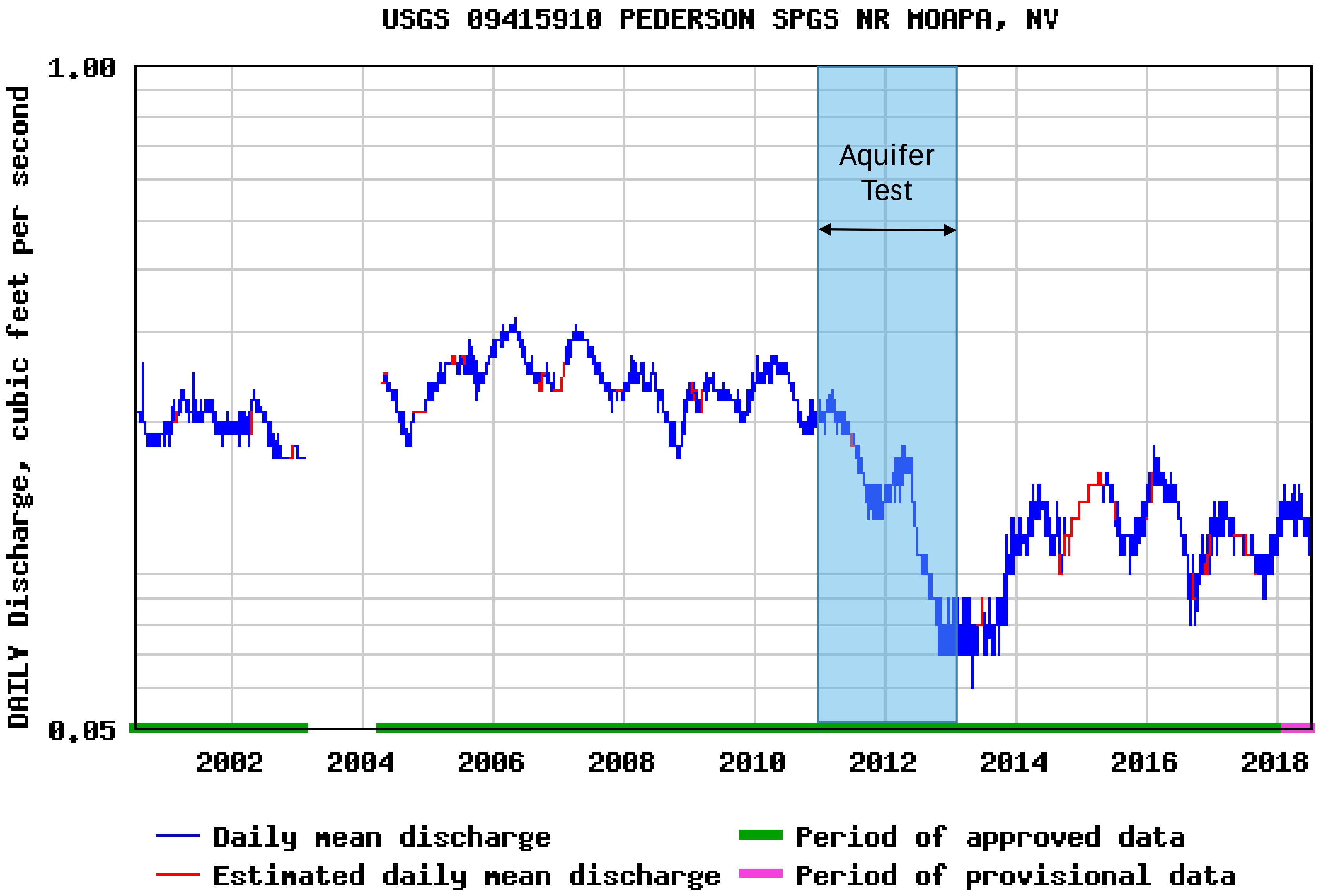
Monitoring Sites

79 monitoring wells

- carbonate
- valley-fill

11 springs and streamflow monitoring sites





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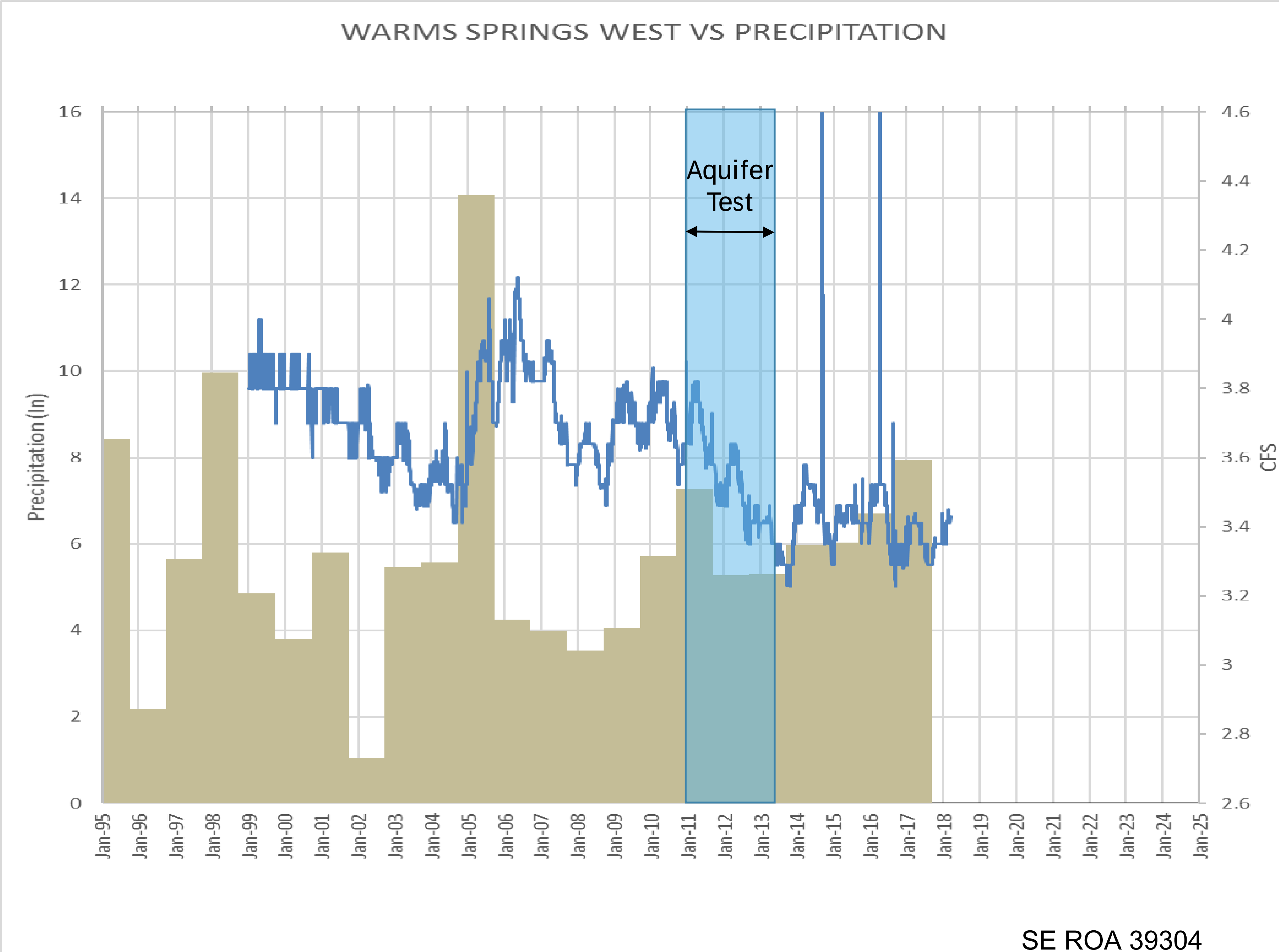


WARMS SPRINGS WEST VS PRECIPITATION
Precipitation (In)
CFS
Aquifer Test
16
14
12
10
8
6
4
2
0
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Jan-17 Jan-18 Jan-19 Jan-20 Jan-21 Jan-22 Jan-23 Jan-24 Jan-25

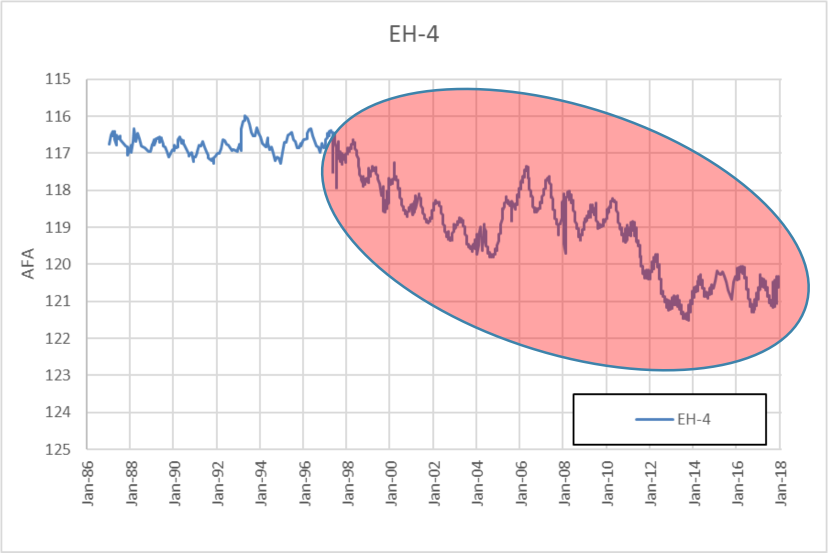
SE ROA 39304

Water Levels vs. High Altitude Springflow

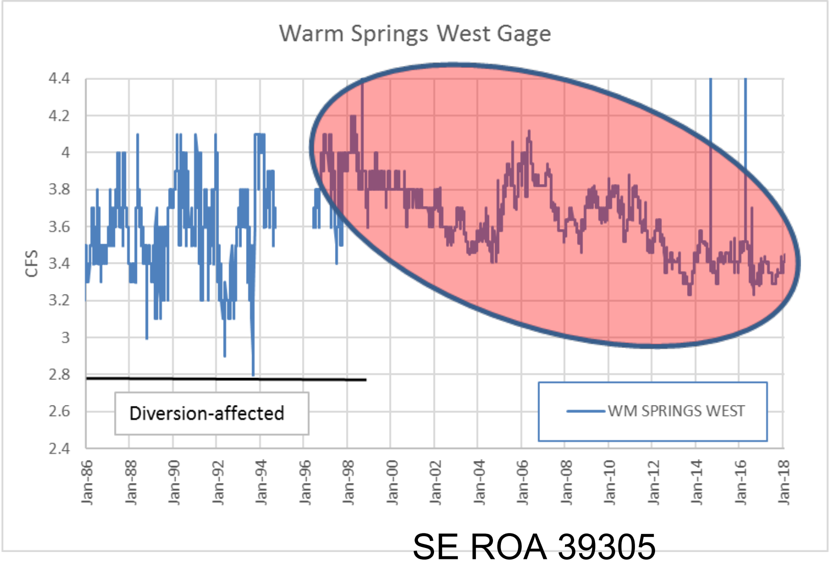
- Springflow mirrors water levels in carbonate aquifer

DECREASING WATER LEVELS DRIVES DECREASING SPRINGFLOW

Water Levels



Warm Springs flow



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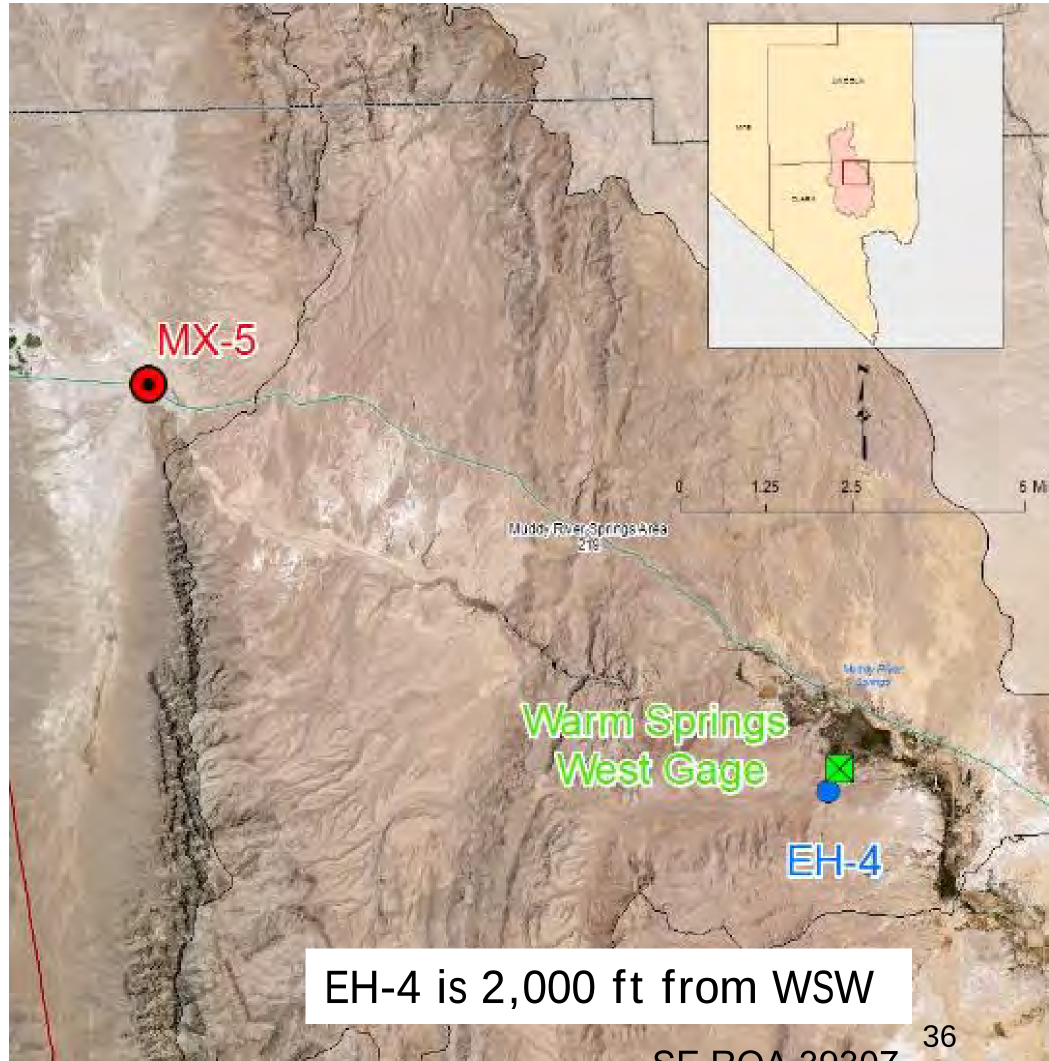
Aquifer Test Results

- Reports provided to the State Engineer
  - Southern Nevada Water Authority
  - U.S. Department of Interior Bureaus
    - Fish and Wildlife Service
    - National Park Service
    - BLM
  - Moapa Band of Paiutes
  - Moapa Valley Water District
  - Coyote Springs Investment, LLC
  - Great Basin Water Network
  - Center for Biological Diversity

Analysis of 1169 results and data

- What does 1169 aquifer test results tell us about limitations on pumping from a conflict/threat perspective?
- State Engineer focused analysis on correlation between pumping and spring flow



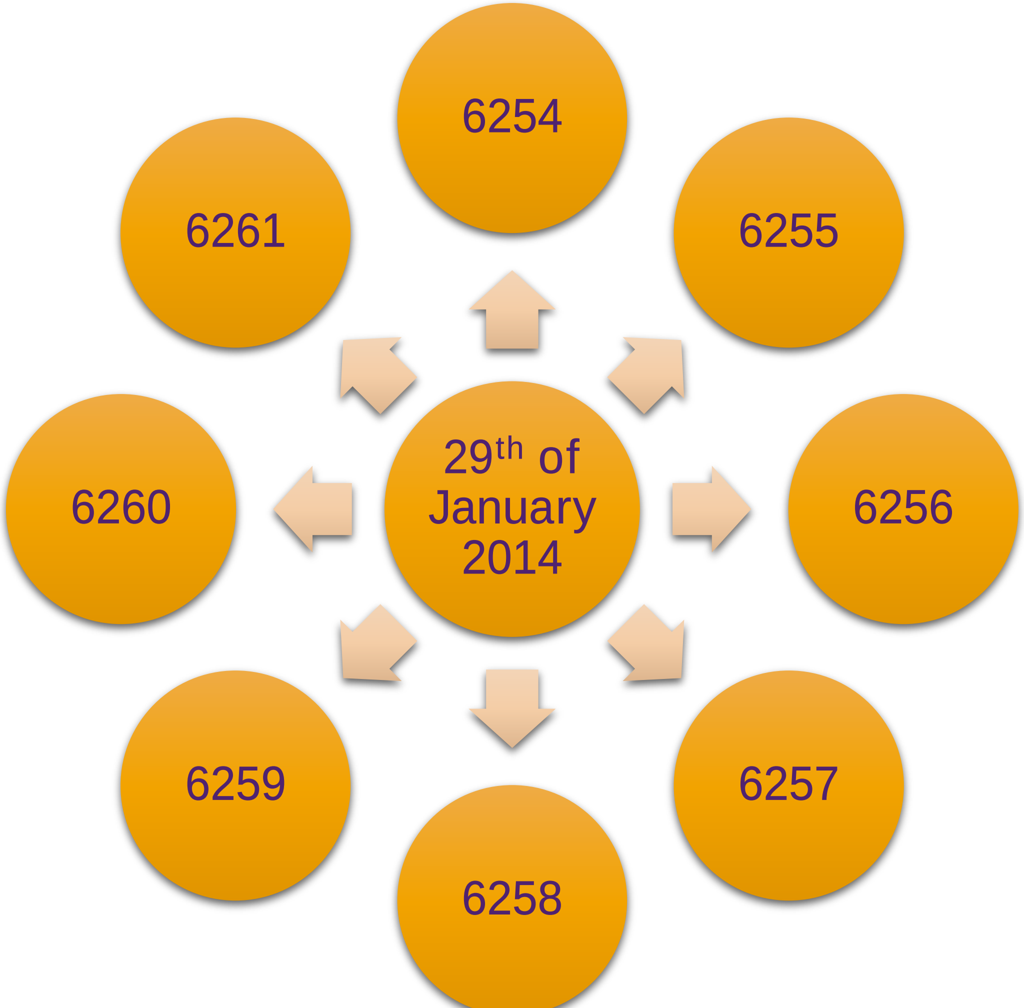
Aquifer Test Results

- Unprecedented decline in high-altitude springs
- Unprecedented decline in water levels
- None of the parties to the aquifer test reported that additional pumping in the central part of CSV or MRSA could occur ***without*** conflict with existing rights or dace habitat
- Interpretations of results – not entirely in agreement
- Demonstrated that the LWRFS basins are *very well connected*

Remember,

- >40,000 acre-feet in committed groundwater rights in the LWRFS
- Two year carbonate aquifer test of 10,200 acre-feet annually caused unprecedented decreases in spring flows and water levels

State Engineer Rulings



State Engineer Rulings

- The basins to be jointly managed
- Denied all pending applications in the LWRFS—NRS 533.370(2) more than 300,000 acre-feet
  - No unappropriated groundwater
  - Conflict with existing rights
  - Threaten to prove detrimental to the public interest

Current Estimated Water Budget

Total Supply 50,000 afa or less

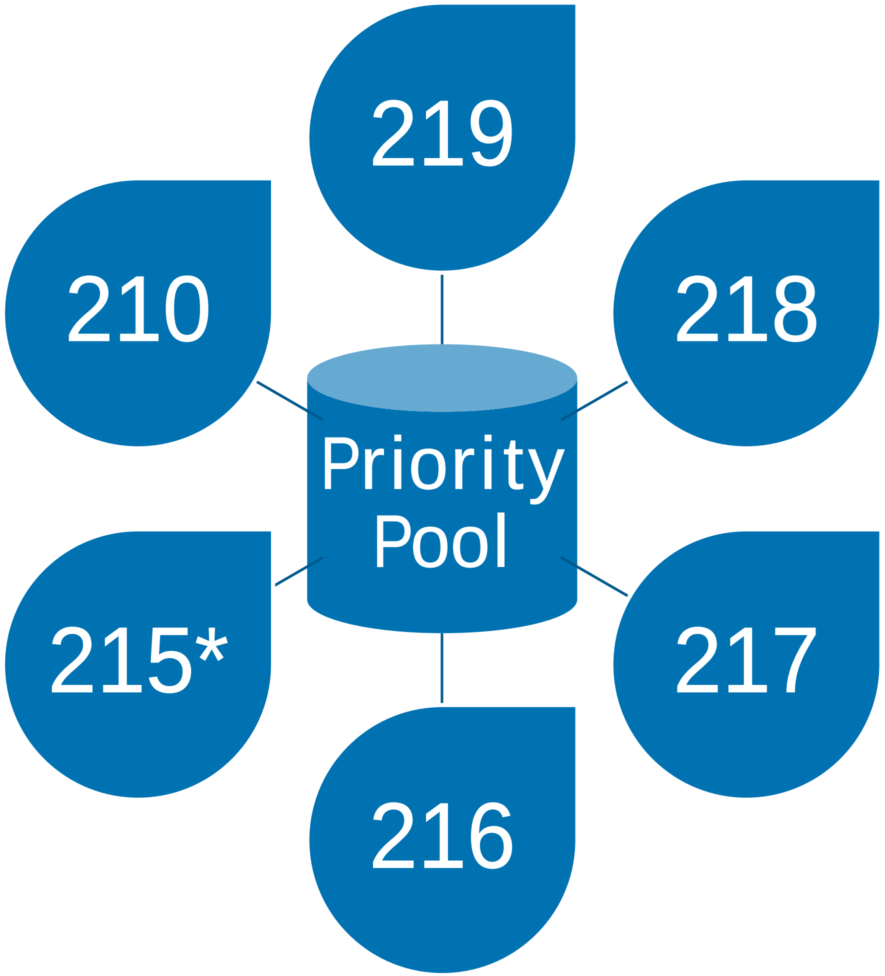
INFLOW:

Subsurface groundwater inflow	*47,502*
Local Recharge	*2,998*

OUTFLOW:

Muddy River streamflow	*33,700*
Muddy River Springs Area ET	*6,000*
California Wash ET/Subsurface outflow	*~10,000*

Joint Management



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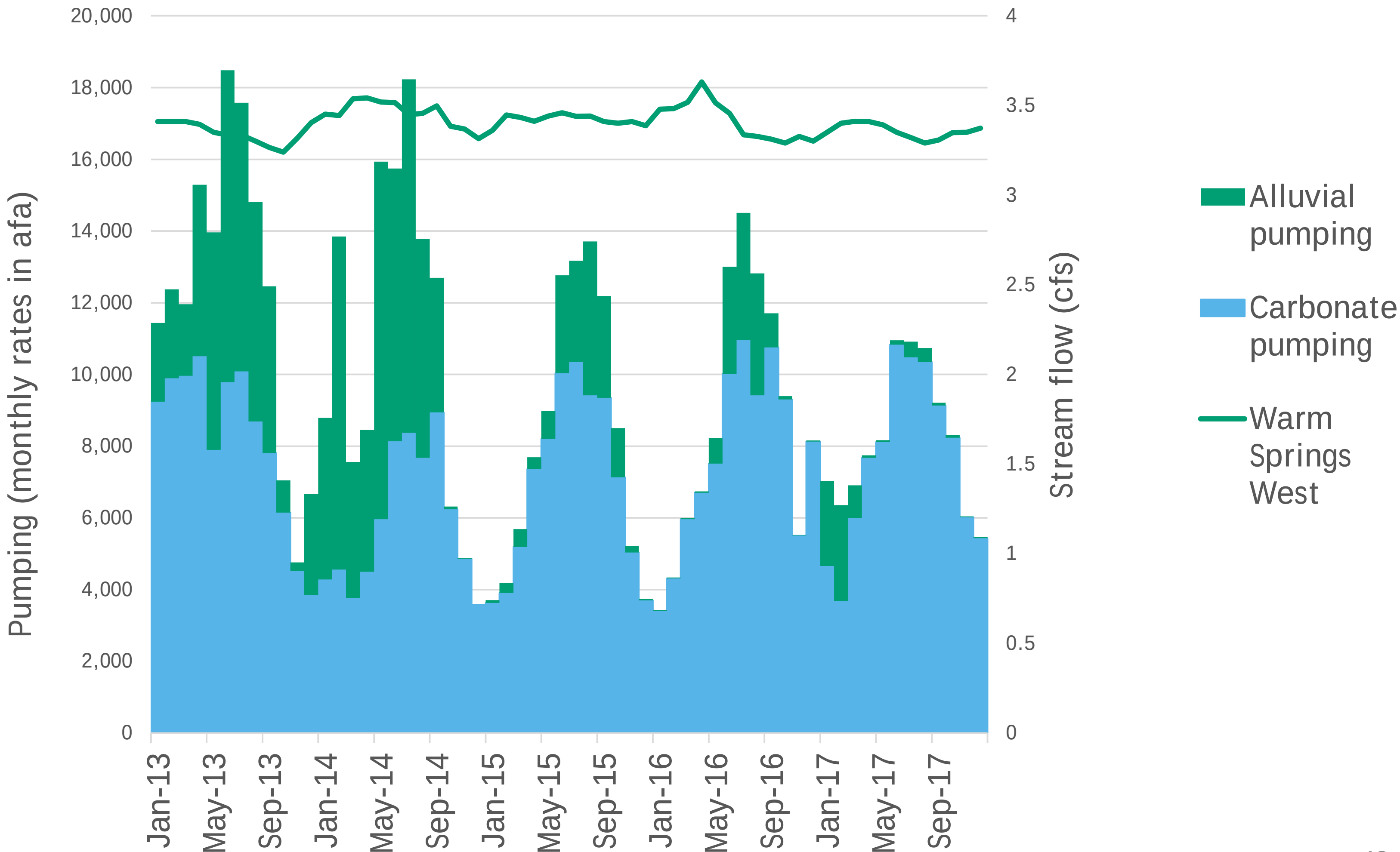
Trends since the end of the aquifer test



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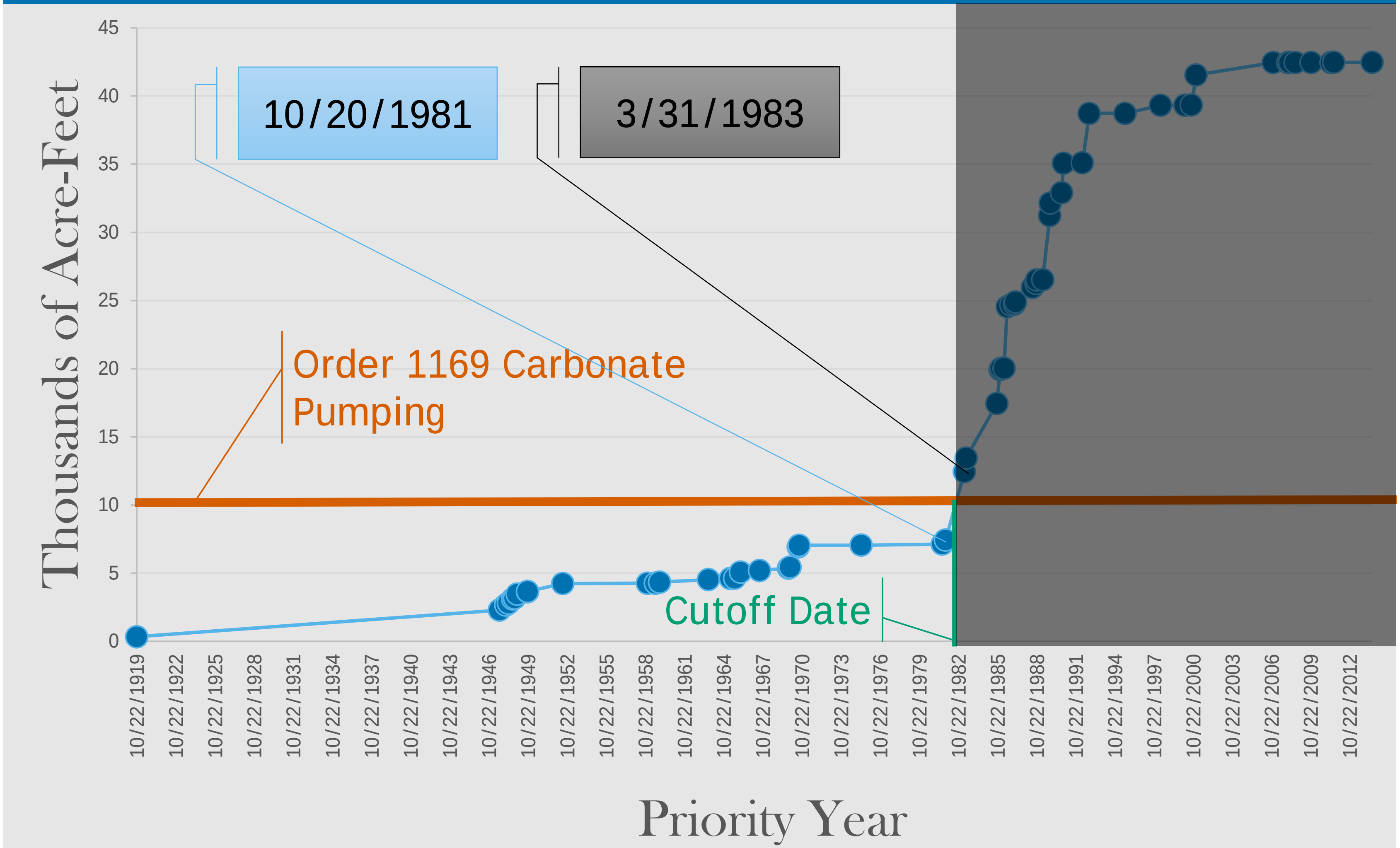
Existing Appropriations in the LWRFS



Muddy River

- Fully appropriated under the Muddy River Decree
- Most senior priority water rights
- Hydrologically connected to the alluvial fill aquifer

More Complications

Moapa dace
(Moapa coriacea)

Not to Scale

Illustration by Joseph R. Tomelleri

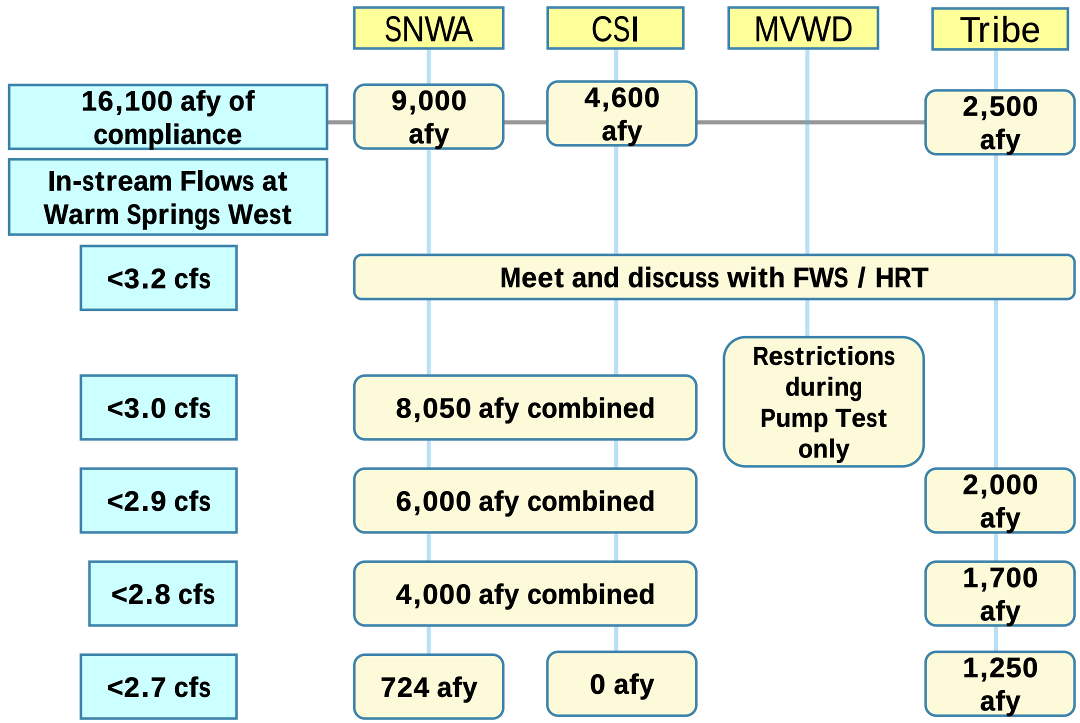
Class:	Actinopterygii
Order:	Cypriniformes
Family:	Cyprinidae
Genus:	Moapa
Species:	coriacea

Length: up to 4.7 inches **Lifespan:** 4+ years **Feed:** omnivorous	**Habitat:** a variety of habitats in the Warm Springs area

2006 Muddy River Memorandum of Agreement (“MOA”): Reducing Groundwater Pumping

- Fish and Wildlife Service anticipated the Aquifer Test in Order 1169 and Order 1169A may affect the Moapa dace
- Agreement to implement conservation measures in advance of Aquifer Test
- ESA’s Biological Opinion analyzed the impacts of 16,000 acre-feet of groundwater pumping on the Moapa dace’s habitat and established “Trigger Ranges” that require pumping to be slowed or ceased at various sites if water flow fell, as measured at the Warm Springs West flume, below certain levels needed for the Moapa dace

MOA triggers



Source: SNWA

What does this mean for Water Users?

- ESA-based enforcement actions could require long-established water users to obtain *take permits* that give up all or a portion of their water for the benefit of the Moapa dace.

- Water users that cause direct harm to the Moapa dace are potentially subject to harsh civil and criminal penalties from the federal government.

Related Issue

- Las Vegas Valley Water District (LVVWD) sent our office a letter in November 2017
  - Coyote Springs Water Resources General Improvement District (CSWRGID)
  - Subdivision map approval

State Engineer's Responsibility as it Relates to Subdivisions

- NRS 278.335(1)—Tentative subdivision map approval
- NRS 278.377—Final subdivision map approval

State Engineer's Responsibility as it Relates to Subdivisions

DIVISION OF WATER RESOURCES CERTIFICATE

THIS PLAT IS APPROVED BY THE STATE OF NEVADA DIVISION OF WATER RESOURCES OF THE DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES CONCERNING WATER QUANTITY, SUBJECT TO THE REVIEW OF APPROVAL ON FILE IN THIS OFFICE.

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Related Issue

In responding to the LVVWD letter, our office considered:

- Aquifer test data and analysis
- Recovery period data
- That under the MOA, a self-imposed curtailment tied to spring flow triggers may limit water supply in the LWRFS
- Requirement to protect senior water rights

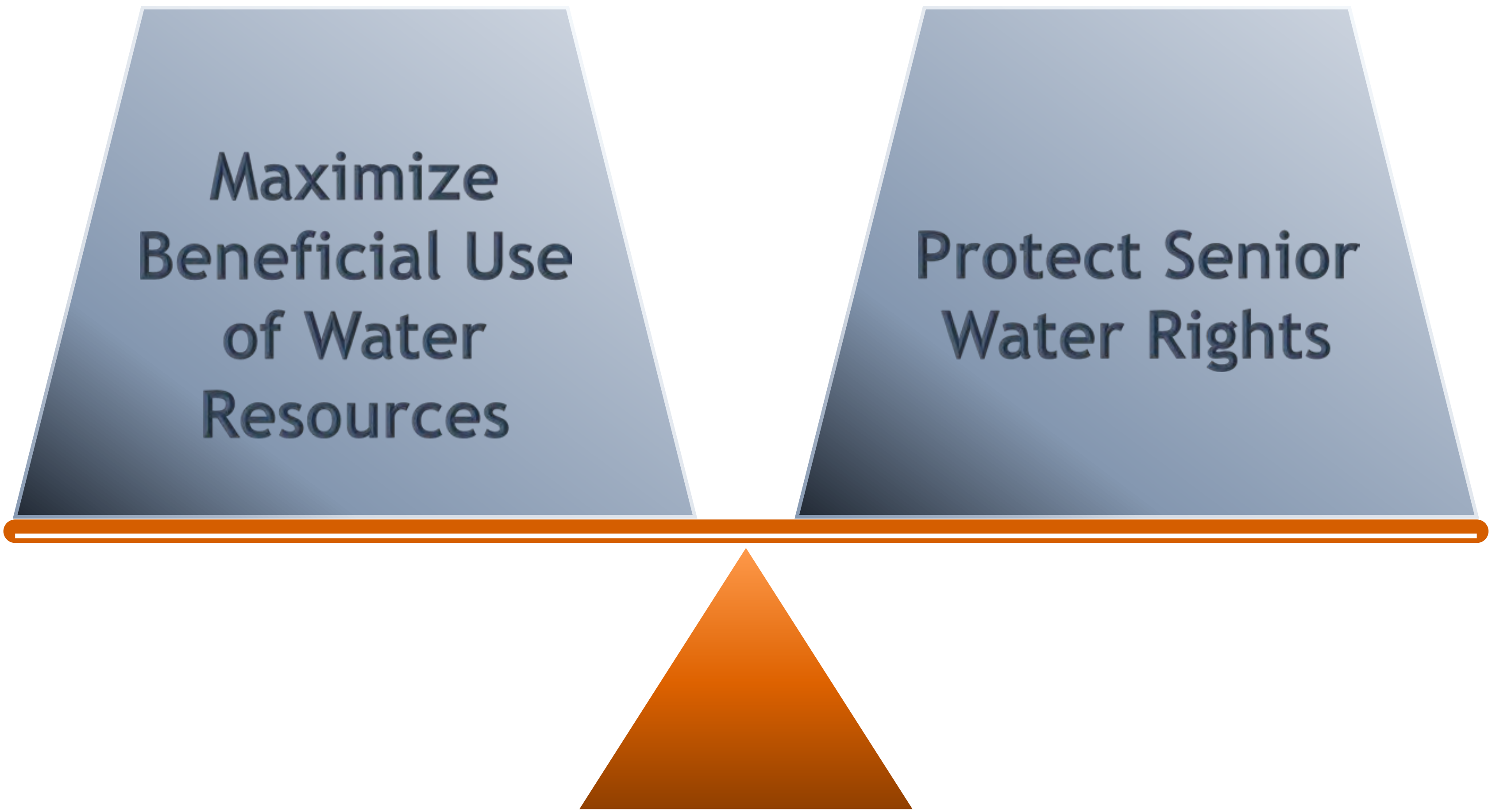
Related Issue

- State Engineer's May 2018 response addressed LVVWD's specific question relating to the sustainable development of groundwater for an entire project

  - Based upon that question presented, the State Engineer cannot justify approval of subdivision maps based on junior priority water rights without the identification of other water sources for development

- Triggered litigation

What is “our” goal?



Options

- Use existing expertise
  - Hydrologic Review Team (HRT) currently collecting data and interpreting pumping effects on the Muddy Springs and the dace
  - Establish a working group consisting of HRT members and other interested parties to begin drafting regulations for a conjunctive use management plan
- Establish groundwater pumping thresholds and monitor springs

Options

- Identify other sources of water, i.e. interbasin transfer of other groundwater or surface water
- Support stakeholder developed groundwater management plan
- Reduce active groundwater rights
  - Curtailment, relinquishments, cancellation, forfeiture

JA_10589

Stakeholder and Public Input

Next Meeting