IN THE SUPREME COURT OF THE STATE OF NEVADA

Case No. 84345
and
Case No. 84640

CITY OF LAS VEGAS, a political subdivision of the State of Nevada,

Appellant

v.

180 LAND CO, LLC, a Nevada limited-liability company, FORE STARS LTD., a Nevada limited liability company,

Respondents

District Court Case No.: A-17-758528-J
Eighth Judicial District Court of Nevada

CITY OF LAS VEGAS' REPLY APPENDIX
VOLUME 5

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CHRONOLOGICAL INDEX TO CITY'S REPLY APPENDIX

DATE	DOCUMENT	VOLUME	PAGE RANGE
2022-09-13	Defendant City of Las Vegas' Second Supplemental Appendix of Exhibits in Support of City's Renewed Motion for Summary Judgment and Motions in Limine Volume 32, Case No. A-18-773268-C	2	REPLY APP 0396 - REPLY APP 0432
2022-11-23	Defendant City of Las Vegas' Supplemental Appendix of Exhibits in Support of City's Countermotion for Summary Judgment on Just Compensation Volume 34, Case No. A-18-773268-C	3	REPLY APP 0433 - REPLY APP 0652
2022-11-23	Defendant City of Las Vegas' Supplemental Appendix of Exhibits in Support of City's Countermotion for Summary Judgment on Just Compensation Volume 35, Case No. A-18-773268-C	4 5	REPLY APP 0653 - REPLY APP 0902 REPLY APP 0903 - REPLY APP 0907
2022-11-23	Defendant City of Las Vegas' Supplemental Appendix of Exhibits in Support of City's Countermotion for Summary Judgment on Just Compensation Volume 36, Case No. A-18-773268-C	5	REPLY APP 0908 - REPLY APP 1096
2022-11-23	Defendant City of Las Vegas' Supplemental Appendix of Exhibits in Support of City's Countermotion for Summary Judgment on Just Compensation Volume 37, Case No. A-18-773268-C	6	REPLY APP 1097 - REPLY APP 1240

DATE	DOCUMENT	VOLUME	PAGE RANGE
2022-11-23	Defendant City of Las Vegas' Supplemental Appendix of Exhibits in Support of City's Countermotion for Summary Judgment on Just Compensation Volume 38, Case No. A-18-773268-C	7	REPLY APP 1241 - REPLY APP 1406
2022-11-23	Defendant City of Las Vegas' Supplemental Appendix of Exhibits in Support of City's Countermotion for Summary Judgment on Just Compensation Volume 39, Case No. A-18-773268-C	7	REPLY APP 1407 - REPLY APP 1476
2023-01-23	Defendant City of Las Vegas' Appendix of Exhibits in Support of Motion to Retax Memorandum of Costs, Volume 1, Exhibits B - C, Case No. A-18-773268-C	8	REPLY APP 1477 - REPLY APP 1667
2022-09-12	Plaintiff Landowners Second Supplement to Appendix of Exhibits in Support of Motion to Determine Take and for Summary Judgment on the Third and Fifth Claims for Relief Volume 24, Excerpt from Exhibit 228, Case No. A-18-773268-C	9	REPLY APP 1668 - REPLY APP 1742

ALPHABETICAL INDEX TO CITY'S REPLY APPENDIX

DATE	DOCUMENT	VOLUME	PAGE RANGE
2022-11-23	Defendant City of Las Vegas' Supplemental Appendix of Exhibits in Support of City's Countermotion for Summary Judgment on Just Compensation Volume 36, Case No. A-18-773268-C	5	REPLY APP 0908 - REPLY APP 1096
2022-11-23	Defendant City of Las Vegas' Supplemental Appendix of Exhibits in Support of City's Countermotion for Summary Judgment on Just Compensation Volume 37, Case No. A-18-773268-C	6	REPLY APP 1097 - REPLY APP 1240
2022-11-23	Defendant City of Las Vegas' Supplemental Appendix of Exhibits in Support of City's Countermotion for Summary Judgment on Just Compensation Volume 38, Case No. A-18-773268-C	7	REPLY APP 1241 - REPLY APP 1406
2022-11-23	Defendant City of Las Vegas' Supplemental Appendix of Exhibits in Support of City's Countermotion for Summary Judgment on Just Compensation Volume 39, Case No. A-18-773268-C	7	REPLY APP 1407 - REPLY APP 1476
2022-09-12	Plaintiff Landowners Reply Re: Plaintiff Landowners' Motion to Determine Take and For Summary Judgment on the Third and Fifth Claims for Relief, Case No. A-18-773268-C	2	REPLY APP 0365 - REPLY APP 0395

DATE	DOCUMENT	VOLUME	PAGE RANGE
2022-09-12	Plaintiff Landowners Second Supplement to Appendix of Exhibits in Support of Motion to Determine Take and for Summary Judgment on the Third and Fifth Claims for Relief Volume 24, Excerpt from Exhibit 228, Case No. A-18-773268-C	9	REPLY APP 1668 - REPLY APP 1742
2022-08-11	Plaintiff Landowners' Appendix of Exhibits in Support of: Plaintiff Landowners' Motion to Determine Take and for Summary Judgment on the Third and Fifth Claims for Relief, Volume 22, Exhibit 214, Case No. A-18-773268-C	1	REPLY APP 0031 - REPLY APP 0227
2022-08-10	Plaintiff Landowners' Motion to Determine Take and for Summary Judgment on the Third and Fifth Claims for Relief, Case No. A-18-773268-C	1	REPLY APP 0001 - REPLY APP 0030

DATED this 2nd day of May, 2023.

BY: /s/ Debbie Leonard

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Attorneys for City of Las Vegas

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that I am an employee of Leonard Law, PC, and that on this date a copy of Appendix Volumes 2-9 were electronically filed with the Clerk of the Court for the Nevada Supreme Court by using the Nevada Supreme Court's E-Filing system (E-Flex). Participants in the case who are registered with E-Flex as users will be served by the E-Flex system. All others will be served by U.S. mail.

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Dated: May 2, 2023

/s/ Tricia Trevino

Tricia Trevino

2nd Update
TO THE
TECHNICAL DRAINAGE STUDY
FOR
QUEENS BOROUGH CULVERT

619.295

February 2006

Prepared for:

JMA Architecture Studios
10150 Covington Cross Drive
Las Vegas, Nevada 89144
Phone: (702) 731-2033
Fax: (702) 731-2039

619.295

February 27, 2006

ENGINEERS PLANNERS SURVEYORS

G. C. WALLACE, INC.

Writer's Contact Information
804-2029

Albert Sung, P.E.
City of Las Vegas Land Development Services
731 South Fourth Street
Las Vegas, Nevada 89101

Subject: 2nd Update to the Technical Drainage Study for Queens Borough Culvert (DS3674)

Dear Mr. Sung:

The purpose of this letter is to serve as an update to the *Technical Drainage Study for Queens Borough Culvert* (DS3674), which was conditionally approved by the City of Las Vegas on August 30, 2005. A copy of the approval letter is included in the Appendix for your review.

The proposed changes are as follows:

The RCB horizontal reverse curves located at RCB Station 29+06.52 will be shifted approximately 140 feet east, and the RCB itself will be extended approximately 86 feet east within the existing channel. A water surface profile analysis was performed to gauge the impact of the proposed alignment shift. The results of the WSPG analysis indicate minimal change to the HGL gradient. The location of the hydraulic jump associated with the RCB to channel transition, shifted approximately 86 feet east, along with the proposed headwall location. The revised location of the hydraulic jump still occurs within the area of the concrete pad; and, therefore, the proposed alignment change does not adversely impact the adjacent property or downstream facilities and is in agreement with the City of Las Vegas drainage criteria.

Copies of the water surface profile calculations and proposed grading plans are provided in the Appendix. A reference copy of the WSPGW calculations, submitted with the previous study, are provided for your convenience.

If you have any questions or require additional information, please contact me at 804-2029.

Very truly yours,

G. C. WALLACE, INC.

Christopher M. Luquette, P.E., CFM.
Project Manager
Flood Control Division

CML/CK/jj

Enc.

c: Roy Clark, GCW

G:\619-295\adminltr\CLV-2UPDATE-QueensBorough-ck-cl-2-27-06.doc

1555 South Rainbow Boulevard · Las Vegas, NV 89146 · T: 702.804.2000 · F: 702.804.2299 · gcwallace.com

FILE: QB12X12-U2.WSW

W S P G W - CIVILDESIGN Version 14.06

Program Package Serial Number: 1622

WATER SURFACE PROFILE LISTING

PAGE 1

Date: 2-24-2006 Time: 3:29:35

QUEENSBOROUGH CULVERT - JMA ARCH STUDIOS

GCWALLACE PROJECT # 619.295

FILENAME: QB12X12-U2.WSW CJK

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-3473.910	30.000	4.332	34.332	4497.00	9.55	1.41	35.75	.00	4.33	166.56		1		0 .0
TRANS STR	-.2202					.0066	.29	4.33	1.00		.035			IR-OPEN
-3430.310	20.400	15.512	35.912	4497.00	3.94	.24	36.15	.00	8.36	131.37		2		0 .0
TRANS STR	.0119					.0007	.02	15.51	.24		.040			IR-OPEN
-3401.010	20.750	15.156	35.906	4497.00	4.20	.27	36.18	.00	7.11	110.00		3		0 .0
TRANS STR	.0110					.0001	.00	15.16	.24		.015			IR-OPEN
-3350.810	21.300	14.661	35.961	4497.00	3.83	.23	36.19	.00	5.89	112.08		4		0 .0
TRANS STR	.0141					.0001	.00	14.66	.21		.015			IR-OPEN
-3325.950	21.650	14.302	35.952	4497.00	3.94	.24	36.19	.00	5.71	107.58		5		0 .0
TRANS STR	.0160							14.302	.213		.015			IR-OPEN
-3315.950	21.810	5.925	27.735	4497.00	31.62	15.53	43.26	.00	10.29	25.00	12.000	25.000	.00	1 1.0
90.310	.0152					.0249	2.24	5.93	2.34	7.02	.015	.00	.00	BOX
-3225.640	23.180	5.731	28.911	4497.00	32.69	16.60	45.51	.00	10.29	25.00	12.000	25.000	.00	1 1.0
2.320	-.0776					.0263	.06	5.73	2.46	.00	.015	.00	.00	BOX
-3223.320	23.000	5.682	28.682	4497.00	32.98	16.89	45.57	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
70.620	.0283					.0264	1.86	12.00	2.49	5.55	.015	.00	.00	BOX
-3152.700	25.000	5.709	30.709	4497.00	32.82	16.73	47.44	.00	10.29	25.00	12.000	25.000	.00	1 1.0
17.410	.0276					.0262	.46	5.71	2.47	5.60	.015	.00	.00	BOX

Program Package Serial Number: 1622

WATER SURFACE PROFILE LISTING

Date: 2-24-2006 Time: 3:29:35

QUEENSBOROUGH CULVERT - JMA ARCH STUDIOS

GCWALLACE PROJECT # 619.295

FILENAME: QB12X12-U2.WSW CJK

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-3135.290	25.480	5.714	31.194	4497.00	32.79	16.70	47.89	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
85.300	.0279					.0260	2.21	12.00	2.47	5.58	.015	.00	.00	BOX
-3049.990	27.860	5.748	33.608	4497.00	32.60	16.50	50.11	.00	10.29	25.00	12.000	25.000	.00	1 1.0
143.470	.0279					.0253	3.63	5.75	2.45	5.58	.015	.00	.00	BOX
-2906.520	31.860	5.829	37.689	4497.00	32.15	16.05	53.73	.40	10.29	25.00	12.000	25.000	.00	1 1.0
203.401	.0278					.0238	4.83	6.22	2.39	5.58	.015	.00	.00	BOX
-2703.119	37.523	6.024	43.546	4497.00	31.11	15.02	58.57	.37	10.29	25.00	12.000	25.000	.00	1 1.0
165.794	.0278					.0214	3.54	6.39	2.28	5.58	.015	.00	.00	BOX
-2537.325	42.138	6.318	48.456	4497.00	29.66	13.66	62.11	.34	10.29	25.00	12.000	25.000	.00	1 1.0
103.695	.0278					.0188	1.95	6.65	2.12	5.58	.015	.00	.00	BOX
-2433.630	45.025	6.626	51.651	4497.00	28.28	12.42	64.07	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
60.182	.0278					.0168	1.01	12.00	1.98	5.58	.015	.00	.00	BOX
-2373.448	46.700	6.888	53.588	4497.00	27.20	11.49	65.08	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
55.228	.0278					.0150	.83	12.00	1.86	5.58	.015	.00	.00	BOX
-2318.220	48.238	7.224	55.462	4497.00	25.94	10.45	65.91	.00	10.29	25.00	12.000	25.000	.00	1 1.0
26.702	.0278					.0136	.36	7.22	1.74	5.58	.015	.00	.00	BOX
-2291.518	48.982	7.440	56.421	4497.00	25.19	9.85	66.27	.00	10.29	25.00	12.000	25.000	.00	1 1.0
34.206	.0278					.0123	.42	7.44	1.66	5.58	.015	.00	.00	BOX

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-2257.313	49.934	7.803	57.737	4497.00	24.01	8.95	66.69	.00	10.29	25.00	12.000	25.000	.00	1 1.0
25.506	.0278					.0109	.28	7.80	1.55	5.58	.015	.00	.00	BOX
-2231.807	50.644	8.184	58.828	4497.00	22.90	8.14	66.97	.00	10.29	25.00	12.000	25.000	.00	1 1.0
18.679	.0278					.0096	.18	8.18	1.44	5.58	.015	.00	.00	BOX
-2213.128	51.164	8.583	59.748	4497.00	21.83	7.40	67.15	.00	10.29	25.00	12.000	25.000	.00	1 1.0
13.128	.0278					.0085	.11	8.58	1.34	5.58	.015	.00	.00	BOX
-2200.000	51.530	9.002	60.532	4497.00	20.81	6.73	67.26	.00	10.29	25.00	12.000	25.000	.00	1 1.0
60.785	.0080					.0080	.49	9.00	1.25	9.00	.015	.00	.00	BOX
-2139.215	52.016	9.002	61.018	4497.00	20.81	6.73	67.75	.00	10.29	25.00	12.000	25.000	.00	1 1.0
405.355	.0080					.0077	3.13	9.00	1.25	9.00	.015	.00	.00	BOX
-1733.860	55.259	9.255	64.514	4497.00	20.24	6.36	70.88	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
54.700	.0080					.0074	.40	12.00	1.20	9.00	.015	.00	.00	BOX
-1679.160	55.697	9.355	65.051	4497.00	20.03	6.23	71.28	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
95.423	.0080					.0069	.65	12.00	1.18	9.00	.015	.00	.00	BOX
-1583.737	56.460	9.811	66.271	4497.00	19.10	5.66	71.93	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
18.737	.0080					.0061	.11	12.00	1.10	9.00	.015	.00	.00	BOX
-1565.000	56.610	10.291	66.901	4497.00	18.21	5.15	72.05	.00	10.29	25.00	12.000	25.000	.00	1 1.0
88.377	.0050					.0051	.45	10.29	1.02	10.85	.015	.00	.00	BOX
-1476.623	57.053	10.793	67.846	4497.00	17.36	4.68	72.53	.00	10.29	25.00	12.000	25.000	.00	1 1.0
257.531	.0050					.0050	1.29	10.79	.95	10.85	.015	.00	.00	BOX
-1219.092	58.343	10.853	69.196	4497.00	17.26	4.63	73.82	.00	10.29	25.00	12.000	25.000	.00	1 1.0
219.092	.0050					.0050	1.10	10.85	.94	10.85	.015	.00	.00	BOX
---------- WARNING - Flow depth near top of box conduit ----------														
-1000.000	59.440	10.853	70.293	4497.00	17.26	4.63	74.92	.00	10.29	25.00	12.000	25.000	.00	1 1.0

Electronically Filed
11/23/2022 3:03 PM
Steven D. Grierson
CLERK OF THE COURT

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(Additional Counsel Identified on Signature Page)

Attorneys for Defendant City of Las Vegas

DISTRICT COURT

CLARK COUNTY, NEVADA

FORE STARS, LTD, SEVENTY ACRES, LLC, a Nevada limited liability company, DOE INDIVIDUALS I through X, DOE CORPORATIONS I through X, DOE LIMITED LIABILITY COMPANIES I through X, Plaintiffs, CITY OF LAS VEGAS, political subdivision of the State of Nevada, THE EIGHTH JUDICIAL DISTRICT COURT, County of Clark, State of Nevada, DEPARTMENT 24 (the HONORABLE JIM CROCKETT, DISTRICT COURT JUDGE, IN HIS OFFICIAL CAPACITY), ROE government entities I through X, ROE Corporations I through X, ROE INDIVIDUALS I through X, ROE LIMITED LIABILITY COMPANIES I through X, ROE quasi-governmental entities I through X, Defendants.	Case No. A-18-773268-C Dept. No. XXIX **SUPPLEMENTAL APPENDIX OF EXHIBITS IN SUPPORT OF CITY'S COUNTERMOTION FOR SUMMARY JUDGMENT ON JUST COMPENSATION** **VOLUME 36**

The City of Las Vegas ("City") submits this Supplemental Appendix of Exhibits in support of its Countermotion for Summary Judgment on Just Compensation. This appendix supplements the Appendix of Exhibits in Support of City's Renewed Motion for Summary Judgment and Motions in Limine filed August 11, 2022 (Volumes 1 through 25); the Supplemental Appendix of Exhibits in Support of City's Renewed Motion for Summary Judgment and Motions in Limine filed August 24, 2022 (Volumes 26

through 27); the Second Supplemental Appendix of Exhibits in Support of City's Renewed Motion for Summary Judgment and Motions in Limine filed September 12, 2022 (Volumes 28 through 32); and the Third Supplemental Appendix of Exhibits in Support of City's Renewed Motion for Summary Judgment and Motions in Limine filed September 14, 2022 (Volume 33).

Exhibit	Exhibit Description	Vol.	Bates No.
A	City records regarding William Peccole's Petition to Annex 2,246 acres to the City of Las Vegas	1	0001-0011
B	City records regarding the Peccole Land Use Plan and the Z-34-81 rezoning application	1	0012-0030
C	City records regarding the Venetian Foothills Master Plan and the Z-30-86 rezoning application	1	0031-0050
D	Excerpts of the 1985 City of Las Vegas General Plan	1	0051-0061
E	City records regarding Peccole Ranch Master Plan and phase I rezoning application (Z-139-88)	1	0062-0106
F	City records regarding Z-40-89 rezoning application	1	0107-0113
G	Ordinance No. 3472 (establishing the Gaming Enterprise District) and related records	1	0114-0137
H	City records regarding the Amended Peccole Ranch Master Plan and phase II rezoning application (Z-17-90)	1	0138-0194
I	Excerpts of 1992 City of Las Vegas General Plan	2	0195-0248
J	City records related to Badlands Golf Course expansion	2	0249-0254
K	Excerpt of land use case files for GPA-24-98 and GPA-6199	2	0255-0257
L	Ordinance No. 5250 and Excerpts of Las Vegas 2020 Master Plan	2	0258-0273
M	Miscellaneous Southwest Sector Land Use Maps from 2002-2005	2	0274-0277
N	Ordinance No. 5787 and Excerpts of 2005 Land Use Element	2	0278-0291
O	Ordinance No. 6056 and Excerpts of 2009 Land Use & Rural Neighborhoods Preservation Element	2	0292-0301
P	Ordinance No. 6152 and Excerpts of 2012 Land Use & Rural Neighborhoods Preservation Element	2	0302-0317
Q	Ordinance No. 6622 and Excerpts of 2018 Land Use & Rural Neighborhoods Preservation Element	2	0318-0332
R	Ordinance No. 1582	2	0333-0339
S	Ordinance No. 4073 and Excerpt of the 1997 City of Las Vegas Zoning Code	2	0340-0341

Exhibit	Exhibit Description	Vol.	Bates No.
T	Ordinance No. 5353	2	0342-0361
U	Ordinance No. 6135 and Excerpts of City of Las Vegas Unified Development Code adopted March 16, 2011	2	0362-0364
V	Deeds transferring ownership of the Badlands Golf Course	2	0365-0377
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Dated this 23rd day of November, 2022.

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CERTIFICATE OF SERVICE

I HEREBY CERTIFY that I am an employee of McDonald Carano LLP, and that on the 23rd day of November, 2022, I caused a true and correct copy of the foregoing **FOURTH SUPPLEMENTAL APPENDIX OF EXHIBITS IN SUPPORT OF CITY'S COUNTERMOTION FOR SUMMARY JUDGMENT ON JUST COMPENSATION – VOLUME 36** to be electronically served with the Clerk of the Court via the Clark County District Court Electronic Filing Program which will provide copies to all counsel of record registered to receive such electronic notification.

/s/ Jelena Jovanovic
An employee of McDonald Carano LLP

EXHIBIT “YYYYY-3”

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: March 24, 2016
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **The SEVENTY**			**COPIES TO:** GCW Engineers
Cross Streets:	SWC of Rampart & Alta			Seventy Acres LLC
File Number:	F:\Depot\DSMemos\DS4787A.ZNA.doc			Bart Anderson, P.E., DevCo
Parcel Number:	138-32-301-005, 006, 210-008			CCRFCD
Zoning Action:	SDR-62393; GPA-62387; ZON-62392			
FEMA Flood Zone	YES	X	NO	
Proposed Storm Drain	YES	X	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	3/3/2016 & 3/9/2016	3/23/2016	See Comments Below	$400.00	425231: $400
			TOTAL FEES (LDDRS):	**$400.00**	**----**

REMARKS: This site development is within a FEMA SPECIAL FLOOD HAZARD AREA, Zone A. No permits of any kind will be issued for this project until a Conditional Letter of Map Revision (CLOMR/CLOMR-F) is received from FEMA.

The Drainage Study for the subject project has been reviewed and:

	is approved subject to conformance to all City standards and the following conditions:
X	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	is conditionally approved subject to NDOT concurrence.

1. This site development is located within a FEMA SPECIAL FLOOD HAZARD AREA, Zone A. **No permits will be issued until a Conditional Letter of Map Revision (CLOMR/CLOMR-F) is received from FEMA. Permits may be issued upon the receipt of Conditional Letter of Map Revision (CLOMR or CLOMR-F) from FEMA.**

2. A Letter of Map Revision (LOMR/LOMR-F) must be obtained from FEMA after the completion of any project within a FEMA Special Flood Hazard Area, Flood Zone "A". The bonded improvements shall include a line item of **$50,000.00** for the LOMR. The bonded improvements will not be released until the LOMR/LOMR-F is obtained from FEMA and filed with the City of Las Vegas.

3. Sites with a grade difference of 2 feet above or below existing are required to have approval from the *City Planning and Development Department*. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the *City Planning Department* (229-6301). The engineer must provide Planning approval with the next submittal.

4. The site is located within the Flood Zone A and is adjacent to an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

5. Please obtain necessary 404 permits from US Army Corps of Engineers and provide a copy of the permit to City of Las Vegas Flood Control Section prior to issuance of the grading permit. Contact the St. George Field Office of the US Army Corps of Engineers for permit information.

6. Provide a comparison table between the 2013 MPU flow rates and the proposed condition at key system locations. The system design shall use the greater flow rates in the analysis. Review and revise the flows accordingly and resubmit the updated analysis. Once the updated analysis is confirmed, update the Report, Tables and Exhibits to match the revised flows.

7. Review the Development Area 4 drainage parameters to refine the density of the lot sizes in the various locations to better determine the drainage impacts of this 183 acre area. Update the hydrology of this area to reflect the impacts of the proposed development.

8. The proposed RCB system velocities are excessive and are routinely above 35 fps. This is well above the allowable 25 fps in the HCDDM. Review and revise the RCB design to reduce the velocity to a maximum of 35 fps. Review the overall impacts to the proposed RCB system to take into account the future upstream system extensions to see where the system can be modified to reduce the velocity within the RCB's. Velocities above 25 fps shall include additional design parameters to mitigate the high velocities. Discuss the mitigation options and recommendations for City and CCRFCD approval.

9. The provided WSPG analysis used an *n-value* of 0.015. Provide an additional WSPG analysis of the two main line RCB's using 0.013 for sensitivity analysis to see the impacts to the velocity.

10. Include new cross sections that incorporate the detailed grading plans for the inlet structures within the HEC-RAS analysis.

11. Provide an overall exhibit that shows the entire storm drain system, labels the publically maintained storm drain system and all maintenance access roads on a single sheet.

12. Proposed storm drain laterals have been identified to collect flows from Peccole West Lot 9 and Queensridge Fairway Homes. Extend the storm drain system to collect the 100-year flows from these adjacent subdivisions.

13. The proposed facilities will be a change to the existing CCRFCD Master Plan and will necessitate a Master Plan Change (MPC) with Regional Flood. Flood Control recommends that the MPC be included with the next Master Plan Update and not be a separate submittal with this project. Coordinate the MPC information and requirements with Regional Flood.

14. The referenced FEMA flow rates used in the downstream analysis are slightly lower than the fully developed condition values. Flood Control shall require that the FEMA analysis include the fully developed condition in the CLOMR request for this project.

15. Provide complete *Plans and Project Specifications* for approval by the *City of Las Vegas*. The Structural Plans and Details shall be a part of the Civil Improvement Plan set. This project is considered as a *Capital Improvement Project* (CIP) with developer funding.

16. Structural plans for the proposed storm drain improvements and pertinent flood control facilities must be submitted for review. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the *Building Department* for processing. The engineer must provide a copy of *Building Department* approval of the structures to *Flood Control* prior to final acceptance of the drainage study.

17. All proposed improvements associated with the Storm Drain facilities shall be bonded and inspected. This project shall require Special Inspection. Coordinate the requirements of and the Agreements needed for Special Inspection with the Building Department.

18. The proposed improvements show drainage facilities of a size that must be reviewed for access and maintenance concerns. The engineer must submit an extra set of improvement plans to the *City Streets & Sanitation Department* for their review and comments. *Streets & Sanitation Department's* approval must be secured prior to the conditional drainage study approval.

19. Storm drain facilities are located on cut/fill slopes. Revise the slopes and/or the storm drain alignment to maintain 16-foot access roads. Provide a cross section detail of the maintenance access.

20. Provide a minimum 25-foot concrete pad at the inlet structures of the RCB's to allow for proper maintenance. Include 16-foot wide concrete access ramps (10% maximum slope) to the RCB inverts. Provide detailed grading plans for all of the inlet structures as well as grading transitions. Provide cross sections of these facilities.

21. Provide a concrete pad and maintenance access to the inlet structures for the local storm drains. Show the needed drainage easements for these facilities.

22. The plans show preliminary mass grading with collection facilities within the parcels to intercept the flows prior to entering the infrastructure drainage improvements. The inlet collection system needs to incorporate stormwater quality (SWQ) features and Best Management Practices (BMP's) at these interim collection points. Revise to incorporate appropriate SWQ and BMP measures. How will these collection facilities be maintained without graded access to the structures?

23. Provide maintenance access road (12-foot wide with a minimum of 6" Type II) to manholes and discharge structures located outside of the improved roadways.

24. Revise the storm drain lateral layouts to eliminate the main line lateral bends and concrete collars. Provide manholes for change in alignment and grade.

25. Provide plan and profile for all proposed storm drain improvements. Include the Q and HGL on all profiles.

26. Relocate manholes to the sides of the RCB's and at a maximum 400-foot spacing. Provide manhole steps and provide 30-inch manhole covers for access. Show concrete collars for the manholes.

27. Verify and correctly label the existing drainage and sewer easements. Provide an Exhibit that shows the drainage easements that are being Vacated and an Exhibit that shows the proposed easements.

28. Provide for the new public drainage easements (privately maintained by the property owner) for the area of the site impacted by the proposed improvements. The easement shall note that the private drainage improvements are privately maintained and the easement must be dedicated and recorded by separate document prior to the final acceptance of the improvement plans. Provide legal description and an exhibit of the drainage easement to Flood Control and *Mary Wulff* (702-229-2139) of *City of Las Vegas Right of Way Section* for the recordation process after the subject drainage study is conceptually approved.

29. The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles. Indicate the type of pipe material for water and sewer lines. Review separation requirements between utilities and show all of the utility crossings of the storm drains.

30. Show the size of the proposed riprap areas and include a detail on the plans. Include the Type 2 and geofabric in the detail section. It is noted that the minimum size of a riprap pad is d_{50}=8". Revise all pertinent plans and callouts accordingly.

31. Technical drainage studies are required for each of the future development super pads. The technical drainage studies for the developments may not be submitted until the conditional approval

of this pertinent infrastructure drainage study is obtained. Final approval for the infrastructure study must be obtained prior to conditional approval of the impacted development super pad drainage studies.

32. The proposed on-site drainage facilities are to be privately maintained. Add a note to the grading plan that *"All on-site surface drainage facilities are to be privately maintained."*

33. Complete the Construction Notes on the Grading Plan including pavement section and reference details for the call-outs of proposed improvements, i.e. RCB's, rip-rap, structure details, manholes, inlets, etc.

34. Provide a note on all grading plans: Property Owner is responsible to maintain the best management practices such as but not limited to the removal of accumulated sediment and debris and care of the vegetation.

35. This project currently has no Proposed Buildings or Structures. Should the project propose changes to this design assumption, then the Engineer is to update the drainage study detailing the flood zone impacts and provide addresses for each building in a FEMA Flood Hazard Zone prior to obtaining a grading permit. This information is necessary to insure that the elevation certificates are provided for each address prior to completion of construction. This information is required until such time as a LOMR is approved that removes the development from the SFHA.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see http://ndep.nv.gov/bwpc/storm01.htm or call (775) 687-9429.

NOTE: The engineer must submit the drainage study to FEMA for a Conditional Letter of Map Revision (CLOMR). A favorable CLOMR must be obtained prior to the issuance of any permits. This site is located in a **FEMA Zone A**. *Clark County Regional Flood Control District* (CCRFCD) review and approval is required prior to recordation of final map or issuance of building/grading permits. The Engineer must send a copy of the report to the CCRFCD for review. **The developer/engineer must also obtain a Letter of Map Revision (LOMR) using the approved drainage study as technical support to inform FEMA of the modifications within the flood zone. The approved LOMR must be submitted to the *City of Las Vegas* prior to the release of the bond.** FEMA Elevation Certificates, showing as-built finish floor elevations, must be completed for each building in the FEMA A Zone. The certificate must be submitted to the *City of Las Vegas Flood Control Section* prior to scheduling a framing inspection.

END OF REMARKS
Ays/pbj

T/R/S: T20S/R60E/12
AREA L-32

EXHIBIT “YYYYY-4”

RESPONSE TO 1ST CLV COMMENTS ON THE TECHNICAL DRAINAGE STUDY FOR THE 435 (FORMERLY "THE SEVENTY")

840-050

September 2017

Prepared For:

Seventy Acres LLC, Fore Stars LTD, and 180 Land Co LLC
9775 West Charleston Boulevard
Las Vegas, NV 89117
Phone: (702) 940-6930
Fax: (702) 940-6931

Prepared By:

GCW, Inc.
1555 S. Rainbow Blvd.
Las Vegas, Nevada 89146
Phone: (702) 804-2000
Fax: (702) 804-2299

840-050

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: The 435 (formerly known as The Seventy) Date: September 2017

Location of Development a) Descriptive (Cross Streets) North/South: Hualapai Way

East/West: Rampart Boulevard

b) Section: 32 Township: 20S Range: 60E

c) APN: 138-32-301-005

Name of Owner: Seventy Acres LLC

Telephone No.: 702-940-6930 Fax No.702-940-6931 E-Mail Address: frank@EHBcompanies.com

Address: 9775 W. Charleston Blvd., Las Vegas, Nevada 89117

Contact Person-Name: Steve Jones, PE **Telephone No.:** (702) 804-2000

* **E-Mail Address:** sjones@gcwengineering.com **Fax No.:** (702) 804-2299

Firm: GCW, Inc

Address: 1555 S. Rainbow Blvd; Las Vegas, NV 89146

Type of Land Development/Land Disturbance

☐	Rezoning	☐	Subdivision Map	☐	Clearing and Grading Only
☐	Parcel Map	☐	Planned Unit Development	☒	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit	Conceptual Drainage, Rough Grade and Storm Drain	

1. Total Owned Land Area: At Site: +/- 70.52 acres Being Developed/Disturbed: +/- 17.5 acres
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☒ Yes** ☐ No
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ Yes** ☐ No
4. Proposed type of development (Residential, Commercial, Etc.): Conceptual Drainage, Rough Grade and Storm Drain Improvements
5. Approximate upstream land area which drains to the subject site: +/- 3.73 sq. mi.
6. Has the site drainage been evaluated in the past? ☒ Yes ☐ No If yes, please identify documentation: Peccole Ranch West Master Study, Queensridge LOMR , Queens Borough Culvert Study
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing dual (2) – 12'x12' RCB at northeast corner of site
8. Briefly describe your proposed schedule for the subject project: Phase 1 Infrastructure (This Study), Phase 1 Improvements (Future Study) Phase 2 – Remaining 52.1 acres (Future Studies)

PROFESSIONAL ENGINEER - STATE OF NEVADA
STEPHEN M. JONES
EXP. 6-30-19
CIVIL
No. 19638
9/12/2017

Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

*New Required Field

****Review and concurrence of the Clark County Regional Flood Control District is required.**

Local Entity File No.

Revision	Date

REFERENCE:

STANDARD FORM 1

GCW
ENGINEERS \ SURVEYORS

840-050

September 12, 2017

Albert Sung, PE
City of Las Vegas – Department of Public Works
333 N. Rancho Drive – 7th Floor
Las Vegas, NV 89106

Re: 1st Response to City of Las Vegas Comments on the Technical Drainage Study for "The 435" (formerly "The Seventy") (DS4787)

Dear Mr. Sung:

During the time after completion of the 1st review of the drainage study by City of Las Vegas (CLV) Public Works, the developer has refined the subject project to be split into two phases:

Phase 1: Installation of required trunk drainage infrastructure and mass grading proposed for future development on the 17.5 acre parcel (APN 138-32-301-005) located at the southwest corner of the intersection of Rampart Blvd. and Alta Dr. The proposed infrastructure will provide the shadow of protection for the first 17.5 acres to be developed on the property, and function to remove the current FEMA Zone 'A' SFHA on the parcel. This portion of the property has approved entitlements for the developer to construct upon, after FEMA accepts the conditional removal of the flood zone upon construction of the drainage infrastructure.

Phase 2: The remaining 52.1 acres formerly included in this drainage study will remain primarily undisturbed, to be improved upon at a later date. The developer does not have entitlements on the parcels that make up the 52.1 acres; therefore, cannot construct improvements intended for future development. However, per coordination with the City, it was agreed that storm drain may be installed if it is required to adequately flood protect Phase 1.

A meeting with review staff to discuss the interim phasing and scope of flood control improvements required to flood protect Phase 1 was performed between GCW and CLV on July 24, 2017. Summary notes from this meeting have been included in Appendix A for reference. Applicable drainage exhibits, analyses and improvement plans have been updated with this study accordingly to reflect the reduced scope of improvements for the Phase 1 area only.

This project is now identified as *The 435*, which is the number of units approved for the 17.5 acre parcel described as Phase 1 above. *The Seventy* remains only identified to describe the remaining 52.1 acres on the property totaling approximately 70 acres.

Additionally, this letter addresses City of Las Vegas (CLV) review comments dated March 24, 2016 included in Appendix A, regarding the project in its entirety. A meeting between the GCW, CLV and the project's representatives was conducted on March 30, 2017 to discuss these comments, and summary notes from that meeting have been included in Appendix A. Note that several comments have now been deferred due to the phasing of the project. The individual

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comments have been addressed with discussion regarding either adjustments to the project design or how phasing impacts its relevance.

Comment: "1. This site development is located within a FEMA SPECIAL FLOOD HAZARD AREA, Zone A. **No permits will be issued until a Conditional Letter of Map Revision (CLOMR/CLOMR-F) is received from FEMA. Permits may be issued upon the receipt of Conditional Letter of Map Revision (CLOMR or CLOMR-F) from FEMA.**"

Response: The requirement for FEMA coordination to receive permits is acknowledged.

Comment: "2. A Letter of Map Revision (LOMR/LOMR-F) must be obtained from FEMA after the completion of any project within a FEMA Special Flood Hazard Area, Flood Zone "A". The bonded improvements shall include a line item of **$50,000.00** for the LOMR. The bonded improvements will not be released until the LOMR/LOMR-F is obtained from FEMA and filed with the City of Las Vegas."

Response: The requirement for an additional bond with regards to LOMR approval is acknowledged.

Comment: "3. Sites with a grade difference of 2 feet above or below existing are required to have approval from the *City Planning and Development Department.* The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the *City Planning Department* (229-6301). The engineer must provide Planning approval with the next submittal."

Response: Approval from CLV Planning for the grade difference has been provided in Appendix B.

Comment: "4. The site is located within the Flood Zone A and is adjacent to an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study."

Response: The requirement for CCRFCD concurrence is acknowledged.

Comment: "5. Please obtain necessary 404 permits from US Army Corps of Engineers and provide a copy of the permit to City of Las Vegas Flood Control Section prior to issuance of the grading permit. Contact the St. George Field Office of the US Army Corps of Engineers for permit information."

Response: The requirement for Clean Water Act 404 permitting from the U.S. Army Corps of Engineers (USACE) is acknowledged. The permits for this project will be forwarded upon receipt.

Comment: "6. Provide a comparison table between the 2013 MPU flow rates and the proposed condition at key system locations. The system design shall use the greater flow rates in the analysis. Review and revise the flows accordingly and resubmit the updated analysis. Once the updated analysis is confirmed, update the Report, Tables and Exhibits to match the revised flows."

Response: This project proposes several facilities in designated MPU alignments. In order to confirm that the project is in accordance with the regional plan, the below table provides a comparison of the design flow rates determined by this study versus the planned flow rates excerpted from the 2013 MPU. Additionally, a FEMA effective flow rate, referenced from the LOMR for Village at Queensridge, has been established for the project area and the CCRFCD 'APSO' alignment; therefore, it has also been included in the comparison to ensure the largest flow rate is evaluated in the hydraulic design of the proposed regional storm drains.

Note that although this project only proposes Phase 1 storm drain, the City requires this study to maintain the hydraulic model for the entire storm drain to ensure design adequacy, specifically related to identifying any high velocity mitigation (refer to Comment No. 8). Therefore, the Storm Drain Facility Summary Map (Figure 7) generally remains as previously submitted with the exception that the facilities have been color coded where Phase 2 facilities are shown in red. Additional data and tables have been provided on Figure 7 to assist the engineer and reviewer determine storm drain flow rates.

Comparison of 100-year Flow Rates in Regional Alignment Facilities – The 435 TDS vs 2013 MPU vs FEMA

Regional Alignment Facility ID[1]	The 435 Facility ID[2]	2013 MPU Q_{100} (cfs)[1]	The 435 TDS Ultimate Condition Q_{100} (cfs)[2]	FEMA Effective Q_{100} (cfs)[3]
APSO-0020	24	4,628 *(CC57B-4)*	4,685 *(CC57B-4)*	4,497
APSO-0050	11, 12	4,278 *(C57B-4)*	4,188 *(CDON3)*	4,497
APSO-0067	9B	2,384 *(C57B-2)*	2,489 *(CDON2)*	2,450
APSO-0067	7	2,384 *(C57B-2)*	2,463 *(CPPH1)*	2,450
APSO-0067	2	2,384 *(C57B-2)*	2,134 *(CON11R)*	2,450
APP2-0000	15, 18, 20, 22	2,004 *(C57B-1)*	1,933 *(CP20)*	N/A

1 – Refer to Figure 4, 2013 MPU Figure F-30, included in Appendix E.
2 – Refer to Figure 13, included in Appendix E.
3 – Referenced from LOMR and 2nd Update to Queensborough Culvert, included in Appendix C.

Comparison of 100-year Flow Rates in Regional Alignment Facilities – The 435 TDS vs 2013 MPU vs FEMA				
Regional Alignment Facility ID[1]	**The 435 Facility ID[2]**	**2013 MPU Q_{100} (cfs)[1]**	**The 435 TDS Ultimate Condition Q_{100} (cfs)[2]**	**FEMA Effective Q_{100} (cfs)[3]**
Note that APSO-0050 MPU flow rate does not match 2013 MPU Figure F-30 and is shown different in this table compared to the Facility Inventory. Refer to below explanation in this response for detail.				

Note that the MPU hydrologic model determining the 100-year flow rate in facility APSO-0050 has defined it at Concentration Point CC57B-4, which includes confluence from regional facility APP1-0000 which does not contribute until downstream of the project in the existing culvert crossing under Rampart Boulevard. Instead, the more comparative flow rate in the MPU hydrologic model for use in planning this project's facilities 11 and 12 is Concentration Point C57B-4.

The 100-year flow rates determined in this TDS, are reported from the ultimate condition. The previous submittal had defined the proposed condition as generating the highest flow rates compared to the ultimate condition; however, review of the below response to Comment No. 7, results in an ultimate condition hydrologic model prepared with this submittal. Therefore, the higher ultimate condition flow rates determined in this submittal were utilized for comparison to the 2013 MPU flow rates.

After review of the above table, the larger flow rates in the proposed regional storm drains are utilized for design to ensure capacity in accordance with the regional plan.

Comment: "7. Review the Development Area 4 drainage parameters to refine the density of the lot sizes in the various locations to better determine the drainage impacts of this 183 acre area. Update the hydrology of this area to reflect the impacts of the proposed development."

Response: Current CLV Zoning for Development Area 4 is identified as R-PD7 (up to 7 units per acre); however, it is believed that this zoning is not realistic considering the nature of this development area. Inspection of the adjacent existing homes are constructed at lot sizes ranging from an estimated 0.25 acres to 1.0 or greater acres, closer in line with a R-E zoning previously shown on the land use plan for the property. It is believed that the R-E type development is realistic for the contributing drainage area.

Per CLV Zoning, the minimum lot size for R-E development is 20,000 square feet or approx. 0.5 acres in area. Per the 3/30/2017 meeting notes included in Appendix A, it was agreed that a curve number corresponding to 1 to 2 units per acre is a reasonable assumption, which approximately corresponds with a future

ultimate condition 0.5 acre average lot size evaluated in this submittal for Development Area 4.

The following table corresponds this submittal's curve number for the Development Area 4 contributing drainage area versus the curve number utilized in the previous submittal. Note that the previous submittal defined its ultimate condition hydrology by illustrating that the ultimate condition homes in Development Area 4 generates less runoff than the existing golf course, by reason of a lower curve number. However, review of the below table shows that the curve number for the 0.5 acre lot is higher than the golf course curve number; thus eliciting a new ultimate condition hydrologic analysis in this submittal.

Summary of Development Area 4 Land Use & Curve Numbers			
Existing & Proposed Condition		**Ultimate Condition**	
Land Use	**CN[1]**	**Land Use**	**CN[1]**
Parks & Golf Course	82 *(Referenced from MPU Index 2)*	20,000 ft^2 Lots	85 *(Referenced from CCRFCD Manual 602A)*
1 – Development Area 4 located on Soil Type 152 – 100% D 'HSG'			

Therefore, an additional ultimate condition hydrologic model and exhibit have been prepared for this submittal and utilized in comparison to MPU and FEMA flows to ensure adequate storm drain design.

Note that storm drain sizes previously proposed remain acceptable although the storm flow rates generally increased with this submittal.

Comment: "8. The proposed RCB system velocities are excessive and are routinely above 35 fps. This is well above the allowable 25 fps in the HCDDM. Review and revise the RCB design to reduce the velocity to a maximum of 35 fps. Review the overall impacts to the proposed RCB system to take into account the future upstream system extensions to see where the system can be modified to reduce the velocity within the RCB's. Velocities above 25 fps shall include additional design parameters to mitigate the high velocities. Discuss the mitigation options and recommendations for City and CCRFCD approval."

Response: Per the March 30, 2017 meeting with CLV, it was agreed that a suitable means of protecting the integrity of the RCB from excessive velocities above 35-fps is to provide the following modifications to the typical cross section, as shown on the C8 plan sheets:

- Additional 3-inches of concrete at the bottom of the RCB,
- Tine the bottom of the RCB (perpendicular to the flow) to create a rougher surface or higher manning's 'n' coefficient.
- Utilize 6,000 psi compressive strength concrete to form the RCB.

For the sections of the RCB where velocities are above the CCRFCD Manual maximum 25-fps, but below 35-fps, the following modifications to the typical RCB cross section are proposed as shown on the C8 plan sheets:

- Additional 1-inch of concrete at the bottom of the RCB,
- Utilize 6,000 psi compressive strength concrete to form the RCB.

Notation has been added to the plans where each type of RCB cross section is proposed, based on inspection of the WSPG model.

Also note that sediment berms have also been utilized as a means to minimize abrasion potential during conveyance. These berms are proposed at the upstream end of the regional trunk storm drain collectors and are intended as a technique to minimize introduction of any sedimentation produced by the desert landscaping in the upstream golf course tributary area.

Comment: "9. The provided WSPG analysis used an *n-value* of 0.015. Provide an additional WSPG analysis of the two main line RCB's using 0.013 for sensitivity analysis to see the impacts to the velocity."

Response: Per the March 30, 2017 meeting with CLV, the regional trunk storm drains are considered the facilities for which velocity impacts could affect the integrity of the RCB. Therefore, these WSPG models have been updated to incorporate a manning's 'n' roughness coefficient of 0.013 in order to identify correct mitigation measures for high velocities as detailed above in Response to Comment No. 8. The updated WSPG models have been included in Appendix D.

Comment: "10. Include new cross sections that incorporate the detailed grading plans for the inlet structures within the HEC-RAS analysis."

Response: The HEC-RAS analyses have not been updated to incorporate the proposed storm drain inlets, the design has changed and separate relevant calculations more accurately determine conservative water surface elevations at each of these collectors. Upon FEMA coordination, detailed comparison of proposed versus existing condition changes to the base flood elevations will be performed; however, it is assumed that any changes adverse to the base flood elevation (raise in water surface or inundation area) will be maintained within the developer's property which is acceptable.

A total of two inlet structures are proposed by this project in its current state, and a synopsis of the design elements of these structures are as follows:

<u>Figure 7 - Facility 9C (APSO-0067 Alignment)</u>
Located at the western boundary of Phase 1, the bottom portion of the ultimate 14-ft wide 12-ft high RCB is to be installed during the interim with the top of the storm drain to remain open in order to collect the contributing flow. Grading is proposed to direct the runoff conveyed in the existing golf course wash to the

open-top RCB and allow for flow to weir into the RCB. The grading has been proposed at a wide breadth with minimal slope armoured with riprap to dissipate the energy prior to the spilling of the flow into the RCB. The riprap armouring and grading around the perimeter of the open-top RCB has been proposed to contain the energy gradient of the incoming flow considering it has to lose momentum prior to the spilling to occur. The energy gradient elevation is considered the 100-year water surface designed for the future FEMA map revision in this area. Note that the energy gradient elevation does not exceed the 100-year HGL in the WSPG model for this reach of storm drain near the junction structure; therefore, no interim tailwater impacts occur to the proposed 10-ft wide by 8-ft high RCB (Facility 22, 'MAIN2').

Additionally, a 3-ft high sediment berm has been proposed at the upstream end of the grading to minimize silt deposition and high velocity impacts to the open-top RCB. Refer to Sheet C4.03 for detailed grading design and Appendix D for the associated hydraulic computations.

This collection facility captures the contributing APSO MPU alignment and flood zone flow upstream of the site, providing the required shadow of protection necessary to develop Phase 1. Note that the open-top RCB is considered a structural element and the structural drawings for this facility will be included with the improvement plans.

Figure 7 - Facility 20 (APP2-0000 Alignment)
As a means to collect the contributing APP2 MPU alignment flow for flood protection of Phase 1 and maintain ultimate use of the storm drain based on preliminary/conceptual site planning for the Phase 2 area, the 10-ft wide by 8-ft high RCB (Facility 22) is required to be extended to the existing golf course wash southwest of Phase 1. An interim 20-ft wide by 12-ft high improved inlet is proposed on the end of the ultimate 10-ft wide by 8-ft high RCB to collect the flows and meet inlet control headwater criteria for a CCRFCD regional facility alignment.

Access is provided from the golf course to this storm drain for maintenance. The storm drain is considered large enough for drive-ability through the inlet opening, to the storm drain and interim open-top RCB.

Comment: "11. Provide an overall exhibit that shows the entire storm drain system, labels the publically maintained storm drain system and all maintenance access roads on a single sheet."

Response: An index sheet has been added to the plans with annotation on all items that are of public significance, such as maintenance responsibilities and access roads.

Comment: "12. Proposed storm drain laterals have been identified to collect flows from Peccole West Lot 9 and Queensridge Fairway Homes. Extend the storm drain system to collect the 100-year flows from these adjacent subdivisions."

Response: Collection of these flows will be addressed by the future Phase 2 drainage study.

Comment: "13. The proposed facilities will be a change to the existing CCRFCD Master Plan and will necessitate a Master Plan Change (MPC) with Regional Flood. Flood Control recommends that the MPC be included with the next Master Plan Update and not be a separate submittal with this project. Coordinate the MPC information and requirements with Regional Flood."

Response: Per the March 30, 2017 meeting with CLV, it was agreed that the in-process 2018 MPU being prepared by CCRFCD will incorporate the regional facility changes proposed by this project. Therefore, an MPC will not be necessary for this project.

Comment: "14. The referenced FEMA flow rates used in the downstream analysis are slightly lower than the fully developed condition values. Flood Control shall require that the FEMA analysis include the fully developed condition in the CLOMR request for this project."

Response: The use of the highest flow rates, generally defined by the 2013 MPU as summarized in the Response to Comment No. 6, will be utilized in the future coordination with FEMA.

Comment: "15. Provide complete *Plans and Project Specifications* for approval by the *City of Las Vegas.* The Structural Plans and Details shall be a part of the Civil Improvement Plan set. This project is considered as a *Capital Improvement Project* (CIP) with developer funding."

Response: The project requirements are acknowledged.

Comment: "16. Structural plans for the proposed storm drain improvements and pertinent flood control facilities must be submitted for review. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the *Building Department* for processing. The engineer must provide a copy of *Building Department* approval of the structures to *Flood Control* prior to final acceptance of the drainage study."

Response: The requirement for Building Department review is acknowledged.

Comment: "17. All proposed improvements associated with the Storm Drain facilities shall be bonded and inspected. This project shall require Special Inspection. Coordinate the requirements of and the Agreements needed for Special Inspection with the Building Department."

Response: The requirement for special inspection is acknowledged.

Comment: "18. The proposed improvements show drainage facilities of a size that must be reviewed for access and maintenance concerns. The engineer must submit an extra set of improvement plans to the *City Streets* & *Sanitation Department* for their review and comments. *Streets* & *Sanitation Department's* approval must be secured prior to the conditional drainage study approval."

Response: Coordination with the Streets & Sanitation Department regarding the operations and maintenance of the proposed facilities has begun, and its requirement is acknowledged. The plans submitted with this study will be forwarded to Mr. Matthew Meyer for review.

Comment: "19. Storm drain facilities are located on cut/fill slopes. Revise the slopes and/or the storm drain alignment to maintain 16-foot access roads. Provide a cross section detail of the maintenance access."

Response: Per the March 30, 2017 meeting with CLV, it was agreed that drive-able access is required to be provided to all manholes. The locations of storm drain in cut-fill slopes is within the future Phase 2 area of the project; therefore, a future drainage study will address access to these areas.

Comment: "20. Provide a minimum 25-foot concrete pad at the inlet structures of the RCB's to allow for proper maintenance. Include 16-foot wide concrete access ramps (10% maximum slope) to the RCB inverts. Provide detailed grading plans for all of the inlet structures as well as grading transitions. Provide cross sections of these facilities."

Response: A concrete pad for maintenance access has been provided at the headwall of the publically maintained 10-ft wide by 8-ft high facility. An access ramps that is drive-able and 12-ft wide has been provided and the storm drain is of a size that allows drive-ability for maintenance through the RCB.

Comment: "21. Provide a concrete pad and maintenance access to the inlet structures for the local storm drains. Show the needed drainage easements for these facilities."

Response: All local storm drains are within Phase 2, and access to these storm drain opening inlets will be addressed in a future drainage study.

Comment: "22. The plans show preliminary mass grading with collection facilities within the parcels to intercept the flows prior to entering the infrastructure drainage improvements. The inlet collection system needs to incorporate stormwater quality (SWQ) features and Best Management Practices (BMP's) at these interim collection points. Revise to incorporate appropriate SWQ and BMP measures. How will these collection facilities be maintained without graded access to the structures?"

Response: A Stormwater Pollution Prevention Plan (SWPPP) addressing BMP measures is required of the is project. Access will be provided to all areas where stormwater can enter a municipal storm system to allow proper SWPPP maintenance.

Comment: "23. Provide maintenance access road (12-foot wide with a minimum of 6" Type II) to manholes and discharge structures located outside of the improved roadways."

Response: An access path is provided to all manholes, with turnarounds as necessary.

Comment: "24. Revise the storm drain lateral layouts to eliminate the main line lateral bends and concrete collars. Provide manholes for change in alignment and grade."

Response: Manholes are provided at all angle curves/points, grade breaks and confluences for adequate maintenance access and in accordance with CCRFCD criteria.

Comment: "25. Provide plan and profile for all proposed storm drain improvements. Include the Q and HGL on all profiles."

Response: Profiles with annotated pipe information, including size, design flow rate and HGL are a part of the included plans.

Comment: "26. Relocate manholes to the sides of the RCB's and at a maximum 400-foot spacing. Provide manhole steps and provide 30-inch manhole covers for access. Show concrete collars for the manholes."

Response: Manholes have been provided on the RCB facilities as requested.

Comment: "27. Verify and correctly label the existing drainage and sewer easements. Provide an Exhibit that shows the drainage easements that are being Vacated and an Exhibit that shows the proposed easements."

Response: The index sheet that shows the master storm drain layout, per Response to Comment No. 11, also includes delineation of proposed and existing/vacated drainage easements.

Comment: "28. Provide for the new public drainage easements (privately maintained by the property owner) for the area of the site impacted by the proposed improvements. The easement shall note that the private drainage improvements are privately maintained and the easement must be dedicated and recorded by separate document prior to the final acceptance of the improvement plans. Provide legal description and an exhibit of the drainage easement to Flood Control and *Mary Wulff* (702-229-2139) of *City of Las Vegas Right of Way Section* for the recordation process after the subject drainage study is conceptually approved."

Response: Acknowledged, the drainage easements for this project will be coordinated through CLV Right-of-Way.

Comment: "29. The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles. Indicate the type of pipe material for water and sewer lines. Review separation requirements between utilities and show all of the utility crossings of the storm drains."

Response: The proposed storm drain does not cross any existing utilities. Any proposed utilities crossing the storm drain are expected with Phase 2 and will be addressed in the technical design by a future drainage study.

Comment: "30. Show the size of the proposed riprap areas and include a detail on the plans. Include the Type 2 and geofabric in the detail section. It is noted that the minimum size of a riprap pad is d_{50}=8". Revise all pertinent plans and callouts accordingly."

Response: Further information and typical details have been added to the plans showing where and how riprap is to be installed.

Comment: "31. Technical drainage studies are required for each of the future development super pads. The technical drainage studies for the developments may not be submitted until the conditional approval of this pertinent infrastructure drainage study is obtained. Final approval for the infrastructure study must be obtained prior to conditional approval of the impacted development super pad drainage studies."

Response: The requirement for future technical studies is acknowledged.

Comment: "32. The proposed on-site drainage facilities are to be privately maintained. Add a note to the grading plan that *"All on-site surface drainage facilities are to be privately maintained.""*

Response: Refer to the master index sheet showing maintenance responsibilities of each storm drain facility. The requested note applies to privately maintained facilities, and has been provided on grading (C4) sheets.

Comment: "33. Complete the Construction Notes on the Grading Plan including pavement section and reference details for the call-outs of proposed improvements, i.e. RCB's, rip-rap, structure details, manholes, inlets, etc."

Response: The construction notes have been reviewed for completeness.

Comment: "34. Provide a note on all grading plans: Property Owner is responsible to maintain the best management practices such as but not limited to the removal of accumulated sediment and debris and care of the vegetation."

Response: The requested note has been added to the plans.

Comment: "35. This project currently has no Proposed Buildings or Structures. Should the project propose changes to this design assumption, then the Engineer is to update the drainage study detailing the flood zone impacts and provide addresses for each building in a FEMA Flood Hazard Zone prior to obtaining a grading permit. This information is necessary to insure that the elevation certificates are provided for each address prior to completion of construction. This information is required until such time as a LOMR is approved that removes the development from the SFHA."

Response: The requirement for future coordination upon construction of the buildings prior to LOMR is acknowledged.

Drainage Exhibit Revisions

Considering the phasing change to the project, the drainage exhibits require modifications. A brief detail of the changes necessary to the previous submitted drainage exhibits to reflect the phasing of the project and the design modifications from addressing the above comments is as follows. Note if a figure changed, it has been replaced with a R suffix to its name (i.e. Figure 7R).

Figures 1 thru 4: Phase boundaries have been added for spatial reference.

Figure 5: No changes, because this submittal's changes affects only the developed condition status of the site.

Figure 6A: Since the site is still anticipated to be constructed for the entire 70 acres, this map does not require change. It is acknowledged that a future technical study will be required to address the 52.1 acres (Phase 2) beyond Phase 1. Note that since the ultimate condition

generates the highest flow rate for storm drain design, refer to response to Comment No. 7, there is no reason to revise this map or prepare an additional interim condition analysis with Phase 1 proposed and Phase 2 future.

Figure 6B: This figure has been removed from the study, it is no longer relevant to the design.

Figure 7: A phase boundary has been added to the figure, and the onsite facilities to be installed with Phase 2 are now color coded red for reference. Due to the unknown nature of future phases beyond Phase 2, future facilities through the golf course west of the 70 acres (a.k.a. Phases 1 and 2) are now deleted to be determined at a later date. The facility summary tables have been updated to show the determined flows in the area to assist the reviewer and designer ensure the associated facility has been designed for the highest flow rate. An additional table utilized to determine lateral flow rates based on the regional MPU flow rates has been added to the figure.

Figure 8: The hydraulic summary table now only establishes HGL and velocities in the Phase 1 proposed storm drain. When future Phase 2 facilities are technically designed, these parameters may change. However, as noted in Response to Comment No. 6, storm drain is assumed extended through Phase 2 at a conceptual design consistent with the previous submittal as shown in the profile sheets included in Appendix D.

Figure 9: No changes, this figure remains relevant for future FEMA coordination.

Figure 10: This figure has been removed from the study, it is no longer relevant to the design since a CLOMR will be processed for Phase 1 only. The future Phase 2 drainage study will address floodplain tie-in analysis at the upstream boundary of Phase 2.

Figure 11: This figure has been revised to show the workmap of FEMA SFHA revision proposed by the new Phase 1 of the project. It shows approximated tie-in delineations where Phase 1 ends and a summary of the FEMA hydraulic analysis based on completion of Phase 1 only.

Figure 12: This figure will be updated during the CLOMR process, as Figure 11 is utilized to show future FEMA coordination goals. For the purposes of this study, this figure has been removed.

Figure 13: This is a new figure with this submittal that demonstrates the ultimate condition analysis prepared by this study. Refer to Response to Comment No. 7 for further detail.

If you have any questions or require additional information, please do not hesitate to contact me at 804-2130.

Respectfully,

GCW, INC.

Steve Jones
Flood Control Division Manager

PROFESSIONAL ENGINEER - STATE OF NEVADA
STEPHEN M. JONES
EXP. 6-30-19
CIVIL
No. 19638

9/12/2017

Enclosures

c: Tom Dyson, GCW
James Duddlesten, GCW

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THE 435 – 1st CLV Response to Comments
APPENDIX LAYOUT

Appendix A. City of Las Vegas Comments & Coordination
1. March 24, 2016 CLV Comments
2. March 30, 2017 Meeting Notes
3. July 24, 2017 Meeting Notes

Appendix B. Response to Comment No. 3 (Grade Difference Approval)

Appendix C. Response to Comments No. 6 and 7 (Storm Drain Design Flow Rates)
1. The Seventy Ultimate Condition Hydrologic Calculations
2. MPU Hydrologic Data
3. LOMR for Village at Queensridge Reference Material

Appendix D. Response to Comments No. 8, 9 and 10 (Storm Drain Hydraulic Analysis)
1. Mainline 1 (APSO) – Manning's 'n' 0.013 (Utilized for Velocity Design)
2. Mainline 1 (APSO) – Manning's 'n' 0.015 (Utilized for HGL Design & Laterals Starting WSE)
3. Mainline 2 (APP2) – Manning's 'n' 0.013 (Utilized for Velocity Design)
4. Mainline 2 (APP2) – Manning's 'n' 0.015 (Utilized for HGL Design & Laterals Starting WSE)
5. Interim Collection Hydraulic Calculations – MAIN1
6. Interim Collection Hydraulic Calculations – MAIN2
7. Referenced Downstream APSO Improvement Plans
8. Preliminary Phase 2 Profiles (Re-included Profile Sheets from TDS)

Appendix E. Revised Drainage Exhibits

Appendix F. Revised Improvement Plans (Rolled Separately)

APPENDIX A

CITY OF LAS VEGAS COMMENTS & COORDINATION

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: March 24, 2016
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **The SEVENTY**			**COPIES TO:** GCW Engineers
Cross Streets:	SWC of Rampart & Alta			Seventy Acres LLC
File Number:	F:\Depot\DSMemos\DS4787A.ZNA.doc			Bart Anderson, P.E., DevCo
Parcel Number:	138-32-301-005, 006, 210-008			CCRFCD
Zoning Action:	SDR-62393; GPA-62387; ZON-62392			
FEMA Flood Zone	YES	**X**	NO	
Proposed Storm Drain	YES	**X**	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	3/3/2016 & 3/9/2016	3/23/2016	See Comments Below	$400.00	425231: $400
			TOTAL FEES (LDDRS):	**$400.00**	**----**

REMARKS: This site development is within a FEMA SPECIAL FLOOD HAZARD AREA, Zone A. No permits of any kind will be issued for this project until a Conditional Letter of Map Revision (CLOMR/CLOMR-F) is received from FEMA.

The Drainage Study for the subject project has been reviewed and:

	is approved subject to conformance to all City standards and the following conditions:
X	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	is conditionally approved subject to NDOT concurrence.

1. This site development is located within a FEMA SPECIAL FLOOD HAZARD AREA, Zone A. **No permits will be issued until a Conditional Letter of Map Revision (CLOMR/CLOMR-F) is received from FEMA. Permits may be issued upon the receipt of Conditional Letter of Map Revision (CLOMR or CLOMR-F) from FEMA.**

2. A Letter of Map Revision (LOMR/LOMR-F) must be obtained from FEMA after the completion of any project within a FEMA Special Flood Hazard Area, Flood Zone "A". The bonded improvements shall include a line item of **$50,000.00** for the LOMR. The bonded improvements will not be released until the LOMR/LOMR-F is obtained from FEMA and filed with the City of Las Vegas.

3. Sites with a grade difference of 2 feet above or below existing are required to have approval from the *City Planning and Development Department*. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the *City Planning Department* (229-6301). The engineer must provide Planning approval with the next submittal.

4. The site is located within the Flood Zone A and is adjacent to an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

5. Please obtain necessary 404 permits from US Army Corps of Engineers and provide a copy of the permit to City of Las Vegas Flood Control Section prior to issuance of the grading permit. Contact the St. George Field Office of the US Army Corps of Engineers for permit information.

6. Provide a comparison table between the 2013 MPU flow rates and the proposed condition at key system locations. The system design shall use the greater flow rates in the analysis. Review and revise the flows accordingly and resubmit the updated analysis. Once the updated analysis is confirmed, update the Report, Tables and Exhibits to match the revised flows.

7. Review the Development Area 4 drainage parameters to refine the density of the lot sizes in the various locations to better determine the drainage impacts of this 183 acre area. Update the hydrology of this area to reflect the impacts of the proposed development.

8. The proposed RCB system velocities are excessive and are routinely above 35 fps. This is well above the allowable 25 fps in the HCDDM. Review and revise the RCB design to reduce the velocity to a maximum of 35 fps. Review the overall impacts to the proposed RCB system to take into account the future upstream system extensions to see where the system can be modified to reduce the velocity within the RCB's. Velocities above 25 fps shall include additional design parameters to mitigate the high velocities. Discuss the mitigation options and recommendations for City and CCRFCD approval.

9. The provided WSPG analysis used an *n-value* of 0.015. Provide an additional WSPG analysis of the two main line RCB's using 0.013 for sensitivity analysis to see the impacts to the velocity.

10. Include new cross sections that incorporate the detailed grading plans for the inlet structures within the HEC-RAS analysis.

11. Provide an overall exhibit that shows the entire storm drain system, labels the publically maintained storm drain system and all maintenance access roads on a single sheet.

12. Proposed storm drain laterals have been identified to collect flows from Peccole West Lot 9 and Queensridge Fairway Homes. Extend the storm drain system to collect the 100-year flows from these adjacent subdivisions.

13. The proposed facilities will be a change to the existing CCRFCD Master Plan and will necessitate a Master Plan Change (MPC) with Regional Flood. Flood Control recommends that the MPC be included with the next Master Plan Update and not be a separate submittal with this project. Coordinate the MPC information and requirements with Regional Flood.

14. The referenced FEMA flow rates used in the downstream analysis are slightly lower than the fully developed condition values. Flood Control shall require that the FEMA analysis include the fully developed condition in the CLOMR request for this project.

15. Provide complete *Plans and Project Specifications* for approval by the *City of Las Vegas*. The Structural Plans and Details shall be a part of the Civil Improvement Plan set. This project is considered as a *Capital Improvement Project* (CIP) with developer funding.

16. Structural plans for the proposed storm drain improvements and pertinent flood control facilities must be submitted for review. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the *Building Department* for processing. The engineer must provide a copy of *Building Department* approval of the structures to *Flood Control* prior to final acceptance of the drainage study.

17. All proposed improvements associated with the Storm Drain facilities shall be bonded and inspected. This project shall require Special Inspection. Coordinate the requirements of and the Agreements needed for Special Inspection with the Building Department.

18. The proposed improvements show drainage facilities of a size that must be reviewed for access and maintenance concerns. The engineer must submit an extra set of improvement plans to the *City Streets & Sanitation Department* for their review and comments. *Streets & Sanitation Department's* approval must be secured prior to the conditional drainage study approval.

19. Storm drain facilities are located on cut/fill slopes. Revise the slopes and/or the storm drain alignment to maintain 16-foot access roads. Provide a cross section detail of the maintenance access.

20. Provide a minimum 25-foot concrete pad at the inlet structures of the RCB's to allow for proper maintenance. Include 16-foot wide concrete access ramps (10% maximum slope) to the RCB inverts. Provide detailed grading plans for all of the inlet structures as well as grading transitions. Provide cross sections of these facilities.

21. Provide a concrete pad and maintenance access to the inlet structures for the local storm drains. Show the needed drainage easements for these facilities.

22. The plans show preliminary mass grading with collection facilities within the parcels to intercept the flows prior to entering the infrastructure drainage improvements. The inlet collection system needs to incorporate stormwater quality (SWQ) features and Best Management Practices (BMP's) at these interim collection points. Revise to incorporate appropriate SWQ and BMP measures. How will these collection facilities be maintained without graded access to the structures?

23. Provide maintenance access road (12-foot wide with a minimum of 6" Type II) to manholes and discharge structures located outside of the improved roadways.

24. Revise the storm drain lateral layouts to eliminate the main line lateral bends and concrete collars. Provide manholes for change in alignment and grade.

25. Provide plan and profile for all proposed storm drain improvements. Include the Q and HGL on all profiles.

26. Relocate manholes to the sides of the RCB's and at a maximum 400-foot spacing. Provide manhole steps and provide 30-inch manhole covers for access. Show concrete collars for the manholes.

27. Verify and correctly label the existing drainage and sewer easements. Provide an Exhibit that shows the drainage easements that are being Vacated and an Exhibit that shows the proposed easements.

28. Provide for the new public drainage easements (privately maintained by the property owner) for the area of the site impacted by the proposed improvements. The easement shall note that the private drainage improvements are privately maintained and the easement must be dedicated and recorded by separate document prior to the final acceptance of the improvement plans. Provide legal description and an exhibit of the drainage easement to Flood Control and *Mary Wulff* (702-229-2139) of *City of Las Vegas Right of Way Section* for the recordation process after the subject drainage study is conceptually approved.

29. The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles. Indicate the type of pipe material for water and sewer lines. Review separation requirements between utilities and show all of the utility crossings of the storm drains.

30. Show the size of the proposed riprap areas and include a detail on the plans. Include the Type 2 and geofabric in the detail section. It is noted that the minimum size of a riprap pad is d_{50}=8". Revise all pertinent plans and callouts accordingly.

31. Technical drainage studies are required for each of the future development super pads. The technical drainage studies for the developments may not be submitted until the conditional approval

of this pertinent infrastructure drainage study is obtained. Final approval for the infrastructure study must be obtained prior to conditional approval of the impacted development super pad drainage studies.

32. The proposed on-site drainage facilities are to be privately maintained. Add a note to the grading plan that *"All on-site surface drainage facilities are to be privately maintained."*

33. Complete the Construction Notes on the Grading Plan including pavement section and reference details for the call-outs of proposed improvements, i.e. RCB's, rip-rap, structure details, manholes, inlets, etc.

34. Provide a note on all grading plans: Property Owner is responsible to maintain the best management practices such as but not limited to the removal of accumulated sediment and debris and care of the vegetation.

35. This project currently has no Proposed Buildings or Structures. Should the project propose changes to this design assumption, then the Engineer is to update the drainage study detailing the flood zone impacts and provide addresses for each building in a FEMA Flood Hazard Zone prior to obtaining a grading permit. This information is necessary to insure that the elevation certificates are provided for each address prior to completion of construction. This information is required until such time as a LOMR is approved that removes the development from the SFHA.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see http://ndep.nv.gov/bwpc/storm01.htm or call (775) 687-9429.

NOTE: The engineer must submit the drainage study to FEMA for a Conditional Letter of Map Revision (CLOMR). A favorable CLOMR must be obtained prior to the issuance of any permits. This site is located in a **FEMA Zone A**. *Clark County Regional Flood Control District* (CCRFCD) review and approval is required prior to recordation of final map or issuance of building/grading permits. The Engineer must send a copy of the report to the CCRFCD for review. **The developer/engineer must also obtain a Letter of Map Revision (LOMR) using the approved drainage study as technical support to inform FEMA of the modifications within the flood zone. The approved LOMR must be submitted to the *City of Las Vegas* prior to the release of the bond.** FEMA Elevation Certificates, showing as-built finish floor elevations, must be completed for each building in the FEMA A Zone. The certificate must be submitted to the *City of Las Vegas Flood Control Section* prior to scheduling a framing inspection.

END OF REMARKS
Ays/pbj

T/R/S: T20S/R60E/12
AREA L-32

Meeting Notes **Project No. 840-050**
By: Grant Tokumi and Mark Fakler

Subject:	**The Seventy**	
	DS4787A	
Place:	**City of Las Vegas, 8th Floor**	
Time:	**2:30 p.m.**	
Date:	**March 30, 2017**	
Attendees:	Yohan Lowee, EHB	Bart Anderson, CLV
	Frank Pankratz, EHB	Lucien Paet, CLV
	Brett Harrison, EHB	Mark Fakler, GCW
	Oh-Sang Kwon, GCW	Steve Jones, GCW
	Peter Jackson, CLV	Grant Tokumi, GCW

The inidividuals listed above met on March 30, 2017, to discuss the City of Las Vegas's comment letter dated March 24, 2016. Below are the comments and the ensuing discussion.

No.	CLV TDS Comments	Meeting Discussion
1	This site development is located within a FEMA SPECIAL FLOOD HAZARD AREA, Zone A. No permits will be issued until a Conditional Letter of Map Revision (CLOMR/CLOMR-F) is received from FEMA. Permits may be issued upon the receipt of Conditional Letter of Map Revision (CLOMR or CLOMR-F) from FEMA.	Noted.
2	A Letter of Map Revision (LOMR/LOMR-F) must be obtained from FEMA after the completion of any project within a FEMA Special Flood Hazard Area, Flood Zone "A". The bonded improvements shall include a line item of **$50,000.00** for the LOMR. The bonded improvements will not be released until the LOMR/LOMR-F is obtained from FEMA and filed with the City of Las Vegas.	It was discussed that the maintenance bond will be released once all drainage improvements for the entire property is completed and turned over to CLV. If it is determined that Phase 2 will not be constructed, the portion of the maintenance bond related to Phase 1 can be released and the Phase 2 bond will remain. The $50,000.00 bond for the LOMR will be released once the LOMR is obtained from FEMA.
3	Sites with a grade difference of 2 feet above or below existing are required to have approval from the *City Planning and Development Department.* The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the *City Planning Department* (229-6301). The engineer must provide Planning approval with the next submittal.	Noted. We have prepared a draft letter for submittal to the City Planning Department.
4	The site is located within the Flood Zone A and is adjacent to an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.	Noted. Upon CLV conditional approval, the study will be submitted to CCRFCD for concurrence.
5	Please obtain necessary 404 permits from US Army Corps of Engineers and provide a copy of the permit to City of Las Vegas Flood Control Section prior to issuance of the grading permit. Contact the St. George Field Office of the US Army Corps of Engineers for permit information.	Noted. We have completed the jurisdictional determination portion of the 404 permit.
6	Provide a comparison table between the 2013 MPU flow rates and the proposed condition at key system locations. The system design shall use the greater flow rates in the analysis. Review and revise the flows accordingly and resubmit the updated analysis. Once the updated analysis is confirmed, update the Report, Tables and Exhibits to match the revised flows.	GCW agrees to evaluate the 2013 MPU flow rate in comparison to this study's technical analysis, and utilize whichever flow rate that is higher in its hydraulic analysis.

No.	CLV TDS Comments	Meeting Discussion
7	Review the Development Area 4 drainage parameters to refine the density of the lot sizes in the various locations to better determine the drainage impacts of this 183 acre area. Update the hydrology of this area to reflect the impacts of the proposed development.	GCW will address the assumed land use for the remaining 183 acres with the next submittal and provide justification for the assumption. It was discussed that either the large lot concept as previously submitted can be used, or a higher density of 1 to 2 units / acre could be a reasonable assumption.
8	The proposed RCB system velocities are excessive and are routinely above 35 fps. This is well above the allowable 25 fps in the HCDDM. Review and revise the RCB design to reduce the velocity to a maximum of 35 fps. Review the overall impacts to the proposed RCB system to take into account the future upstream system extensions to see where the system can be modified to reduce the velocity within the RCB's. Velocities above 25 fps shall include additional design parameters to mitigate the high velocities. Discuss the mitigation options and recommendations for City and CCRFCD approval.	To address high velocities in the RCB, CLV was agreeable to using mitigation measures similar to that used in the Reverence project, consisting of corrugated sides, and an additional 3-inch sacrificial concrete invert using 6,000 psi concrete with a tined rough finish
9	The provided WSPG analysis used an *n-value* of 0.015. Provide an additional WSPG analysis of the two main line RCB's using 0.013 for sensitivity analysis to see the impacts to the velocity.	CLV noted that it requires design to assume worst case for velocity and the CCRFCD Manual denotes a 0.013 roughness coefficient. The roughness coefficient of 0.015 is considered worse case for sizing per CCRFCD policy. Therefore, GCW agrees to provide additional WSPG models with 'n' value of 0.013. The erosion mitigation measures discussed in Comment 8 would be required where velocities are considered over 35 fps in the 0.013 model.
10	Include new cross sections that incorporate the detailed grading plans for the inlet structures within the HEC-RAS analysis.	The hydraulic models will be updated to incorporate entrance, contraction and expansion losses through the geometry changes upstream and at the culvert inlet.
11	Provide an overall exhibit that shows the entire storm drain system, labels the publically maintained storm drain system and all maintenance access roads on a single sheet.	An exhibit will be prepared and this information will be added to the mass grading and storm drain plans.
12	Proposed storm drain laterals have been identified to collect flows from Peccole West Lot 9 and Queensridge Fairway Homes. Extend the storm drain system to collect the 100-year flows from these adjacent subdivisions.	A trapezoidal ditch can be used at the outlet of the Queensridge Fairway Homes as long as the channel meets criteria and is considered privately maintained. Additional erosion protection (ex. Riprap) may be necessary if velocities exceed 5 fps. It was discussed that due to the incomplete entitlement process for the site, that the rough grading (formerly super pads) outside of the 17 acres approved land use area must be removed from the plans upon re-submittal and the only grading allowed by this project is what is required to construct the storm drain improvements as previously presented.
13	The proposed facilities will be a change to the existing CCRFCD Master Plan and will necessitate a Master Plan Change (MPC) with Regional Flood. Flood Control recommends that the MPC be included with the next Master Plan Update and not be a separate submittal with this project. Coordinate the MPC information and requirements with Regional Flood.	Noted. We will forward the approved study and plans such that the CCRFCD can coordinate the revisions in their 2018 MPU update.
14	The referenced FEMA flow rates used in the downstream analysis are slightly lower than the fully developed condition values. Flood Control shall require that the FEMA analysis include the fully developed condition in the CLOMR request for this project.	Noted. The FEMA analysis will include the fully developed condition.
15	Provide complete *Plans and Project Specifications* for approval by the *City of Las Vegas.* The Structural Plans and Details shall be a part of the Civil Improvement Plan set. This project is considered as a *Capital Improvement Project* (CIP) with developer funding.	Noted. Specs and structural plans will be included with the improvement plans.

No.	CLV TDS Comments	Meeting Discussion
16	Structural plans for the proposed storm drain improvements and pertinent flood control facilities must be submitted for review. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the *Building Department* for processing. The engineer must provide a copy of *Building Department* approval of the structures to *Flood Control* prior to final acceptance of the drainage study.	CCRFCD will require a geotechnical study, structural plans and specifications with their concurrence review, and will not provide concurrence unless the geotechnical study, structural plans and specifications are approve-able through CLV Building Department review. City will be able to provide conditional approval prior to Building Department approval.
17	All proposed improvements associated with the Storm Drain facilities shall be bonded and inspected. This project shall require Special Inspection. Coordinate the requirements of and the Agreements needed for Special Inspection with the	Noted. We will coordinate with the Building Department for the special inspection.
18	The proposed improvements show drainage facilities of a size that must be reviewed for access and maintenance concerns. The engineer must submit an extra set of improvement plans to the *City Streets* & *Sanitation Department* for their review and comments. *Streets* & *Sanitation Department's* approval must be secured prior to the conditional drainage study approval.	Noted. We will provide plans to the City Streets & Sanitation Department. For clarification, we will need to obtain City Streets & Sanitation Department approval for access and maintenance prior to CLV conditional approval of the TDS.
19	Storm drain facilities are located on cut/fill slopes. Revise the slopes and/or the storm drain alignment to maintain 16-foot access roads. Provide a cross section detail of the maintenance access.	12-foot access roads may be used except in areas where the access road is benched into slopes. Access roads will be 16-foot wide when benched into slopes.
20	Provide a minimum 25-foot concrete pad at the inlet structures of the RCB's to allow for proper maintenance. Include 16-foot wide concrete access ramps (10% maximum slope) to the RCB inverts. Provide detailed grading plans for all of the inlet structures as well as grading transitions. Provide cross sections of these facilities.	Noted. We will add concrete pads at the inlets to the RCB's. We believe that a 12-foot wide concrete access road (10% max slope) will provide sufficient access to the concrete pads.
21	Provide a concrete pad and maintenance access to the inlet structures for the local storm drains. Show the needed drainage easements for these facilities.	Concrete pad at inlet structures are only needed in areas publically maintained. Inlet areas privately maintained do not require concrete pads.
22	The plans show preliminary mass grading with collection facilities within the parcels to intercept the flows prior to entering the infrastructure drainage improvements. The inlet collection system needs to incorporate storm water quality (SWQ) features and Best Management Practices (BMP's) at these interim collection points. Revise to incorporate appropriate SWQ and BMP measures. How will these collection facilities be maintained without graded access to the structures?	Noted. SWQ and BMP measures will be provided as part of the SWPPP process. Access (12 feet) will be shown on the plans. Sediment berms will be provided @ both of the RCB inlets.
23	Provide maintenance access road (12-foot wide with a minimum of 6" Type II) to manholes and discharge structures located outside of the improved roadways.	Access road is not required to be directly over top the entire length of storm drain; however, access to all manholes are required.
24	Revise the storm drain lateral layouts to eliminate the main line lateral bends and concrete collars. Provide manholes for change in alignment and grade.	Noted. Manholes will be used when necessary and the bends and collars will be eliminated.
25	Provide plan and profile for all proposed storm drain improvements. Include the Q and HGL on all profiles.	Noted. This information is contained on our profiles that are part of our plan set.
26	Relocate manholes to the sides of the RCB's and at a maximum 400-foot spacing. Provide manhole steps and provide 30-inch manhole covers for access. Show concrete collars for the manholes.	In Phase 1, the manhole spacing shall be 400-ft minimum. For Phase 2, manhole spacing and access to manholes shall require additional discussions. CLV requires access, however, the property owner has agreed with neighboring property owners that roads will not be constructed in the Phase 2 area.

No.	CLV TDS Comments	Meeting Discussion
27	Verify and correctly label the existing drainage and sewer easements. Provide an Exhibit that shows the drainage easements that are being Vacated and an Exhibit that shows the proposed easements.	Noted. This information will be shown on the plans and we will include an exhibit in our study.
28	Provide for the new public drainage easements (privately maintained by the property owner) for the area of the site impacted by the proposed improvements. The easement shall note that the private drainage improvements are privately maintained and the easement must be dedicated and recorded by separate document prior to the final acceptance of the improvement plans. Provide legal description and an exhibit of the drainage easement to Flood Control and *Mary Wulff* (702-229-2139) of *City of Las Vegas Right of Way Section* for the recordation process after the subject drainage study is conceptually approved.	Noted. Public and private easements will be identified in the plans. Legal descriptions & exhibits will be prepared and forward to the City for review and subsequent recordation. The RCBs and large diameter RCPs will be publically maintained.
29	The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles. Indicate the type of pipe material for water and sewer lines. Review separation requirements between utilities and show all of the utility crossings of the storm drains.	Utility design needs to be included with TDS to verify utility crossings.
30	Show the size of the proposed riprap areas and include a detail on the plans. Include the Type 2 and geofabric in the detail section. It is noted that the minimum size of a riprap pad is d50=8". Revise all pertinent plans and callouts accordingly.	Noted. This will be included in the plan set.
31	Technical drainage studies are required for each of the future development super pads. The technical drainage studies for the developments may not be submitted until the conditional approval of this pertinent infrastructure drainage study is obtained. Final approval for the infrastructure study must be obtained prior to conditional approval of the impacted development super pad drainage studies.	Noted and understood.
32	The proposed on-site drainage facilities are to be privately maintained. Add a note to the grading plan that *"All on-site surface drainage facilities are to be privately maintained.*	Noted. All on-site surface drainage facilities will be privately maintained. The RCB's and large diameter RCP's will be publicly maintained.
33	Complete the Construction Notes on the Grading Plan including pavement section and reference details for the call-outs of proposed improvements, i.e. RCB's, rip-rap, structure details, manholes, inlets, etc.	Noted. Construction notes will be complete.
34	Provide a note on all grading plans: Property Owner is responsible to maintain the best management practices such as but not limited to the removal of accumulated sediment and debris and care of the vegetation.	Noted. A note will be added to the plans stating such.
35	This project currently has no Proposed Buildings or Structures. Should the project propose changes to this design assumption, then the Engineer is to update the drainage study detailing the flood zone impacts and provide addresses for each building in a FEMA Flood Hazard Zone prior to obtaining a grading permit. This information is necessary to insure that the elevation certificates are provided for each address prior to completion of construction. This information is required until such time as a LOMR is approved that removes the development from the SFHA.	No permits allowed prior to CLOMR approval. Vertical construction can begin prior to LOMR approval.

840-050

MEETING MINUTES

ENGINEERS \ SURVEYORS

Prepared By:	Steve Jones	702-804-2130 sjones@gcwengineering.com
Re:	**The Seventy (aka Badlands)** **Technical Drainage Study – Interim Phasing**	
Place:	City of Las Vegas Public Works – Opal Conference Room (7th Floor)	
Date:	July 24, 2017	Time: 10:00am

Attendees:
Steve Jones, GCW
Mark Fakler, GCW
Oh-Sang Kwon, CLV
Peter Jackson, CLV
Jennifer Nuesca, CLV
Bart Anderson, CLV

GCW discussed that due to complications in obtaining planning approval, the developer has given direction to GCW to investigate drainage improvements required to flood protect the 17.5 acres (1st phase) that the City has given approval to construct. GCW discussed its proposal of drainage facilities that will sufficiently flood protect the 1st phase. There are two primary flow contributing sources, within the MPU regional facility alignments know as 'APSO' and 'APP2'. The 1st phase drainage facilities will utilize the ultimate facility design presented in the previous drainage study and modify it to allow for flows to be collected appropriately. In order to collect the APP2 alignment, the RCB will be constructed to a location where it can be opened in its ultimate alignment with an improved inlet collecting the contributing wash. In order to collect the APSO alignment, the RCB will be constructed in two pieces, the first phase will construct it similar to an open channel to allow for the contributing wash flow to weir into the top of the open RCB with the accompanying grading necessary to accomplish the hydraulics. See attached exhibit, as a concept of the APSO collection presented in the meeting.

CLV considered this a phased project and therefore, GCW's proposal is acceptable. CLV knowing that this storm drain will be extended in the future and understanding comments generated during the first review of the study, will require GCW to extend its hydraulic model through the entire 70 acres in order to prove that the 1st phase of storm drain is adequate for future connection. The following stipulations were outlined by CLV regarding the interim APSO collection.

- CLV will require access for maintenance purposes into the open channel portion of the RCB storm drain. GCW will investigate effective means of access to meet criteria for open channel maintenance access.
- CLV will require a 2 to 3-ft deep sediment settling pool with a low flow pipe prior to the inflow contributing into the open channel to minimize sediment contribution to the storm drain system considering its high velocities.
- CLV will require a structural design for the section of open RCB that will be enclosed in the 2nd phase of the project. This structural design will be required upon improvement plans and CCRFCD submittal.

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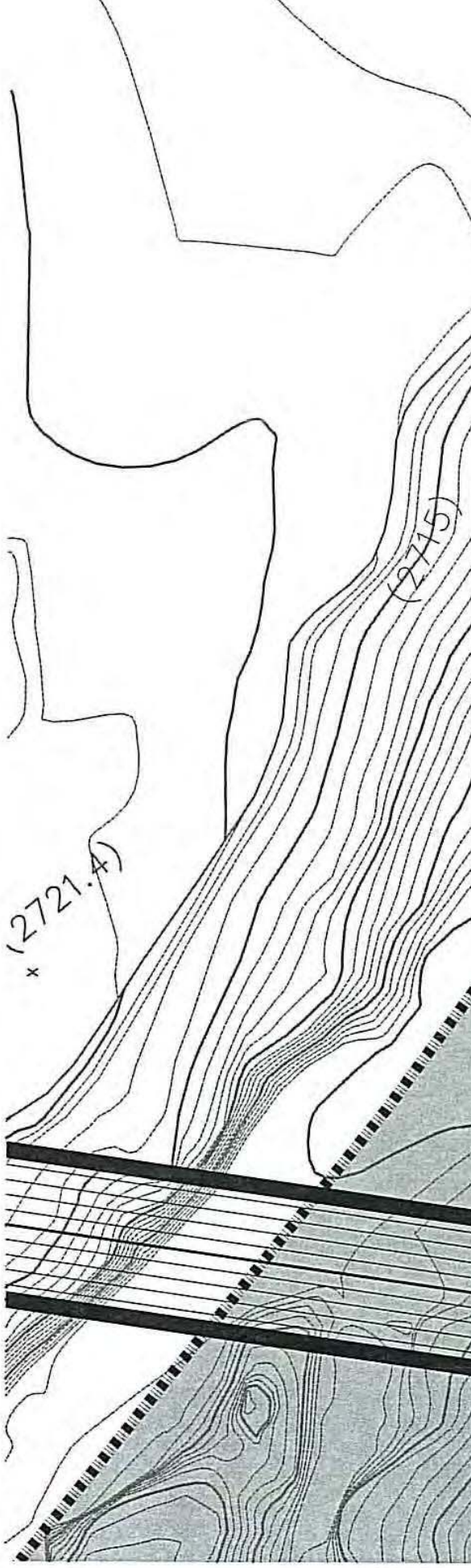
- GCW briefly discussed the hydraulic principles regarding the interim collector, including that sump around the top of the open RCB will allow for the weir depth and inflow energy gradient to be contained. Additionally, the weir depth over the top of the RCB will not cause any tailwater impacts to the extension of the RCB to collect the APP2 alignment.
- It was agreed that many of the comments generated during 1st review related to the design in the 2nd phase. Therefore, when responding to CLV comments, GCW can defer resolution of these items to the 2nd phase submittal of the project if they do not affect the 1st phase design.

SJ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APPENDIX B

RESPONSE TO COMMENT NO. 3
(GRADE DIFFERENCE APPROVAL)

APPENDIX C

RESPONSE TO COMMENTS NO. 6 AND 7
(STORM DRAIN DESIGN FLOW RATES)

The Seventy Ultimate Condition Hydrologic Calculations

RUNOFF CURVE NUMBERS
(URBAN AREAS[1])

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts: ONSITE THE 435 CN					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
See Table 602A					
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94

1 Average runoff condition, and $I_a = 0.2S$.
2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system. Impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using Figure 603.
3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
4 Composite CN's for natural desert landscaping should be computed using Figure 603 based on the impervious area percentage (CN #98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using Figure 603 based on the degree of development impervious area percentage) and the CN's for the newly graded pervious areas.

Revision	Date

"THE 435"
PROP. LAND USE; COMMERCIAL USED FOR CONSERVATIVE PURPOSES

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

Average Lot Size or Usage[1]	Percent Impervious[2]	Curve Number for Hydrologic Soil Groups			
		A	B	C	D
Apartments/Condos	72	81	88	91	93
Townhouses/6,000 sq ft lots or less[3]	69	80	87	90	92
7,000 sq ft lots	63	76	84	89	91
8,000 sq ft lots	58	73	82	88	90
10,000 sq ft lots	38	61	75	83	87
14,000 sq ft lots	30	57	72	81	86
20,000 sq ft lots	25	54	70	80	85
40,000 sq ft lots	20	51	68	79	84
80,000 sq ft lots	12	46	65	77	82

GOLF COURSE OFFSITE BASINS (RE LAND USE)

1 Lot size should represent the size of the average lot and not the gross acreage divided by the number of lots.
2 Actual percent impervious value should be compared to selected land use type.
3 In cases where average residential lots are smaller than 6,000 sq ft, commercial/business/industrial land use should be used.

Revision	Date

REFERENCE:

TABLE 602A

The Seventy					
WEIGHTED CURVE NUMBERS					
Ultimate Conditions					
Basin	Soil	Percent	CN	Land Use	WCN
57B-1	152	5.0%	82.0	Parks, Golf Courses	93.7
	152	54.0%	93.0	Public Facility, Residential	
	152	41.0%	96.0	Commercial, Retail, Casino, High Rise Condo	
57B-1A	152	100.0%	85.0	Medium Residential	85.0
57B-1B	152	100.0%	93.0	Public Facility, Residential	93.0
57B-1C	152	100.0%	96.0	Commercial, Retail, Casino, High Rise Condo	96.0
57B-2A	152	100.0%	87.0	Low Density Residential	87.0
57B-2B	152	100.0%	87.0	Low Density Residential	87.0
57B-2C	152	100.0%	87.0	Low Density Residential	87.0
57B-2D	152	100.0%	91.0	High Density Residential	91.0
57B-2E	152	100.0%	91.0	High Density Residential	91.0
57B-2F	152	100.0%	91.0	High Density Residential	91.0
57B-2G1	152	100.0%	87.0	Low Density Residential	87.0
57B-2G2	152	100.0%	87.0	Low Density Residential	87.0
57B-2H1	152	100.0%	87.0	Low Density Residential	87.0
57B-2H2	152	100.0%	87.0	Low Density Residential	87.0
57B-2I	152	100.0%	87.0	Low Density Residential	87.0
57B-3	152	29.2%	82.0	Parks, Golf Courses	89.3
	152	9.0%	85.0	Medium Residential	
	152	54.0%	93.0	Public Facility, Residential	
	152	7.8%	96.0	Commercial, Retail, Casino, High Rise Condo	
57B-3A	152	100.0%	85.0	Medium Residential	85.0
57B-3B	152	100.0%	85.0	Medium Residential	85.0
57B-3C	152	100.0%	87.0	Low Density Residential	87.0
57B-3D	152	100.0%	87.0	Low Density Residential	87.0

57B-3E	152	100.0%	87.0	Low Density Residential	87.0
57B-3F	152	100.0%	87.0	Low Density Residential	87.0
57B-3G	152	100.0%	87.0	Low Density Residential	87.0
57B-4	152	8.1%	82.0	Parks, Golf Courses	93.8
	152	0.3%	85.0	Medium Residential	
	152	30.2%	93.0	Public Facility, Residential	
	152	61.3%	96.0	Commercial, Retail, Casino, High Rise Condo	
57B-4B	152	100.0%	96.0	Commercial, Retail, Casino, High Rise Condo	96.0
57B-4C	152	100.0%	96.0	Commercial, Retail, Casino, High Rise Condo	96.0
ON1	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON2	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON3R	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON5	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON6	152	100.0%	93.0	Public Facility, Residential	93.0
ON8	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON9	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON10	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON11R	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON12	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON13	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON14	152	100.0%	82.0	80,000 ft^2 (>1.8 acres lots)	82.0
ON15R	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON16R	152	100.0%	85.0	R-E (0.5 acre lots)	85.0
ON18R	152	100.0%	85.0	R-E (0.5 acre lots)	85.0

DON1	152	100.0%	95.0	Commercial and business	**95.0**
DON2	152	100.0%	95.0	Commercial and business	**95.0**
DON3	152	100.0%	95.0	Commercial and business	**95.0**
DON4	152	100.0%	95.0	Commercial and business	**95.0**

NOTES

This map is for assessment use only and does NOT represent a survey.

No liability is assumed for the accuracy of the data deliniated herein. Information on roads and other non-assessed parcels may be obtained from the Road Document Listing in the Assessor's Office.

This map is compiled from official records, including surveys and deeds, but only contains the information required for assessment. See the recorded documents for more detailed legal information.

USE THIS SCALE(FEET) WHEN MAP REDUCED FROM 11X17 ORIGINAL

0 100 200 400 600 800

ASSESSOR'S PARCELS - CLARK CO., NV.

Michele W. Shafe - Assessor

MAP LEGEND

PARCEL BOUNDARY
SUB BOUNDARY
PM/LD BOUNDARY
ROAD EASEMENT
MATCH / LEADER LINE
HISTORIC LOT LINE
HISTORIC SUB BOUNDARY
HISTORIC PM/LD BOUNDARY
SECTION LINE

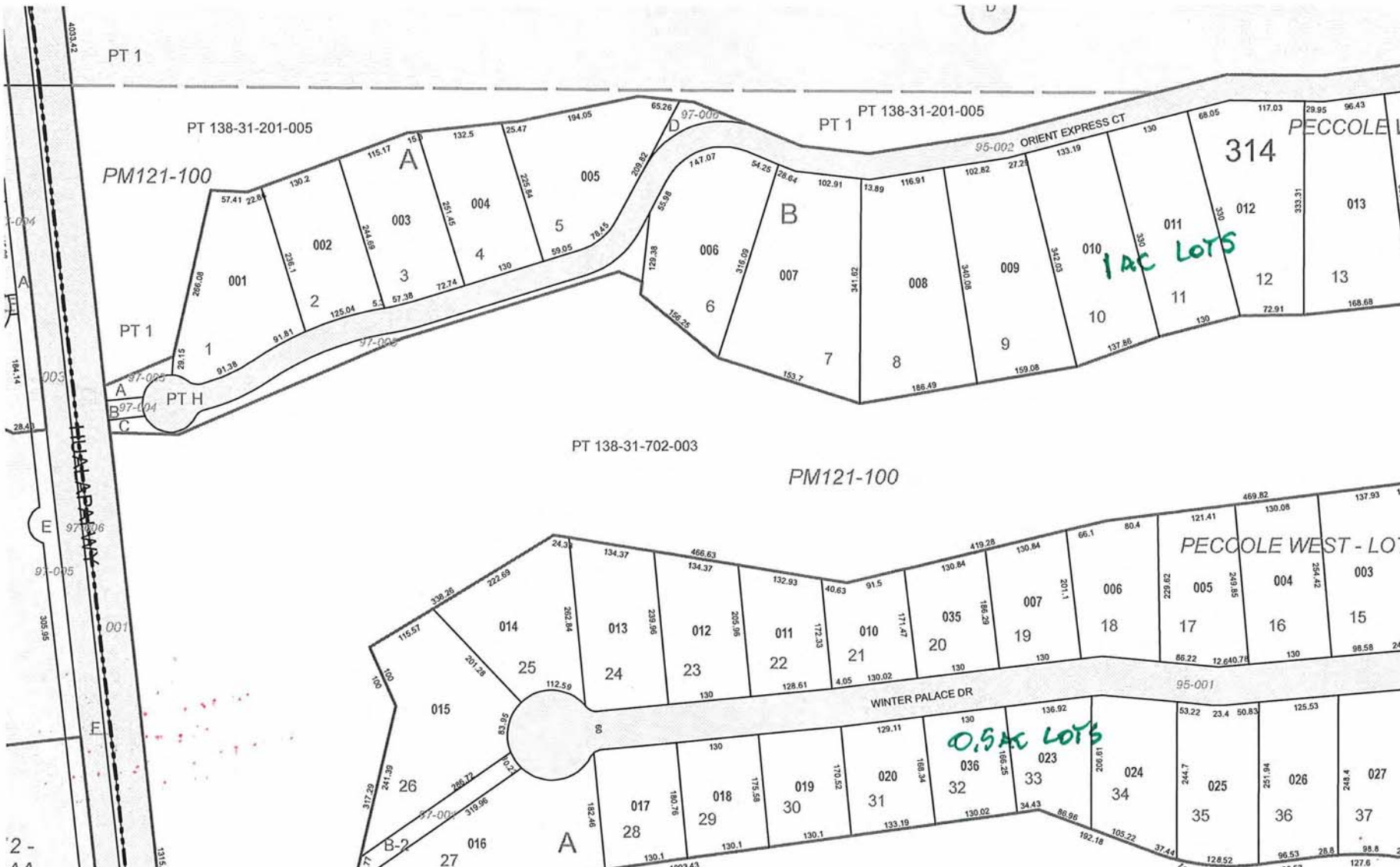
CONDOMINIUM UNIT
AIR SPACE PCL
RIGHT OF WAY PCL
SUB-SURFACE PCL

001 ROAD PARCEL NUMBER
001 PARCEL NUMER
1.00 ACREAGE
202 PARCEL SUB/SEQ NUMBER
PB 24-45 PLAT RECORDING NUMBER
5 BLOCK NUMBER
5 LOT NUMBER
GL5 GOV. LOT NUMBER

BOOK T20S R

27 126 12
36 137 13
65 164 16
74 175 17

Scale: 1" =



REPLY APP 0972

NOTES

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USE THIS SCALE(FEET) WHEN MAP REDUCED FROM 11X17 ORIGINAL

0 100 200 400 600 800

MAP LEGEND

PARCEL BOUNDARY
SUB BOUNDARY
PM/LD BOUNDARY
ROAD EASEMENT
MATCH / LEADER LINE
HISTORIC LOT LINE
HISTORIC SUB BOUNDARY
HISTORIC PM/LD BOUNDARY
SECTION LINE

CONDOMINIUM UNIT
AIR SPACE PCL
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001 ROAD PARCEL NUMBER
001 PARCEL NUMER
1.00 ACREAGE
202 PARCEL SUB/SEQ NUMBER
PB 24-45 PLAT RECORDING NUMBER
5 BLOCK NUMBER
5 LOT NUMBER
GL5 GOV. LOT NUMBER

ASSESSOR'S PARCELS - CLARK CO., NV.
Michele W. Shafe - Assessor

BOOK T20S R

27	126	12
36	137	13
65	164	16
74	175	17

Scale: 1" =

REPLY APP 0973

NOTES

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This map is compiled from official records, including surveys and deeds, but only contains the information required for assessment. See the recorded documents for more detailed legal information.

USE THIS SCALE(FEET) WHEN MAP REDUCED FROM 11X17 ORIGINAL

0 100 200 400 600 800

MAP LEGEND

PARCEL BOUNDARY
SUB BOUNDARY
PM/LD BOUNDARY
ROAD EASEMENT
MATCH / LEADER LINE
HISTORIC LOT LINE
HISTORIC SUB BOUNDARY
HISTORIC PM/LD BOUNDARY
SECTION LINE

CONDOMINIUM UNIT
AIR SPACE PCL
RIGHT OF WAY PCL
SUB-SURFACE PCL

001 ROAD PARCEL NUMBER
001 PARCEL NUMER
1.00 ACREAGE
202 PARCEL SUB/SEQ NUMBER
PB 24-45 PLAT RECORDING NUMBER
5 BLOCK NUMBER
5 LOT NUMBER
GL5 GOV. LOT NUMBER

ASSESSOR'S PARCELS - CLARK CO., NV.
Michele W. Shafe - Assessor

BOOK T20S R

27	126	12
36	137	13
65	164	16
74	175	17

Scale: 1" =

REPLY APP 0974

REPLY APP 0975

HYDROLOGIC CRITERIA AND DESIGN MANUAL

TIME OF CONCENTRATION

The Seventy
Ultimate Conditions

Project No: 840-050
Date: 1-May-17
Calculated by: MMC

			INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK URBANIZED BASINS		Tc	Tlag	REMARKS
	AREA Ac (3)	AREA Sq Mi (4)	INITIAL LENGTH Feet (5)	SLOPE % (6)	Ti Min (7)	TRAVEL LENGTH Feet (8)	SLOPE % (9a)	V1 VELOCITY fps (9b)	V2 VELOCITY fps (10)	Tt Min (11)	TOTAL LENGTH Feet (12)	Tc = (L/180)+10 Min (13)	Min (14)	Tlag = 0.6Tc/60 Hours (15)	Rainfall:
3	31.1	0.0485	250	2.80	5.1	3020	2.2	3.0	4.5	12.2	3270	28.2	17.3	0.173	2.89
0	28.4	0.0443	370	2.40	9.5	2080	2.3	3.1	4.6	8.4	2450	23.6	17.9	0.179	2.96
6	19.3	0.0301	100	1.00	4.7	1630	1.0	2.0	3.1	10.3	1730	19.6	15.0	0.150	2.91
2	0.6	0.0009	50	1.00	2.8	490	1.2	2.2	3.4	3.7	540	13.0	6.5	0.065	2.89
4	6.3	0.0098	186	13.40	3.5	2700	1.7	2.6	4.0	12.4	2886	26.0	15.9	0.159	3.05
4	3.0	0.0047	50	2.00	3.5	1400	2.7	3.3	5.0	5.5	1450	18.1	8.9	0.089	2.99
4	1.7	0.0027	100	1.00	6.1	222	6.8	5.3	8.0	0.7	322	11.8	6.9	0.069	2.96
2	5.7	0.0088	110	1.00	5.5	1200	1.1	2.1	3.2	7.6	1310	17.3	13.0	0.130	3.09
2	14.5	0.0227	110	1.00	5.5	1360	3.4	3.7	5.6	4.8	1470	18.2	10.2	0.102	3.08
2	57.8	0.0902	110	1.00	5.5	3000	2.5	3.2	4.8	11.2	3110	27.3	16.7	0.167	3.03
4	1.6	0.0026	35	5.60	2.0	730	2.9	3.4	5.2	3.2	765	14.3	5.2	0.052	3.08
4	4.6	0.0073	40	2.50	2.9	1511	2.2	3.0	4.5	6.5	1551	18.6	9.4	0.094	3.03
4	18.6	0.0291	300	3.70	6.9	4120	1.1	2.1	3.2	22.7	4420	34.6	29.6	0.296	3.01
4	10.0	0.0156	300	2.30	8.1	2500	2.2	3.0	4.5	10.1	2800	25.6	18.2	0.182	3.04
4	4.6	0.0072	80	7.50	2.8	1575	2.6	3.3	4.9	6.2	1655	19.2	9.0	0.090	2.99
3	30.8	0.0481	380	1.30	10.0	4170	2.4	3.1	4.7	15.6	4550	35.3	25.6	0.256	3.06
0	16.6	0.0259	170	1.00	8.6	1360	2.0	2.9	4.3	6.2	1530	18.5	14.9	0.149	3.07
0	32.8	0.0513	110	1.00	6.9	2500	2.4	3.1	4.7	9.7	2610	24.5	16.6	0.166	3.00
4	4.4	0.0069	130	1.00	7.0	1140	2.5	3.2	4.8	4.8	1270	17.1	11.8	0.118	3.05
4	11.8	0.0184	125	1.00	6.9	2500	2.7	3.3	5.0	9.1	2625	24.6	16.0	0.160	2.99
4	16.0	0.0251	240	1.00	9.5	3200	2.5	3.2	4.8	11.9	3440	29.1	21.4	0.214	3.06
4	7.4	0.0116	180	2.70	5.9	2170	2.5	3.2	4.9	8.3	2350	23.1	14.2	0.142	3.05
4	1.5	0.0023	220	3.20	6.2	260	4.6	4.3	6.6	1.0	480	12.7	7.2	0.072	2.99
2	82.7	0.1293	35	2.00	2.1	4890	2.4	3.1	4.7	18.1	4925	37.4	20.2	0.202	2.91
2	7.1	0.0110	150	2.70	3.5	860	2.9	3.4	5.2	3.6	1010	15.6	7.1	0.071	2.91
2	7.8	0.0122	100	1.00	4.0	1560	1.6	2.6	3.9	7.8	1660	19.2	11.8	0.118	2.90
0	25.4	0.0397	165	4.20	5.3	2040	3.0	3.5	5.3	7.2	2205	22.3	12.5	0.125	3.08
0	17.5	0.0273	180	5.00	5.2	2700	2.5	3.2	4.8	10.2	2880	26.0	15.4	0.154	3.00
0	4.1	0.0065	135	12.00	3.4	500	1.7	2.6	4.0	3.2	635	13.5	6.5	0.065	2.96
0	9.4	0.0147	125	4.00	4.7	1420	2.9	3.4	5.2	5.4	1545	18.6	10.0	0.100	3.05
6	2.3	0.0035	20	4.00	1.3	785	1.7	2.6	4.0	4.4	805	14.5	5.7	0.057	3.04
0	12.2	0.0190	65	6.20	2.9	1950	8.7	6.0	9.0	4.1	2015	21.2	7.0	0.070	2.99
0	25.5	0.0399	290	15.50	4.5	3085	1.0	2.0	3.1	18.2	3375	28.8	22.7	0.227	3.06
0	11.4	0.0177	100	29.00	2.2	1460	2.9	3.4	5.2	5.5	1560	18.7	7.6	0.076	2.98
0	5.1	0.0080	270	13.70	4.5	350	1.6	2.6	3.9	2.3	620	13.4	6.8	0.068	2.95
0	11.6	0.0182	225	3.50	6.5	1300	3.1	3.6	5.4	4.8	1525	18.5	11.4	0.114	3.08
0	12.0	0.0187	210	7.10	5.0	1540	3.6	3.8	5.8	5.2	1750	19.7	10.2	0.102	3.04
4	3.5	0.0054	100	1.00	7.3	1575	0.5	1.4	2.2	14.1	1675	19.3	21.5	0.193	3.00
0	21.5	0.0335	120	7.50	3.7	2070	3.3	3.7	5.6	7.0	2190	22.2	10.7	0.107	2.98
0	10.9	0.0171	45	45.00	1.2	2050	3.3	3.7	5.6	6.9	2095	21.6	8.2	0.082	2.97
0	18.5	0.0289	175	0.60	10.4	2565	2.5	3.2	4.9	9.7	2740	25.2	20.1	0.201	2.95
0	10.8	0.0169	138	15.50	2.0	1515	1.9	2.8	4.2	7.0	1653	19.2	9.0	0.090	2.93
0	19.5	0.0304	100	21.00	1.5	1735	1.7	2.6	4.0	8.3	1835	20.2	9.9	0.099	2.93
0	21.1	0.0330	240	5.00	3.8	1530	2.8	3.4	5.1	5.8	1770	19.8	9.7	0.097	2.91
0	17.4	0.0272	109	2.80	3.1	1650	0.03	0.3	0.5	60.0	1759	19.8	63.1	0.198	2.88

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

Existing: $V1 = 14.8*(S/100)^{1/2}$
$V2 = 29.4*(S/100)^{1/2}$

Developed: $V1 = 20.2*(S/100)^{1/2}$
$V2 = 30.6*(S/100)^{1/2}$

values referenced from Assumed Land Use (R-E)

STANDARD FORM 4

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *              JUN   1998              *
 *            VERSION 4.1               *
 *                                      *
 *  RUN DATE   28APR17  TIME  10:30:06  *
 *                                      *
 ****************************************

                                                    ****************************************
                                                    *                                      *
                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
                                                    *    HYDROLOGIC ENGINEERING CENTER     *
                                                    *          609 SECOND STREET           *
                                                    *       DAVIS, CALIFORNIA 95616        *
                                                    *           (916) 756-1104             *
                                                    *                                      *
                                                    ****************************************

                                  X     X  XXXXXXX   XXXXX          X
                                  X     X  X        X     X        XX
                                  X     X  X        X              X
                                  XXXXXXX  XXXX     X        XXXXX  X
                                  X     X  X        X              X
                                  X     X  X        X     X        X
                                  X     X  XXXXXXX   XXXXX        XXX

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                          HEC-1 INPUT                                                    PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

                        *DIAGRAM
 *** FREE ***
             1          ID   ***************************************************************
             2          ID   * ............................................................ *
             3          ID   * :                                                          : *
             4          ID   * :              THE SEVENTY                                 : *
             5          ID   * :              ULTIMATE                                    : *
             6          ID   * :              ~~PROPOSED~~ CONDITIONS                     : *
             7          ID   * :..........................................................: *
             8          ID   * :              RETURN PERIOD_ _ _ _100 & 10 -YEAR          : *
             9          ID   * :              DISTRIBUTION_ _ _ _ 6-HOUR SDN3             : *
            10          ID   * :              PROJECT NO_ _ _ _ _ 840.050                 : *
            11          ID   * :              FILENAME_ _ _ _ _ PROPOSED.H1               : *
            12          ID   * :              DATE MODELED_ _ _ _ 2/22/16                 : *
            13          ID   * :              MODELED BY_ _ _ _ JAM, MMC, RRD, SHT        : *
            14          ID   * :..........................................................: *
            15          ID   * :                                                          : *
            16          ID   * :..........................................................: *
            17          ID   ***************************************************************
            18          ID
            19          ID    REFERENCED HYDROLOGIC MODELS:
            20          ID    2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE
            21          ID    CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
            22          ID    CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
            23          ID    GOWAN WATERSHED (ALL)
            24          ID    RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
            25          ID    INPUT FILE = ALLGOW3.DAT
            26          ID    INPUT FILE DATE = MAY 5, 2008
            27          ID    DESIGN STORM = 100-YEAR 6-HR STORM
            28          ID    STORM DISTRIBUTION = SDN #3
            29          ID    MODELED BY PBS&J (MICHELE L. D'ALESSANDRO, E.I., CFM)
            30          ID    CHECKED BY PBS&J (HARSHAL B. DESAI, P.E., CFM)
            31          ID    STORM CENTERING = FULL WATERSHED
            32          ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
            33          ID
            34          ID                          AREA     DARF
            35          ID                          SQ. MI.
            36          ID                          0-0.5    0.99
            37          ID                          0.5-1    0.975
            38          ID                          1-2      0.95
            39          ID                          2-3      0.925
            40          ID                          3-4      0.915
            41          ID                          4-5      0.908
            42          ID                          5-6      0.903
            43          ID                          6-7      0.895
            44          ID                          10YR     0.570
            45          ID
            46          ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
            47          ID
            48          ID  100-YEAR,  6-HOUR STORM,  SDN3
            49          ID
            50          IT       5       0       0     700
            51          IO       5       0       0
            52          IN       5       0       0
            53          JR    PREC    0.99   0.975    0.95   0.925   0.915   0.908   0.903   0.895   0.570
                        *
1                                          HEC-1 INPUT                                                    PAGE  2

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            54          KK     ON1
            55          KM  OFFSITE BASIN ON1
            56          PB    3.08
            57          BA  0.0397
            58          PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13    0.13
            59          PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
            60          PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
            61          PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            62          PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            63          PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
            64          PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
            65          PC   0.998   0.999       1
            66          LS       0      85
```

```
 67          UD    .125
             *

 68          KK  57B-3A
 69          KM  ONSITE BASIN 57B-3A
 70          PB    3.07
 71          BA  0.0259
 72          LS       0      85
 73          UD    .149
             *

 74          KK    CON1
 75          KM  COMBINE 57B-3A AND ON1
 76          HC       2
             *

 77          KK   RCON1
 78          KM  ROUTE CON1 TO CON2
 79          KM   LENGTH  SLOPE   n-VALUE         SHAPE    WIDTH   S-SLOPE
 80          RD    3020    .027    .040       0    TRAP      50       3
             *

 81          KK  57B-3B
 82          KM  OFFSITE BASIN 57B-3B
 83          PB    3.00
 84          BA  0.0513
 85          LS       0      85
 86          UD    .166
             *

 87          KK     ON2
 88          KM  OFFSITE BASIN ON2
 89          PB    3.00
 90          BA  0.0273
 91          LS       0      85
 92          UD    .154
             *
1                                        HEC-1 INPUT                                          PAGE  3

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 93          KK    CON2
 94          KM  COMBINE CON1, 57B-3B AND ON2
 95          HC       3
             *

 96          KK  57B-3D
 97          KM  OFFSITE BASIN 57B-3D
 98          PB    2.99
 99          BA  0.0184
100          LS       0      87
101          UD    .160
             *

102          KK    ON3R
103          KM  ONSITE BASIN ON3R
104          PB    2.96
105          BA  0.0065
106          LS       0      85
107          UD    .065
             *

108          KK   CON3R
109          KM  COMBINE CON2, 57B-3D AND ON3R
110          HC       3
             *

111          KK     ON5
112          KM  OFFSITE BASIN ON5
113          PB    3.05
114          BA  0.0147
115          LS       0      85
116          UD    .100
             *

117          KK  57B-3C
118          KM  OFFSITE BASIN 57B-3C
119          PB    3.05
120          BA  0.0069
121          LS       0      87
122          UD    .118
             *

123          KK     ON6
124          KM  OFFSITE BASIN ON6
125          PB    3.04
126          BA  0.0035
127          LS       0      93
128          UD    .057
             *
1                                        HEC-1 INPUT                                          PAGE  4

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

129          KK    CON6
130          KM  COMBINE 57B-3C AND ON6
131          HC       2
             *

132          KK   CCON6
133          KM  COMBINE ON5 AND CON6
134          HC       2
             *

135          KK  RCCON6
136          KM  ROUTE CCON6 TO CON8
137          KM   LENGTH  SLOPE   n-VALUE         SHAPE    WIDTH   S-SLOPE
138          RD    2015    .037    .040       0    TRAP      20       2
             *
```

```
139          KK     ON8
140          KM  ONSITE BASIN ON8
141          PB    2.99
142          BA  0.0190
143          LS       0      85
144          UD    .070
             *

145          KK    CON8
146          KM  COMBINE CCON6 AND ON8
147          HC        2
             *

148          KK    SW11
149          KM  REFERENCED FROM 2013 MPU
150          BA   0.589
151          PB    3.34
152          LS       0    87.8
153          UD   0.311
             *

154          KK   RSW11
155          KM  REFERENCED FROM 2013 MPU
156          KM  ROUTE SW11 TO CSW17
157          KM  FACILITY = ANGEL PARK - CHARLESTON BOULEVARD
158          KM  FACILITY # = APCB 0064, 0080
159          KM  LINING = RCB
160          RD    2338  0.0167   0.015       0    TRAP       7       0
             *

161          KK    SW17
162          KM  REFERENCED FROM 2013 MPU
163          BA   0.356
164          PB    3.30
165          LS       0    87.8
166          UD   0.271
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

167          KK   CSW17
168          KM  REFERENCED FROM 2013 MPU
169          KM  COMBINE RSW11 AND SW17
170          HC        2
             *

171          KK  RCSW17
172          KM  REFERENCED FROM 2013 MPU
173          KM  ROUTE CSW17 TO CSW18
174          KM  FACILITY = ANGEL PARK - CHARLESTON BOULEVARD
175          KM  FACILITY # = APCB 0000,0001,0019,0050
176          KM  LINING = RCB
177          RD    3600   0.014   0.015       0    TRAP      11       0
             *

178          KK    SW18
179          KM  REFERENCED FROM 2013 MPU
180          BA   0.405
181          PB    3.27
182          LS       0    86.8
183          UD   0.271
             *

184          KK   CSW18
185          KM  REFERENCED FROM 2013 MPU
186          KM  COMBINE RCSW17 AND SW18
187          HC        2
             *

188          KK  RCSW18
189          KM  REFERENCED FROM 2013 MPU
190          KM  ROUTE CSW18 TO C12A
191          KM  FACILITY = ANGEL PARK SOUTH
192          KM  FACILITY # = APSO 0254,0255,0258,0345,0346; APCB 0000
193          KM  NATURAL WASH
194          KM  LENGTH = 5,200
195          KM  SLOPE = 1.4%
196          KM  N = 0.040
197          KM  HYDRAULIC RADIUS = 1.5
198          KM  VELOCITY =  9.2
199          RM        2   0.157    0.15
             *

200          KK     12A
201          KM  REFERENCED FROM 2013 MPU
202          BA   0.392
203          PB    3.20
204          LS       0    91.2
205          UD   0.264
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

206          KK    C12A
207          KM  REFERENCED FROM 2013 MPU
208          KM  COMBINE 12A AND RCSW18
209          HC        2
             *

210          KK   RC12A
211          KM  REFERENCED FROM 2013 MPU
212          KM  ROUTE THRU 12B
213          KM  FACILITY = ANGEL PARK SOUTH
214          KM  FACILITY # = APSO 0204, 0205
215          KM  NATURAL WASH
216          KM  LENGTH = 2,600
217          KM  SLOPE = 3.5%
218          KM  N = 0.040
```

```
 219          KM  HYDRAULIC RADIUS = 1.5
 220          KM  VELOCITY = 14.5
 221          RM       1    0.05    0.15
              *

 222          KK     12B
 223          KM  REFERENCED FROM 2013 MPU
 224          BA   0.260
 225          PB    3.13
 226          LS       0    91.0
 227          UD   0.233
              *

 228          KK    C12B
 229          KM  REFERENCED FROM 2013 MPU
 230          KM  COMBINE 12B AND RC12A
 231          HC       2
              *

 232          KK  57B-2A
 233          KM  OFFSITE BASIN 57B-2A
 234          PB    3.05
 235          BA  0.0098
 236          LS       0      87
 237          UD    .159
              *

 238          KK  57B-3F
 239          KM  OFFSITE BASIN 57B-3F
 240          PB    3.05
 241          BA  0.0116
 242          LS       0      87
 243          UD    .142
              *
1                                        HEC-1 INPUT                                          PAGE  7

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 244          KK  57B-3E
 245          KM  OFFSITE BASIN 57B-3E
 246          PB    3.06
 247          BA  0.0251
 248          LS       0      87
 249          UD    .214
              *

 250          KK     ON9
 251          KM  ONSITE BASIN ON9
 252          PB    3.06
 253          BA  0.0399
 254          LS       0      85
 255          UD    .227
              *

 256          KK    CON9
 257          KM  COMBINE C12B, 57B-2A, 57B-3F, 57B-3E AND ON9
 258          HC       5
              *

 259          KK   RCON9
 260          KM  ROUTE CON9 TO CON10
 261          KM   LENGTH  SLOPE   n-VALUE          SHAPE    WIDTH   S-SLOPE
 262          RD    1540    .030    .040       0    TRAP      50       2
              *

 263          KK  57B-3G
 264          KM  OFFSITE BASIN 57B-3G
 265          PB    2.99
 266          BA  0.0023
 267          LS       0      87
 268          UD    .072
              *

 269          KK  57B-2B
 270          KM  OFFSITE BASIN 57B-2B
 271          PB    2.99
 272          BA  0.0047
 273          LS       0      87
 274          UD    .089
              *

 275          KK  57B-2C
 276          KM  OFFSITE BASIN 57B-2C
 277          PB    2.96
 278          BA  0.0027
 279          LS       0      87
 280          UD    .069
              *
1                                        HEC-1 INPUT                                          PAGE  8

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 281          KK    ON10
 282          KM  ONSITE BASIN ON10
 283          PB    2.98
 284          BA  0.0177
 285          LS       0      85
 286          UD    .076
              *

 287          KK   CON10
 288          KM  COMBINE CON9, 57B-3G, 57B-2B, 57B-2C AND ON10
 289          HC       5
              *

 290          KK  CCON10
 291          KM  COMBINE CON8 AND CON10
 292          HC       2
              *
```

```
293          KK   ON11R
294          KM  ONSITE BASIN ON11R
295          PB    2.95
296          BA  0.0080
297          LS       0      85
298          UD    .068
             *

299          KK  CON11R
300          KM  COMBINE CCON10 AND ON11R
301          HC        2
             *

302          KK  57B-2D
303          KM  OFFSITE BASIN 57B-2D
304          PB    3.09
305          BA  0.0088
306          LS       0      91
307          UD    .130
             *

308          KK  57B-2E
309          KM  OFFSITE BASIN 57B-2E
310          PB    3.08
311          BA  0.0227
312          LS       0      91
313          UD    .102
             *

314          KK C57B-2E
315          KM  COMBINE 57B-2D AND 57B-2E
316          HC        2
             *
1                                    HEC-1 INPUT                                    PAGE  9

        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

317          KK 57B-2G1
318          KM  OFFSITE BASIN 57B-2G1
319          PB    3.08
320          BA  0.0026
321          LS       0      87
322          UD    .052
             *

323          KK    ON12
324          KM  ONSITE BASIN ON12
325          PB    3.08
326          BA  0.0182
327          LS       0      85
328          UD    .114
             *

329          KK   CON12
330          KM  COMBINE C57B-2E, 57B-2G1 AND ON12
331          HC        3
             *

332          KK 57B-2G2
333          KM  OFFSITE BASIN 57B-2G2
334          PB    3.03
335          BA  0.0073
336          LS       0      87
337          UD    .094
             *

338          KK    ON13
339          KM  ONSITE BASIN ON13
340          PB    3.04
341          BA  0.0187
342          LS       0      85
343          UD    .102
             *

344          KK   CON13
345          KM  COMBINE CON12, 57B-2G2 AND ON13
346          HC        3
             *

347          KK  57B-2F
348          KM  OFFSITE BASIN 57B-2F
349          PB    3.03
350          BA  0.0902
351          LS       0      91
352          UD    .167
             *
1                                    HEC-1 INPUT                                    PAGE 10

        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

353          KK 57B-2H2
354          KM  OFFSITE BASIN 57B-2H2
355          PB    3.04
356          BA  0.0156
357          LS       0      87
358          UD    .182
             *

359          KK    ON14
360          KM  ONSITE BASIN ON14
361          PB    3.00
362          BA  0.0054
363          LS       0      82
364          UD    .193
             *

365          KK   CON14
366          KM  COMBINE C57B-2F, 57B-2H2 AND ON14
367          HC        3
             *
```

```
368          KK  RCON14
369          KM  ROUTE CON14 TO CON15R
370          KM   LENGTH  SLOPE   n-VALUE         SHAPE    WIDTH   S-SLOPE
371          RD    2160    .032    .040       0    TRAP      20       2
             *

372          KK  57B-2I
373          KM  OFFSITE BASIN 57B-2I
374          PB    2.99
375          BA  0.0072
376          LS       0      87
377          UD    .090
             *

378          KK 57B-2H1
379          KM  OFFSITE BASIN 57B-2H1
380          PB    3.01
381          BA  0.0291
382          LS       0      87
383          UD    .296
             *

384          KK   ON15R
385          KM  ONSITE BASIN ON15R
386          PB    2.98
387          BA  0.0335
388          LS       0      85
389          UD    .107
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

390          KK  CON15R
391          KM  COMBINE CON13, CON14, 57B-21, 57B-2H1 AND ON15R
392          HC       5
             *

393          KK   ON16R
394          KM  ONSITE BASIN ON16R
395          PB    2.97
396          BA  0.0171
397          LS       0      85
398          UD    .082
             *

399          KK  CON16R
400          KM  COMBINE CON15R AND ON16R
401          HC       2
             *

402          KK   CPPH1
403          KM  COMBINE CON3R, CON11R AND CON16R
404          HC       3
             *

405          KK    DON1
406          KM  ONSITE BASIN DON1
407          PB    2.93
408          BA  0.0169
409          LS       0      95
410          UD    .090
             *

411          KK    DON2
412          KM  ONSITE BASIN DON2
413          PB    2.93
414          BA  0.0304
415          LS       0      95
416          UD    .099
             *

417          KK   CDON2
418          KM  COMBINE CCON16R, CDON1 AND DON2
419          HC       3
             *

420          KK  RCDON2
421          KM  ROUTE CDON2 TO CDON3
422          KM   LENGTH  SLOPE   n-VALUE         SHAPE    WIDTH   S-SLOPE
423          RD    1000    .048    .016       0    TRAP      10      50
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

424          KK   13B-1
425          KM  REFERENCED FROM 2013 MPU
426          BA   0.249
427          PB    3.19
428          LS       0    91.6
429          UD   0.284
             *

430          KK RC13B-1
431          KM  REFERENCED FROM 2013 MPU
432          KM  ROUTE 13B-1 TO C13B-2
433          KM  GRIFFITH PARK DRIVE AND HUALAPAI WAY
434          RD    3000   0.018   0.016       0    TRAP       0      50
             *

435          KK   13B-2
436          KM  REFERENCED FROM 2013 MPU
437          BA   0.216
438          PB    3.14
439          LS       0    89.7
440          UD   0.231
             *
```

```
441          KK  C13B-2
442          KM  REFERENCED FROM 2013 MPU
443          KM  COMBINE 13B-2 AND RC13B-1
444          KM  HUALAPAI WAY AND LOCAL FACILITY
445          HC       2
             *

446          KK RC13B-2
447          KM  REFERENCED FROM 2013 MPU
448          KM  ROUTE C13B-2 TO CCPIC-A
449          KM  LINING = GRASS
450          RD    4900   0.021    0.03       0    TRAP      40       6
             *

451          KK     19A
452          KM  REFERENCED FROM 2013 MPU
453          BA   0.253
454          PB    3.25
455          LS       0    89.9
456          UD   0.351
             *

457          KK    R19A
458          KM  REFERENCED FROM 2013 MPU
459          KM  ROUTE 19A TO C13A-1
460          KM  UNNAMED ROAD
461          RD    4300   0.021   0.016       0    TRAP       0      50
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

462          KK   13A-1
463          KM  REFERENCED FROM 2013 MPU
464          BA   0.224
465          PB    3.19
466          LS       0    91.4
467          UD   0.302
             *

468          KK  C13A-1
469          KM  REFERENCED FROM 2013 MPU
470          KM  COMBINE 13A-1 AND R19A
471          KM  TOWN CENTER DRIVE AND SWALE
472          HC       2
             *

473          KK RC13A-1
474          KM  REFERENCED FROM 2013 MPU
475          KM  ROUTE C13A-1 TO C13A-2
476          KM  NATURAL WASH
477          KM  TRAVEL LENGTH = 2,800
478          KM  SLOPE = 2.1%
479          KM  N = 0.040
480          KM  HYDRAULIC RADIUS = 1.5
481          KM  VELOCITY = 11.4
482          RM       1   0.068    0.15
             *

483          KK   13A-2
484          KM  REFERENCED FROM 2013 MPU
485          BA   0.188
486          PB    3.15
487          LS       0    90.0
488          UD   0.236
             *

489          KK  C13A-2
490          KM  REFERENCED FROM 2013 MPU
491          KM  COMBINE 13A-2 AND RC13A-1
492          HC       2
             *

493          KK RC13A-2
494          KM  REFERENCED FROM 2013 MPU
495          KM  ROUTE C13A-2 TO CPIC-C
496          KM  LINING = GRASS
497          RD    5200   0.015    0.03       0    TRAP      40       4
             *

498          KK   PIC-C
499          KM  REFERENCED FROM 2013 MPU
500          BA   0.243
501          PB    3.08
502          LS       0    90.4
503          UD   0.373
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

504          KK  CPIC-C
505          KM  REFERENCED FROM 2013 MPU
506          KM  COMBINE PIC-C AND RC13A-2
507          HC       2
             *

508          KK RCPIC-C
509          KM  REFERENCED FROM 2013 MPU
510          KM  ROUTE CPIC-C TO CPIC-A
511          KM  LINING = GRASS
512          RD    2200   0.025    0.03       0    TRAP      40       4
             *

513          KK   PIC-A
514          KM  REFERENCED FROM 2013 MPU
515          BA   0.359
516          PB    3.03
517          LS       0    91.1
518          UD   0.499
```

```
                *

519             KK  CPIC-A
520             KM  REFERENCED FROM 2013 MPU
521             KM  COMBINE RCPIC-C AND PIC-A
522             HC       2
                *

523             KK CCPIC-A
524             KM  REFERENCED FROM 2013 MPU
525             KM  COMBINE CPIC-A AND RC13B-2
526             HC       2
                *

527             KK   ON18R
528             KM  ONSITE BASIN ON18R
529             PB    2.95
530             BA  0.0289
531             LS       0       85
532             UD    .201
                *

533             KK  CON18R
534             KM  COMBINE CCPIC-A AND ON18R
535             HC       2
                *

536             KK  57B-1A
537             KM  OFFSITE BASIN 57B-1A
538             PB    2.96
539             BA  0.0443
540             LS       0       85
541             UD    .179
                *
```



```
LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

542             KK CCON18R
543             KM  COMBINE 57B-1A AND CON18R
544             HC       2
                *

545             KKRCCON18R
546             KM  ROUTE CCON18R TO CDON3
547             KM   LENGTH  SLOPE   n-VALUE         SHAPE    WIDTH   S-SLOPE
548             RD    1520    .014    .016       0    TRAP      10      50
                *

549             KK  57B-1B
550             KM  OFFSITE BASIN 57B-1B
551             PB    2.91
552             BA  0.0301
553             LS       0       93
554             UD    .150
                *

555             KK    CP19
556             KM  COMBINE CCON18R AND 57B-1B
557             HC       2
                *

558             KK  57B-1C
559             KM  OFFSITE BASIN 57B-1C
560             PB    2.89
561             BA  0.0009
562             LS       0       96
563             UD    .065
                *

564             KK    CP20
565             KM  COMBINE CP19 AND 57B-1C
566             HC       2
                *

567             KK    DON3
568             KM  ONSITE BASIN DON3
569             PB    2.91
570             BA  0.0330
571             LS       0       95
572             UD    .097
                *

573             KK   CDON3
574             KM  COMBINE DON3, CP20 AND CDON2
575             HC       3
                *
```



```
LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

576             KK  RCDON3
577             KM  ROUTE CDON3 TO CDON4
578             KM   LENGTH  SLOPE   n-VALUE         SHAPE    WIDTH   S-SLOPE
579             RD    1500    .003    .016       0    TRAP      15      50
                *

580             KK    DON4
581             KM  ONSITE BASIN DON4
582             PB    2.88
583             BA  0.0272
584             LS       0       95
585             UD    .198
                *

586             KK  57B-4B
587             KM  OFFSITE BASIN 57B-4B
588             PB    2.91
589             BA  0.0110
590             LS       0       96
```

```
 591          UD    .071
              *

 592          KK  57B-4C
 593          KM  OFFSITE BASIN 57B-4C
 594          PB    2.90
 595          BA  0.0122
 596          LS       0      96
 597          UD    .118
              *

 598          KK C57B-4C
 599          KM  COMBINE 57B-4B AND 57B-4C
 600          HC       2
              *

 601          KK   CDON4
 602          KM  COMBINE DON4, CDON3 AND C57B-4C
 603          HC       3
              *

 604          KK   57B-1
 605          KM  OFFSITE BASIN 57B-1
 606          BA  0.0485
 607          PB    2.89
 608          LS       0    93.7
 609          UD   0.173
              *

 610          KK   PIC-B
 611          KM  REFERENCED FROM 2013 MPU
 612          BA   0.441
 613          PB    2.98
 614          LS       0    91.1
 615          UD   0.471
              *
1                                          HEC-1 INPUT                                                    PAGE 17

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 616          KK  RPIC-B
 617          KM  REFERENCED FROM 2013 MPU
 618          KM  ROUTE PIC-B TO CC57B-4
 619          KM  FACILITY = ANGEL PARK - PECCOLE 1
 620          KM  FACILITY # = APP1 0000
 621          KM  LINING = RCP
 622          RD    2982   0.024   0.013       0    CIRC       6
              *

 623          KK   57B-3
 624          KM  OFFSITE BASIN 57B-3
 625          BA  0.0481
 626          PB    3.06
 627          LS       0    89.3
 628          UD   0.256
              *

 629          KK   57B-4
 630          KM  OFFSITE BASIN 57B-4
 631          BA  0.1293
 632          PB    2.91
 633          LS       0    93.8
 634          UD   0.202
              *

 635          KK  C57B-4
 636          KM  COMBINE 57B-3 AND 57B-4
 637          HC       2
              *

 638          KK CC57B-4
 639          KM  COMBINE RPIC-B, 57B-1, C57B-4, AND CDON4
 640          HC       4
              *
 641          ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE    (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.    (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    54       ON1
               .
               .
    68         .      57B-3A
               .           .
               .           .
    74      CON1............
               V
               V
    77     RCON1
               .
               .
    81         .      57B-3B
               .           .
               .           .
    87         .           .         ON2
               .           .           .
               .           .           .
    93      CON2........................
               .
               .
    96         .      57B-3D
               .           .
               .           .
   102         .           .        ON3R
               .           .           .
               .           .           .
   108     CON3R........................
               .
```

```
111          ON5
117          57B-3C
123                  ON6
129          CON6...........
132     CCON6...........
                V
                V
135     RCCON6
139          ON8
145     CON8...........
148          SW11
                V
                V
154          RSW11
161                  SW17
167          CSW17...........
                V
                V
171          RCSW17
178                  SW18
184          CSW18...........
                V
                V
188          RCSW18
200                  12A
206          C12A...........
                V
                V
210          RC12A
222                  12B
228          C12B...........
232                  57B-2A
238                          57B-3F
244                                  57B-3E
250                                          ON9
256          CON9.......................................
                V
                V
259          RCON9
263                  57B-3G
269                          57B-2B
275                                  57B-2C
281                                          ON10
287          CON10......................................
290     CCON10...........
293          ON11R
299     CON11R...........
302          57B-2D
308                  57B-2E
```

```
314          .           .     C57B-2E............
             .           .           .
317          .           .           .     57B-2G1
             .           .           .           .
323          .           .           .           .        ON12
             .           .           .           .           .
329          .           .       CON12.......................
             .           .           .
332          .           .           .     57B-2G2
             .           .           .           .
338          .           .           .           .        ON13
             .           .           .           .           .
344          .           .       CON13.......................
             .           .           .
347          .           .           .      57B-2F
             .           .           .         .
353          .           .           .         .     57B-2H2
             .           .           .         .           .
359          .           .           .         .           .        ON14
             .           .           .         .           .           .
365          .           .           .       CON14.......................
             .           .           .         V
             .           .           .         V
368          .           .           .      RCON14
             .           .           .         .
372          .           .           .         .      57B-2I
             .           .           .         .           .
378          .           .           .         .           .     57B-2H1
             .           .           .         .           .           .
384          .           .           .         .           .           .       ON15R
             .           .           .         .           .           .           .
390          .           .       CON15R..............................................
             .           .           .
393          .           .           .       ON16R
             .           .           .         .
399          .           .       CON16R............
             .           .           .
402       CPPH1........................
             .
405          .        DON1
             .           .
411          .           .        DON2
             .           .           .
417       CDON2........................
             V
             V
420      RCDON2
             .
424          .       13B-1
             .           V
             .           V
430          .     RC13B-1
             .           .
435          .           .       13B-2
             .           .           .
441          .      C13B-2............
             .           V
             .           V
446          .     RC13B-2
             .           .
451          .           .         19A
             .           .           V
             .           .           V
457          .           .        R19A
             .           .           .
462          .           .           .       13A-1
             .           .           .           .
468          .           .      C13A-1............
             .           .           V
             .           .           V
473          .           .     RC13A-1
             .           .           .
483          .           .           .       13A-2
             .           .           .           .
489          .           .      C13A-2............
             .           .           V
             .           .           V
493          .           .     RC13A-2
             .           .           .
498          .           .           .       PIC-C
             .           .           .           .
504          .           .      CPIC-C............
```

```
                                                  V
                .           .           V
  508           .           .     RCPIC-C
                .           .           .
  513           .           .           .       PIC-A
                .           .           .           .
  519           .           .     CPIC-A...........
                .           .           .
  523           .     CCPIC-A...........
                .           .
  527           .           .      ON18R
                .           .           .
  533           .      CON18R...........
                .           .
  536           .           .     57B-1A
                .           .           .
  542           .     CCON18R...........
                .           V
                .           V
  545           .    RCCON18R
                .           .
  549           .           .     57B-1B
                .           .           .
  555           .        CP19...........
                .           .
  558           .           .     57B-1C
                .           .           .
  564           .        CP20...........
                .           .
  567           .           .       DON3
                .           .           .
  573       CDON3........................
                V
                V
  576      RCDON3
                .
  580           .        DON4
                .           .
  586           .           .     57B-4B
                .           .           .
  592           .           .           .     57B-4C
                .           .           .           .
  598           .           .    C57B-4C...........
                .           .           .
  601       CDON4........................
                .
  604           .       57B-1
                .           .
  610           .           .      PIC-B
                .           .           V
  616           .           .     RPIC-B
                .           .           .
  623           .           .           .      57B-3
                .           .           .           .
  629           .           .           .           .      57B-4
                .           .           .           .          .
  635           .           .           .     C57B-4...........
                .           .           .           .
  638     CC57B-4...................................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN   1998               *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   28APR17  TIME  10:30:06  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

```
*****************************************************************
* ............................................................. *
* :                                                           : *
* :                THE SEVENTY                                : *
* :                ULTIMATE                                   : *
* :                PROPOSED CONDITIONS                        : *
* :...........................................................: *
* :                RETURN PERIOD_ _ _ _100 & 10 -YEAR         : *
* :                DISTRIBUTION_ _ _ _ 6-HOUR SDN3            : *
* :                PROJECT NO_ _ _ _ _ 840.050                : *
* :                FILENAME_ _ _ _ _ _ PROPOSED.H1            : *
* :                DATE MODELED_ _ _ _ 2/22/16                : *
```

```
* :                MODELED BY_ _ _ _ _ JAM, MMC, RRD, SHT      : *
* :.............................................................: *
* :                                                             : *
* :.............................................................: *
*****************************************************************
```

REFERENCED HYDROLOGIC MODELS:
2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE
CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
GOWAN WATERSHED (ALL)
RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
INPUT FILE = ALLGOW3.DAT
INPUT FILE DATE = MAY 5, 2008
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY PBS&J (MICHELE L. D'ALESSANDRO, E.I., CFM)
CHECKED BY PBS&J (HARSHAL B. DESAI, P.E., CFM)
STORM CENTERING = FULL WATERSHED
JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA SQ. MI.	DARF
0-0.5	0.99
0.5-1	0.975
1-2	0.95
2-3	0.925
3-4	0.915
4-5	0.908
5-6	0.903
6-7	0.895
10YR	0.570

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

100-YEAR, 6-HOUR STORM, SDN3

```
  51 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1   0  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ        700  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      3   0  ENDING DATE
                      NDTIME       1015  ENDING TIME
                       ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   58.25 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                      NPLAN          1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                    .99       .98       .95       .93       .92       .91       .90       .89       .57
1
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .99	RATIO 2 .98	RATIO 3 .95	RATIO 4 .93	RATIO 5 .92	RATIO 6 .91	RATIO 7 .90	RATIO 8 .89	RATIO 9 .57
HYDROGRAPH AT +	ON1	.04	1	FLOW	57.	56.	54.	51.	51.	50.	50.	49.	23.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-3A	.03	1	FLOW	36.	35.	34.	32.	32.	31.	31.	31.	14.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT +	CON1	.07	1	FLOW	93.	91.	87.	84.	82.	81.	81.	79.	36.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO +	RCON1	.07	1	FLOW	91.	89.	87.	83.	82.	81.	80.	79.	35.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	57B-3B	.05	1	FLOW	66.	65.	62.	59.	58.	58.	57.	56.	25.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON2	.03	1	FLOW	36.	35.	34.	32.	32.	32.	31.	31.	14.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT +	CON2	.14	1	FLOW	177.	173.	165.	158.	155.	153.	151.	149.	64.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
HYDROGRAPH AT +	57B-3D	.02	1	FLOW	26.	25.	24.	23.	23.	23.	23.	22.	11.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58

HYDROGRAPH AT +	ON3R	.01	1	FLOW	11.	10.	10.	10.	9.	9.	9.	9.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT +	CON3R	.17	1	FLOW	205.	200.	191.	183.	180.	177.	176.	173.	74.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
HYDROGRAPH AT +	ON5	.01	1	FLOW	21.	21.	20.	19.	19.	19.	19.	18.	8.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.58
HYDROGRAPH AT +	57B-3C	.01	1	FLOW	11.	10.	10.	10.	9.	9.	9.	9.	4.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON6	.00	1	FLOW	8.	8.	8.	7.	7.	7.	7.	7.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CON6	.01	1	FLOW	18.	18.	17.	16.	16.	16.	16.	16.	8.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CCON6	.03	1	FLOW	40.	39.	37.	36.	35.	35.	35.	34.	16.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO +	RCCON6	.03	1	FLOW	36.	35.	34.	33.	32.	32.	32.	31.	16.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT +	ON8	.02	1	FLOW	31.	30.	29.	28.	27.	27.	27.	26.	12.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CON8	.04	1	FLOW	59.	58.	55.	53.	52.	52.	51.	50.	23.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	SW11	.59	1	FLOW	759.	743.	717.	691.	680.	673.	668.	660.	330.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RSW11	.59	1	FLOW	754.	738.	712.	686.	676.	668.	663.	655.	325.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	SW17	.36	1	FLOW	479.	469.	452.	436.	429.	424.	421.	416.	205.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	CSW17	.94	1	FLOW	1221.	1196.	1153.	1111.	1095.	1083.	1075.	1061.	530.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RCSW17	.94	1	FLOW	1211.	1186.	1143.	1101.	1083.	1073.	1063.	1051.	521.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	SW18	.41	1	FLOW	519.	507.	489.	470.	463.	457.	454.	448.	215.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
2 COMBINED AT +	CSW18	1.35	1	FLOW	1718.	1682.	1622.	1562.	1537.	1521.	1508.	1490.	736.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RCSW18	1.35	1	FLOW	1610.	1576.	1520.	1464.	1441.	1426.	1414.	1397.	690.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	12A	.39	1	FLOW	576.	565.	547.	529.	521.	516.	513.	507.	272.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C12A	1.74	1	FLOW	2046.	2003.	1932.	1861.	1832.	1813.	1798.	1776.	881.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO +	RC12A	1.74	1	FLOW	2025.	1983.	1913.	1843.	1815.	1796.	1782.	1760.	880.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	12B	.26	1	FLOW	387.	380.	367.	355.	350.	347.	344.	340.	182.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C12B	2.00	1	FLOW	2259.	2212.	2134.	2056.	2024.	2002.	1987.	1962.	990.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT +	57B-2A	.01	1	FLOW	14.	14.	13.	13.	13.	13.	12.	12.	6.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-3F	.01	1	FLOW	17.	17.	16.	16.	15.	15.	15.	15.	7.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-3E	.03	1	FLOW	32.	31.	30.	29.	29.	28.	28.	28.	13.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT +	ON9	.04	1	FLOW	47.	46.	44.	42.	41.	41.	40.	40.	18.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
5 COMBINED AT +	CON9	2.09	1	FLOW	2333.	2284.	2203.	2123.	2090.	2068.	2052.	2026.	1014.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92

ROUTED TO +	RCON9	2.09	1	FLOW	2310.	2262.	2184.	2105.	2073.	2051.	2035.	2010.	1014.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	57B-3G	.00	1	FLOW	4.	4.	4.	4.	4.	4.	3.	3.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	57B-2B	.00	1	FLOW	8.	7.	7.	7.	7.	7.	7.	7.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	57B-2C	.00	1	FLOW	5.	5.	4.	4.	4.	4.	4.	4.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	ON10	.02	1	FLOW	28.	27.	26.	25.	24.	24.	24.	24.	11.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
5 COMBINED AT +	CON10	2.12	1	FLOW	2318.	2270.	2191.	2113.	2080.	2058.	2042.	2017.	1018.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
2 COMBINED AT +	CCON10	2.16	1	FLOW	2339.	2291.	2212.	2132.	2099.	2077.	2061.	2036.	1028.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	ON11R	.01	1	FLOW	13.	12.	12.	11.	11.	11.	11.	11.	5.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CON11R	2.17	1	FLOW	2341.	2293.	2214.	2134.	2101.	2079.	2063.	2038.	1029.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	57B-2D	.01	1	FLOW	16.	15.	15.	14.	14.	14.	14.	14.	7.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-2E	.02	1	FLOW	42.	41.	40.	38.	38.	37.	37.	37.	19.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	C57B-2E	.03	1	FLOW	56.	55.	53.	52.	51.	50.	50.	49.	26.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	57B-2G1	.00	1	FLOW	5.	5.	5.	5.	5.	4.	4.	4.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	ON12	.02	1	FLOW	26.	26.	25.	24.	23.	23.	23.	22.	10.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT +	CON12	.05	1	FLOW	87.	85.	82.	79.	78.	77.	77.	76.	38.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	57B-2G2	.01	1	FLOW	12.	11.	11.	11.	10.	10.	10.	10.	5.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	ON13	.02	1	FLOW	27.	26.	25.	24.	24.	24.	23.	23.	10.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.58
3 COMBINED AT +	CON13	.08	1	FLOW	126.	123.	118.	114.	112.	111.	110.	109.	53.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	57B-2F	.09	1	FLOW	147.	145.	140.	135.	133.	132.	131.	129.	69.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-2H2	.02	1	FLOW	21.	21.	20.	19.	19.	19.	19.	18.	9.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON14	.01	1	FLOW	6.	5.	5.	5.	5.	5.	5.	5.	2.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
3 COMBINED AT +	CON14	.11	1	FLOW	174.	171.	165.	159.	157.	155.	154.	152.	79.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO +	RCON14	.11	1	FLOW	166.	163.	158.	156.	153.	152.	151.	146.	79.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT +	57B-2I	.01	1	FLOW	12.	11.	11.	10.	10.	10.	10.	10.	5.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	57B-2H1	.03	1	FLOW	32.	31.	30.	29.	29.	28.	28.	28.	13.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	ON15R	.03	1	FLOW	46.	45.	43.	41.	41.	40.	40.	39.	18.
				TIME	3.50	3.50	3.50	3.58	3.58	3.58	3.58	3.58	3.58
5 COMBINED AT +	CON15R	.26	1	FLOW	355.	347.	335.	323.	318.	314.	312.	307.	150.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON16R	.02	1	FLOW	26.	25.	24.	23.	23.	23.	22.	22.	10.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50

2 COMBINED AT													
+	CON16R	.28	1	FLOW	377.	369.	355.	343.	337.	334.	331.	326.	159.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	CPPH1	2.61	1	FLOW	2706.	2649.	2556.	2463.	2425.	2399.	2379.	2351.	1167.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
HYDROGRAPH AT													
+	DON1	.02	1	FLOW	34.	34.	33.	32.	31.	31.	31.	31.	18.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	DON2	.03	1	FLOW	60.	59.	57.	55.	55.	54.	54.	53.	31.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT													
+	CDON2	2.66	1	FLOW	2734.	2677.	2583.	2489.	2451.	2425.	2405.	2376.	1182.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO													
+	RCDON2	2.66	1	FLOW	2727.	2670.	2576.	2482.	2444.	2417.	2398.	2369.	1173.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
HYDROGRAPH AT													
+	13B-1	.25	1	FLOW	354.	347.	336.	325.	321.	318.	315.	312.	169.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
ROUTED TO													
+	RC13B-1	.25	1	FLOW	354.	347.	336.	324.	320.	317.	314.	311.	171.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83
HYDROGRAPH AT													
+	13B-2	.22	1	FLOW	310.	304.	294.	283.	279.	277.	274.	271.	140.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT													
+	C13B-2	.47	1	FLOW	634.	622.	602.	581.	573.	567.	563.	557.	294.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO													
+	RC13B-2	.47	1	FLOW	641.	628.	607.	586.	578.	572.	568.	561.	295.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT													
+	19A	.25	1	FLOW	318.	312.	301.	291.	287.	284.	282.	278.	144.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO													
+	R19A	.25	1	FLOW	319.	313.	302.	292.	288.	285.	283.	280.	146.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT													
+	13A-1	.22	1	FLOW	308.	303.	293.	283.	279.	277.	275.	272.	147.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT													
+	C13A-1	.48	1	FLOW	595.	583.	564.	545.	537.	532.	528.	522.	273.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO													
+	RC13A-1	.48	1	FLOW	581.	569.	551.	532.	524.	519.	515.	509.	268.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT													
+	13A-2	.19	1	FLOW	272.	267.	258.	249.	246.	243.	241.	238.	124.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT													
+	C13A-2	.66	1	FLOW	782.	766.	740.	715.	704.	697.	692.	684.	354.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO													
+	RC13A-2	.66	1	FLOW	781.	765.	738.	712.	702.	694.	689.	681.	354.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT													
+	PIC-C	.24	1	FLOW	280.	274.	265.	256.	252.	250.	248.	245.	129.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
2 COMBINED AT													
+	CPIC-C	.91	1	FLOW	1041.	1020.	985.	951.	937.	927.	920.	909.	462.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
ROUTED TO													
+	RCPIC-C	.91	1	FLOW	1030.	1009.	975.	940.	922.	915.	908.	896.	461.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT													
+	PIC-A	.36	1	FLOW	356.	349.	338.	326.	322.	318.	316.	312.	165.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
2 COMBINED AT													
+	CPIC-A	1.27	1	FLOW	1386.	1359.	1313.	1266.	1243.	1233.	1224.	1208.	625.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
2 COMBINED AT													
+	CCPIC-A	1.73	1	FLOW	1997.	1959.	1895.	1830.	1800.	1785.	1772.	1750.	900.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT													
+	ON18R	.03	1	FLOW	33.	32.	31.	30.	29.	29.	28.	28.	13.
				TIME	3.58	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT													
+	CON18R	1.76	1	FLOW	2014.	1976.	1911.	1845.	1815.	1800.	1787.	1764.	906.
				TIME	3.92	3.92	1911.	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT													
+	57B-1A	.04	1	FLOW	54.	53.	51.	48.	48.	47.	47.	46.	20.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58

```
  2 COMBINED AT
+                CCON18R     1.81    1  FLOW      2039.   1999.   1934.   1867.   1837.   1821.   1808.   1785.    914.
                                        TIME      3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92

 ROUTED TO
+               RCCON18R     1.81    1  FLOW      2027.   1984.   1917.   1849.   1824.   1806.   1788.   1768.    914.
                                        TIME      3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92    4.00

 HYDROGRAPH AT
+                 57B-1B      .03    1  FLOW        51.     50.     49.     47.     47.     46.     46.     45.     25.
                                        TIME      3.58    3.58    3.58    3.58    3.58    3.58    3.58    3.58    3.58

  2 COMBINED AT
+                   CP19     1.84    1  FLOW      2044.   2000.   1933.   1865.   1840.   1821.   1804.   1783.    921.
                                        TIME      3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92    4.00

 HYDROGRAPH AT
+                 57B-1C      .00    1  FLOW         2.      2.      2.      2.      2.      2.      2.      2.      1.
                                        TIME      3.50    3.50    3.50    3.50    3.50    3.50    3.50    3.50    3.50

  2 COMBINED AT
+                   CP20     1.84    1  FLOW      2044.   2001.   1933.   1865.   1840.   1821.   1804.   1783.    921.
                                        TIME      3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92    4.00

 HYDROGRAPH AT
+                   DON3      .03    1  FLOW        65.     64.     62.     60.     59.     59.     58.     58.     34.
                                        TIME      3.50    3.50    3.50    3.50    3.50    3.50    3.50    3.50    3.50

  3 COMBINED AT
+                   CDON3     4.53    1  FLOW      4705.   4607.   4451.   4293.   4232.   4188.   4152.   4103.   2067.
                                        TIME      3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92

 ROUTED TO
+                  RCDON3     4.53    1  FLOW      4686.   4584.   4428.   4268.   4203.   4149.   4115.   4078.   2055.
                                        TIME      3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92    4.00

 HYDROGRAPH AT
+                   DON4      .03    1  FLOW        44.     43.     42.     41.     40.     40.     40.     39.     23.
                                        TIME      3.58    3.58    3.58    3.58    3.58    3.58    3.58    3.58    3.58

 HYDROGRAPH AT
+                 57B-4B      .01    1  FLOW        24.     24.     23.     22.     22.     22.     22.     22.     13.
                                        TIME      3.50    3.50    3.50    3.50    3.50    3.50    3.50    3.50    3.50

 HYDROGRAPH AT
+                 57B-4C      .01    1  FLOW        23.     22.     22.     21.     21.     21.     21.     20.     12.
                                        TIME      3.50    3.50    3.50    3.50    3.50    3.50    3.50    3.50    3.58

  2 COMBINED AT
+                C57B-4C      .02    1  FLOW        47.     46.     45.     43.     43.     43.     42.     42.     25.
                                        TIME      3.50    3.50    3.50    3.50    3.50    3.50    3.50    3.50    3.50

  3 COMBINED AT
+                   CDON4     4.58    1  FLOW      4715.   4614.   4456.   4296.   4230.   4176.   4142.   4105.   2068.
                                        TIME      3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92    4.00

 HYDROGRAPH AT
+                   57B-1      .05    1  FLOW        80.     79.     76.     74.     73.     72.     72.     71.     40.
                                        TIME      3.58    3.58    3.58    3.58    3.58    3.58    3.58    3.58    3.58

 HYDROGRAPH AT
+                   PIC-B      .44    1  FLOW       442.    433.    419.    405.    399.    395.    392.    388.    205.
                                        TIME      3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92

 ROUTED TO
+                  RPIC-B      .44    1  FLOW       439.    431.    416.    402.    396.    392.    390.    385.    202.
                                        TIME      3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92

 HYDROGRAPH AT
+                   57B-3      .05    1  FLOW        63.     62.     60.     58.     57.     56.     56.     55.     28.
                                        TIME      3.67    3.67    3.67    3.67    3.67    3.67    3.67    3.67    3.67

 HYDROGRAPH AT
+                   57B-4      .13    1  FLOW       202.    198.    192.    186.    184.    182.    181.    179.    101.
                                        TIME      3.58    3.58    3.58    3.58    3.58    3.58    3.58    3.58    3.58

  2 COMBINED AT
+                  C57B-4      .18    1  FLOW       259.    254.    246.    238.    235.    233.    232.    229.    127.
                                        TIME      3.58    3.58    3.67    3.67    3.67    3.67    3.67    3.67    3.67

  4 COMBINED AT
+                 CC57B-4     5.25    1  FLOW      5325.   5212.   5035.   4856.   4782.   4723.   4685.   4642.   2336.
                                        TIME      3.92    3.92    3.92    3.92    3.92    3.92    3.92    3.92    4.00
1
                                   SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                          INTERPOLATED TO
                                                                       COMPUTATION INTERVAL
          ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                   PEAK
                               (MIN)     (CFS)     (MIN)      (IN)    (MIN)     (CFS)     (MIN)       (IN)

        FOR PLAN = 1  RATIO=  .00
           RCON1  MANE         5.00     91.14    225.00      1.63     5.00     91.14    225.00       1.63

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5690E+01 EXCESS= .0000E+00 OUTFLOW= .5711E+01 BASIN STORAGE= .5503E-02 PERCENT ERROR=   -.5

        FOR PLAN = 1  RATIO=  .00
           RCON1  MANE         5.00     89.20    225.00      1.59     5.00     89.20    225.00       1.59

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5554E+01 EXCESS= .0000E+00 OUTFLOW= .5576E+01 BASIN STORAGE= .5460E-02 PERCENT ERROR=   -.5

        FOR PLAN = 1  RATIO=  .00
           RCON1  MANE         5.00     86.58    225.00      1.53     5.00     86.58    225.00       1.53
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .5329E+01 EXCESS= .0000E+00 OUTFLOW= .5349E+01 BASIN STORAGE= .6258E-02 PERCENT ERROR=   -.5

          FOR PLAN = 1  RATIO=  .00
             RCON1  MANE         5.00     83.32    225.00      1.46      5.00     83.32    225.00        1.46

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5105E+01 EXCESS= .0000E+00 OUTFLOW= .5125E+01 BASIN STORAGE= .6005E-02 PERCENT ERROR=   -.5

          FOR PLAN = 1  RATIO=  .00
             RCON1  MANE         5.00     82.01    225.00      1.44      5.00     82.01    225.00        1.44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5016E+01 EXCESS= .0000E+00 OUTFLOW= .5036E+01 BASIN STORAGE= .5973E-02 PERCENT ERROR=   -.5

          FOR PLAN = 1  RATIO=  .00
             RCON1  MANE         5.00     81.09    225.00      1.42      5.00     81.09    225.00        1.42

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4954E+01 EXCESS= .0000E+00 OUTFLOW= .4974E+01 BASIN STORAGE= .5951E-02 PERCENT ERROR=   -.5

          FOR PLAN = 1  RATIO=  .00
             RCON1  MANE         5.00     80.43    225.00      1.41      5.00     80.43    225.00        1.41

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4910E+01 EXCESS= .0000E+00 OUTFLOW= .4930E+01 BASIN STORAGE= .5935E-02 PERCENT ERROR=   -.5

          FOR PLAN = 1  RATIO=  .00
             RCON1  MANE         5.00     79.38    225.00      1.39      5.00     79.38    225.00        1.39

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4839E+01 EXCESS= .0000E+00 OUTFLOW= .4859E+01 BASIN STORAGE= .5706E-02 PERCENT ERROR=   -.5

          FOR PLAN = 1  RATIO=  .00
             RCON1  MANE         3.75     34.82    228.75       .62      5.00     34.70    225.00         .63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2166E+01 EXCESS= .0000E+00 OUTFLOW= .2178E+01 BASIN STORAGE= .6676E-02 PERCENT ERROR=   -.8

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE         4.25     37.68    216.75      1.74      5.00     36.10    220.00        1.73

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2322E+01 EXCESS= .0000E+00 OUTFLOW= .2327E+01 BASIN STORAGE= .2692E-02 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE         4.25     36.85    216.75      1.70      5.00     35.37    220.00        1.70

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2269E+01 EXCESS= .0000E+00 OUTFLOW= .2274E+01 BASIN STORAGE= .2668E-02 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE         4.25     35.46    216.75      1.63      5.00     34.16    220.00        1.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2181E+01 EXCESS= .0000E+00 OUTFLOW= .2186E+01 BASIN STORAGE= .2626E-02 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE         4.25     34.06    216.75      1.57      5.00     32.94    220.00        1.56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2094E+01 EXCESS= .0000E+00 OUTFLOW= .2098E+01 BASIN STORAGE= .2584E-02 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE         4.25     33.51    216.75      1.54      5.00     32.45    220.00        1.54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2059E+01 EXCESS= .0000E+00 OUTFLOW= .2064E+01 BASIN STORAGE= .2567E-02 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE         4.25     33.12    216.75      1.52      5.00     32.11    220.00        1.52

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2035E+01 EXCESS= .0000E+00 OUTFLOW= .2039E+01 BASIN STORAGE= .2556E-02 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE         4.25     32.84    216.75      1.51      5.00     31.87    220.00        1.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2018E+01 EXCESS= .0000E+00 OUTFLOW= .2022E+01 BASIN STORAGE= .2547E-02 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE         4.25     32.40    216.75      1.49      5.00     31.48    220.00        1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1990E+01 EXCESS= .0000E+00 OUTFLOW= .1995E+01 BASIN STORAGE= .2533E-02 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE         4.00     15.82    220.00       .70      5.00     15.82    220.00         .70

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9360E+00 EXCESS= .0000E+00 OUTFLOW= .9381E+00 BASIN STORAGE= .2552E-02 PERCENT ERROR=   -.5

          FOR PLAN = 1  RATIO=  .00
             RSW11  MANE         1.02    755.16    226.24      2.08      5.00    753.82    225.00        2.08
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .6522E+02 EXCESS= .0000E+00 OUTFLOW= .6522E+02 BASIN STORAGE= .1654E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RSW11  MANE         1.03    740.95    226.07      2.03      5.00    738.42    225.00        2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6380E+02 EXCESS= .0000E+00 OUTFLOW= .6381E+02 BASIN STORAGE= .1696E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RSW11  MANE         1.05    714.15    226.19      1.96      5.00    712.14    225.00        1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6145E+02 EXCESS= .0000E+00 OUTFLOW= .6145E+02 BASIN STORAGE= .1622E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RSW11  MANE         1.06    686.99    226.38      1.88      5.00    685.95    225.00        1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5911E+02 EXCESS= .0000E+00 OUTFLOW= .5911E+02 BASIN STORAGE= .1763E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RSW11  MANE         1.07    677.33    225.62      1.85      5.00    675.73    225.00        1.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5818E+02 EXCESS= .0000E+00 OUTFLOW= .5818E+02 BASIN STORAGE= .1832E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RSW11  MANE         1.07    669.72    225.52      1.83      5.00    668.38    225.00        1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5752E+02 EXCESS= .0000E+00 OUTFLOW= .5752E+02 BASIN STORAGE= .1613E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RSW11  MANE         1.08    665.29    226.22      1.82      5.00    663.31    225.00        1.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5706E+02 EXCESS= .0000E+00 OUTFLOW= .5706E+02 BASIN STORAGE= .1791E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RSW11  MANE         1.08    656.69    226.27      1.79      5.00    654.91    225.00        1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5631E+02 EXCESS= .0000E+00 OUTFLOW= .5632E+02 BASIN STORAGE= .1761E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RSW11  MANE         1.43    328.10    225.73       .88      5.00    324.89    225.00         .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2754E+02 EXCESS= .0000E+00 OUTFLOW= .2754E+02 BASIN STORAGE= .1787E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.65   1211.98    225.57      2.06      5.00   1210.68    225.00        2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1040E+03 EXCESS= .0000E+00 OUTFLOW= .1040E+03 BASIN STORAGE= .3928E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.66   1187.90    225.78      2.02      5.00   1185.71    225.00        2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1018E+03 EXCESS= .0000E+00 OUTFLOW= .1018E+03 BASIN STORAGE= .3507E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.68   1144.91    225.68      1.94      5.00   1143.40    225.00        1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9799E+02 EXCESS= .0000E+00 OUTFLOW= .9800E+02 BASIN STORAGE= .3522E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.71   1102.37    225.64      1.87      5.00   1101.22    225.00        1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9424E+02 EXCESS= .0000E+00 OUTFLOW= .9424E+02 BASIN STORAGE= .3477E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.72   1087.77    227.00      1.84      5.00   1083.30    225.00        1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9278E+02 EXCESS= .0000E+00 OUTFLOW= .9279E+02 BASIN STORAGE= .3927E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.73   1077.08    226.26      1.82      5.00   1072.79    225.00        1.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9172E+02 EXCESS= .0000E+00 OUTFLOW= .9173E+02 BASIN STORAGE= .3817E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.73   1069.06    226.95      1.81      5.00   1062.80    225.00        1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9100E+02 EXCESS= .0000E+00 OUTFLOW= .9101E+02 BASIN STORAGE= .3937E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.74   1055.75    226.36      1.78      5.00   1050.97    225.00        1.78
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .8979E+02 EXCESS= .0000E+00 OUTFLOW= .8980E+02 BASIN STORAGE= .3511E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         2.30    524.06    227.64       .87      5.00    520.91    225.00         .87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4386E+02 EXCESS= .0000E+00 OUTFLOW= .4387E+02 BASIN STORAGE= .3897E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCON9  MANE         1.66   2328.84    232.98      2.07      5.00   2309.87    235.00        2.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2305E+03 EXCESS= .0000E+00 OUTFLOW= .2305E+03 BASIN STORAGE= .3208E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCON9  MANE         1.68   2280.17    233.11      2.03      5.00   2262.08    235.00        2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2256E+03 EXCESS= .0000E+00 OUTFLOW= .2256E+03 BASIN STORAGE= .2940E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCON9  MANE         1.70   2201.42    232.81      1.95      5.00   2183.90    235.00        1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2174E+03 EXCESS= .0000E+00 OUTFLOW= .2174E+03 BASIN STORAGE= .3191E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCON9  MANE         1.72   2122.45    232.56      1.88      5.00   2105.31    235.00        1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2093E+03 EXCESS= .0000E+00 OUTFLOW= .2093E+03 BASIN STORAGE= .2643E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCON9  MANE         1.73   2091.60    232.15      1.85      5.00   2072.92    235.00        1.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2060E+03 EXCESS= .0000E+00 OUTFLOW= .2060E+03 BASIN STORAGE= .2866E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCON9  MANE         1.74   2066.14    233.08      1.83      5.00   2050.89    235.00        1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2037E+03 EXCESS= .0000E+00 OUTFLOW= .2037E+03 BASIN STORAGE= .2814E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCON9  MANE         1.74   2053.69    232.00      1.81      5.00   2034.67    235.00        1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2021E+03 EXCESS= .0000E+00 OUTFLOW= .2021E+03 BASIN STORAGE= .2919E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCON9  MANE         1.75   2024.66    233.08      1.79      5.00   2009.96    235.00        1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1995E+03 EXCESS= .0000E+00 OUTFLOW= .1995E+03 BASIN STORAGE= .2757E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
               RCON9  MANE         2.26   1014.92    234.87       .89      5.00   1014.41    235.00         .89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9895E+02 EXCESS= .0000E+00 OUTFLOW= .9896E+02 BASIN STORAGE= .3233E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
              RCON14  MANE         4.25    167.38    221.00      1.99      5.00    166.33    220.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1179E+02 EXCESS= .0000E+00 OUTFLOW= .1181E+02 BASIN STORAGE= .2635E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RCON14  MANE         4.25    164.16    221.00      1.95      5.00    163.07    220.00        1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1155E+02 EXCESS= .0000E+00 OUTFLOW= .1156E+02 BASIN STORAGE= .2609E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RCON14  MANE         4.25    158.77    221.00      1.88      5.00    157.63    220.00        1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1114E+02 EXCESS= .0000E+00 OUTFLOW= .1115E+02 BASIN STORAGE= .2565E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RCON14  MANE         4.00    155.50    220.00      1.81      5.00    155.50    220.00        1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1074E+02 EXCESS= .0000E+00 OUTFLOW= .1075E+02 BASIN STORAGE= .2457E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RCON14  MANE         4.00    153.27    220.00      1.78      5.00    153.27    220.00        1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1057E+02 EXCESS= .0000E+00 OUTFLOW= .1059E+02 BASIN STORAGE= .2440E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              RCON14  MANE         4.00    151.72    220.00      1.77      5.00    151.72    220.00        1.77
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1046E+02 EXCESS= .0000E+00 OUTFLOW= .1047E+02 BASIN STORAGE= .2427E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
            RCON14  MANE         4.00    150.60    220.00      1.75      5.00    150.60    220.00        1.75

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1038E+02 EXCESS= .0000E+00 OUTFLOW= .1039E+02 BASIN STORAGE= .2418E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
            RCON14  MANE         4.25    146.92    221.00      1.73      5.00    145.67    220.00        1.73

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1024E+02 EXCESS= .0000E+00 OUTFLOW= .1025E+02 BASIN STORAGE= .2466E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
            RCON14  MANE         5.00     78.65    220.00       .88      5.00     78.65    220.00         .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5186E+01 EXCESS= .0000E+00 OUTFLOW= .5194E+01 BASIN STORAGE= .2404E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
            RCDON2  MANE          .81   2728.42    230.18      2.01      5.00   2726.73    230.00        2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2848E+03 EXCESS= .0000E+00 OUTFLOW= .2848E+03 BASIN STORAGE= .3309E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON2  MANE          .81   2673.15    230.59      1.96      5.00   2669.86    230.00        1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2787E+03 EXCESS= .0000E+00 OUTFLOW= .2787E+03 BASIN STORAGE= .3091E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON2  MANE          .82   2577.62    230.21      1.89      5.00   2575.63    230.00        1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2685E+03 EXCESS= .0000E+00 OUTFLOW= .2685E+03 BASIN STORAGE= .3009E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON2  MANE          .83   2485.98    230.71      1.82      5.00   2482.27    230.00        1.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2584E+03 EXCESS= .0000E+00 OUTFLOW= .2584E+03 BASIN STORAGE= .3038E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON2  MANE          .83   2447.88    230.78      1.79      5.00   2444.10    230.00        1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2543E+03 EXCESS= .0000E+00 OUTFLOW= .2543E+03 BASIN STORAGE= .3216E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON2  MANE          .83   2421.10    230.56      1.77      5.00   2417.28    230.00        1.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2514E+03 EXCESS= .0000E+00 OUTFLOW= .2514E+03 BASIN STORAGE= .2991E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON2  MANE          .83   2399.83    231.05      1.76      5.00   2397.51    230.00        1.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2494E+03 EXCESS= .0000E+00 OUTFLOW= .2494E+03 BASIN STORAGE= .3304E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON2  MANE          .84   2372.56    230.91      1.73      5.00   2369.01    230.00        1.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2462E+03 EXCESS= .0000E+00 OUTFLOW= .2462E+03 BASIN STORAGE= .3023E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON2  MANE         1.00   1181.48    231.31       .86      5.00   1173.25    230.00         .86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1214E+03 EXCESS= .0000E+00 OUTFLOW= .1214E+03 BASIN STORAGE= .2920E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    353.60    225.00      2.27      5.00    353.60    225.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3020E+02 EXCESS= .0000E+00 OUTFLOW= .3021E+02 BASIN STORAGE= .1566E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    346.83    225.00      2.23      5.00    346.83    225.00        2.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2960E+02 EXCESS= .0000E+00 OUTFLOW= .2961E+02 BASIN STORAGE= .1548E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    335.54    225.00      2.15      5.00    335.54    225.00        2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2860E+02 EXCESS= .0000E+00 OUTFLOW= .2861E+02 BASIN STORAGE= .1518E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    324.25    225.00      2.08      5.00    324.25    225.00        2.08
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .2760E+02 EXCESS= .0000E+00 OUTFLOW= .2762E+02 BASIN STORAGE= .1489E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    319.73    225.00      2.05      5.00    319.73    225.00        2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2721E+02 EXCESS= .0000E+00 OUTFLOW= .2722E+02 BASIN STORAGE= .1476E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    316.57    225.00      2.03      5.00    316.57    225.00        2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2693E+02 EXCESS= .0000E+00 OUTFLOW= .2694E+02 BASIN STORAGE= .1468E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    314.32    230.00      2.01      5.00    314.32    230.00        2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2673E+02 EXCESS= .0000E+00 OUTFLOW= .2675E+02 BASIN STORAGE= .1462E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    310.89    230.00      1.99      5.00    310.89    230.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2641E+02 EXCESS= .0000E+00 OUTFLOW= .2643E+02 BASIN STORAGE= .1452E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    171.06    230.00      1.05      5.00    171.06    230.00        1.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1391E+02 EXCESS= .0000E+00 OUTFLOW= .1392E+02 BASIN STORAGE= .1716E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    640.80    230.00      2.18      5.00    640.80    230.00        2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5392E+02 EXCESS= .0000E+00 OUTFLOW= .5398E+02 BASIN STORAGE= .5817E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    628.20    230.00      2.13      5.00    628.20    230.00        2.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5282E+02 EXCESS= .0000E+00 OUTFLOW= .5288E+02 BASIN STORAGE= .5767E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    607.17    230.00      2.06      5.00    607.17    230.00        2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5100E+02 EXCESS= .0000E+00 OUTFLOW= .5105E+02 BASIN STORAGE= .5683E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    586.10    230.00      1.99      5.00    586.10    230.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4918E+02 EXCESS= .0000E+00 OUTFLOW= .4923E+02 BASIN STORAGE= .5597E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    578.31    230.00      1.96      5.00    578.31    230.00        1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4845E+02 EXCESS= .0000E+00 OUTFLOW= .4850E+02 BASIN STORAGE= .7165E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    572.39    230.00      1.94      5.00    572.39    230.00        1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4794E+02 EXCESS= .0000E+00 OUTFLOW= .4799E+02 BASIN STORAGE= .7136E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    568.15    230.00      1.92      5.00    568.15    230.00        1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4758E+02 EXCESS= .0000E+00 OUTFLOW= .4763E+02 BASIN STORAGE= .7115E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    561.38    230.00      1.90      5.00    561.38    230.00        1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4700E+02 EXCESS= .0000E+00 OUTFLOW= .4705E+02 BASIN STORAGE= .6748E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    295.27    235.00       .98      5.00    295.27    235.00         .98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2427E+02 EXCESS= .0000E+00 OUTFLOW= .2430E+02 BASIN STORAGE= .7210E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
               R19A  MANE         5.00    318.89    235.00      2.18      5.00    318.89    235.00        2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2936E+02 EXCESS= .0000E+00 OUTFLOW= .2938E+02 BASIN STORAGE= .2006E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
               R19A  MANE         5.00    312.72    235.00      2.13      5.00    312.72    235.00        2.13
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .2875E+02 EXCESS= .0000E+00 OUTFLOW= .2877E+02 BASIN STORAGE= .1983E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    302.45    235.00      2.06      5.00    302.45    235.00        2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2774E+02 EXCESS= .0000E+00 OUTFLOW= .2776E+02 BASIN STORAGE= .1945E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    292.17    235.00      1.98      5.00    292.17    235.00        1.98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2673E+02 EXCESS= .0000E+00 OUTFLOW= .2675E+02 BASIN STORAGE= .1906E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    288.05    235.00      1.95      5.00    288.05    235.00        1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2633E+02 EXCESS= .0000E+00 OUTFLOW= .2635E+02 BASIN STORAGE= .1891E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    285.17    235.00      1.93      5.00    285.17    235.00        1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2605E+02 EXCESS= .0000E+00 OUTFLOW= .2606E+02 BASIN STORAGE= .1880E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    283.11    235.00      1.92      5.00    283.11    235.00        1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2585E+02 EXCESS= .0000E+00 OUTFLOW= .2586E+02 BASIN STORAGE= .1872E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    279.82    235.00      1.89      5.00    279.82    235.00        1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2553E+02 EXCESS= .0000E+00 OUTFLOW= .2554E+02 BASIN STORAGE= .1860E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    146.43    235.00       .96      5.00    146.43    235.00         .96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1300E+02 EXCESS= .0000E+00 OUTFLOW= .1300E+02 BASIN STORAGE= .2023E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
             RC13A-2  MANE         5.00    780.51    235.00      2.18      5.00    780.51    235.00        2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7731E+02 EXCESS= .0000E+00 OUTFLOW= .7736E+02 BASIN STORAGE= .8795E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
             RC13A-2  MANE         5.00    764.75    235.00      2.14      5.00    764.75    235.00        2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7572E+02 EXCESS= .0000E+00 OUTFLOW= .7577E+02 BASIN STORAGE= .8721E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
             RC13A-2  MANE         5.00    738.48    235.00      2.06      5.00    738.48    235.00        2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7309E+02 EXCESS= .0000E+00 OUTFLOW= .7314E+02 BASIN STORAGE= .8303E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
             RC13A-2  MANE         5.00    712.20    235.00      1.99      5.00    712.20    235.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7047E+02 EXCESS= .0000E+00 OUTFLOW= .7051E+02 BASIN STORAGE= .8180E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
             RC13A-2  MANE         5.00    701.68    235.00      1.96      5.00    701.68    235.00        1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6942E+02 EXCESS= .0000E+00 OUTFLOW= .6947E+02 BASIN STORAGE= .8130E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
             RC13A-2  MANE         5.00    694.32    235.00      1.94      5.00    694.32    235.00        1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6869E+02 EXCESS= .0000E+00 OUTFLOW= .6873E+02 BASIN STORAGE= .8095E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
             RC13A-2  MANE         5.00    689.06    235.00      1.92      5.00    689.06    235.00        1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6817E+02 EXCESS= .0000E+00 OUTFLOW= .6821E+02 BASIN STORAGE= .7878E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
             RC13A-2  MANE         5.00    680.64    235.00      1.90      5.00    680.64    235.00        1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6733E+02 EXCESS= .0000E+00 OUTFLOW= .6738E+02 BASIN STORAGE= .7838E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
             RC13A-2  MANE         5.00    353.55    240.00       .98      5.00    353.55    240.00         .98
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .3459E+02 EXCESS= .0000E+00 OUTFLOW= .3462E+02 BASIN STORAGE= .6811E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         2.90   1036.21    237.50      2.15      5.00   1029.58    235.00        2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1041E+03 EXCESS= .0000E+00 OUTFLOW= .1041E+03 BASIN STORAGE= .2599E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         2.92   1018.48    236.21      2.11      5.00   1009.34    235.00        2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1020E+03 EXCESS= .0000E+00 OUTFLOW= .1020E+03 BASIN STORAGE= .2441E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         2.95    983.10    236.05      2.03      5.00    975.10    235.00        2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9842E+02 EXCESS= .0000E+00 OUTFLOW= .9843E+02 BASIN STORAGE= .3029E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         2.99    947.55    235.94      1.96      5.00    940.20    235.00        1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9487E+02 EXCESS= .0000E+00 OUTFLOW= .9488E+02 BASIN STORAGE= .2774E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         3.00    935.30    237.12      1.93      5.00    921.65    235.00        1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9346E+02 EXCESS= .0000E+00 OUTFLOW= .9347E+02 BASIN STORAGE= .2840E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         3.01    923.69    237.96      1.91      5.00    914.93    235.00        1.91

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9247E+02 EXCESS= .0000E+00 OUTFLOW= .9248E+02 BASIN STORAGE= .2450E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         3.02    912.75    235.55      1.90      5.00    907.94    235.00        1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9176E+02 EXCESS= .0000E+00 OUTFLOW= .9177E+02 BASIN STORAGE= .2737E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         3.03    906.65    236.52      1.87      5.00    895.54    235.00        1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9064E+02 EXCESS= .0000E+00 OUTFLOW= .9064E+02 BASIN STORAGE= .3045E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         3.82    462.80    240.43       .96      5.00    461.30    240.00         .96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4647E+02 EXCESS= .0000E+00 OUTFLOW= .4648E+02 BASIN STORAGE= .2735E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCCON18R  MANE         2.10   2027.45    234.78      2.12      5.00   2027.21    235.00        2.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2038E+03 EXCESS= .0000E+00 OUTFLOW= .2038E+03 BASIN STORAGE= .6994E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCCON18R  MANE         2.11   1987.08    233.81      2.07      5.00   1983.87    235.00        2.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1997E+03 EXCESS= .0000E+00 OUTFLOW= .1997E+03 BASIN STORAGE= .8778E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCCON18R  MANE         2.12   1917.25    233.66      2.00      5.00   1916.54    235.00        2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1927E+03 EXCESS= .0000E+00 OUTFLOW= .1927E+03 BASIN STORAGE= .7687E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCCON18R  MANE         2.14   1851.92    237.86      1.93      5.00   1849.06    235.00        1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1858E+03 EXCESS= .0000E+00 OUTFLOW= .1858E+03 BASIN STORAGE= .7165E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCCON18R  MANE         2.15   1825.30    234.55      1.90      5.00   1824.29    235.00        1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1830E+03 EXCESS= .0000E+00 OUTFLOW= .1830E+03 BASIN STORAGE= .7044E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCCON18R  MANE         2.16   1810.35    237.21      1.88      5.00   1805.80    235.00        1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1810E+03 EXCESS= .0000E+00 OUTFLOW= .1810E+03 BASIN STORAGE= .8589E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCCON18R  MANE         2.16   1794.70    237.64      1.87      5.00   1788.35    235.00        1.87
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1797E+03 EXCESS= .0000E+00 OUTFLOW= .1797E+03 BASIN STORAGE= .9117E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCCON18R  MANE         2.17   1769.12    234.06      1.84      5.00   1767.98    235.00        1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1774E+03 EXCESS= .0000E+00 OUTFLOW= .1774E+03 BASIN STORAGE= .7444E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCCON18R  MANE         2.56    915.44    241.05       .94      5.00    914.17    240.00         .94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9090E+02 EXCESS= .0000E+00 OUTFLOW= .9090E+02 BASIN STORAGE= .7342E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE         2.99   4697.11    235.93      2.05      5.00   4685.68    235.00        2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4964E+03 EXCESS= .0000E+00 OUTFLOW= .4964E+03 BASIN STORAGE= .1425E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE         3.00   4586.71    237.19      2.01      5.00   4584.33    235.00        2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4859E+03 EXCESS= .0000E+00 OUTFLOW= .4859E+03 BASIN STORAGE= .1442E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE         3.03   4440.81    236.23      1.94      5.00   4427.80    235.00        1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4685E+03 EXCESS= .0000E+00 OUTFLOW= .4685E+03 BASIN STORAGE= .1645E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE         3.06   4276.40    235.33      1.87      5.00   4268.43    235.00        1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4512E+03 EXCESS= .0000E+00 OUTFLOW= .4512E+03 BASIN STORAGE= .1299E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE         3.07   4218.31    236.19      1.84      5.00   4202.67    235.00        1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4443E+03 EXCESS= .0000E+00 OUTFLOW= .4442E+03 BASIN STORAGE= .1436E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE         3.08   4167.94    236.82      1.82      5.00   4149.17    235.00        1.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4394E+03 EXCESS= .0000E+00 OUTFLOW= .4394E+03 BASIN STORAGE= .1289E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE         3.08   4130.65    237.33      1.80      5.00   4115.19    235.00        1.80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4360E+03 EXCESS= .0000E+00 OUTFLOW= .4359E+03 BASIN STORAGE= .1439E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE         3.09   4078.39    234.95      1.78      5.00   4078.35    235.00        1.78

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4304E+03 EXCESS= .0000E+00 OUTFLOW= .4304E+03 BASIN STORAGE= .1278E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE         3.68   2061.55    238.91       .89      5.00   2055.47    240.00         .89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2159E+03 EXCESS= .0000E+00 OUTFLOW= .2159E+03 BASIN STORAGE= .1399E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE         1.74    439.87    237.27      2.03      5.00    439.01    235.00        2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4783E+02 EXCESS= .0000E+00 OUTFLOW= .4783E+02 BASIN STORAGE= .2578E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE         1.75    432.13    236.45      1.99      5.00    430.53    235.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4685E+02 EXCESS= .0000E+00 OUTFLOW= .4685E+02 BASIN STORAGE= .2499E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE         1.76    417.58    236.27      1.92      5.00    416.38    235.00        1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4522E+02 EXCESS= .0000E+00 OUTFLOW= .4522E+02 BASIN STORAGE= .2493E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE         1.78    403.10    236.14      1.85      5.00    402.16    235.00        1.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4360E+02 EXCESS= .0000E+00 OUTFLOW= .4360E+02 BASIN STORAGE= .2464E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE         1.78    398.34    236.81      1.83      5.00    396.16    235.00        1.83
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .4296E+02 EXCESS= .0000E+00 OUTFLOW= .4296E+02 BASIN STORAGE= .2533E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE         1.78    393.51    237.29      1.81      5.00    392.22    235.00        1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4251E+02 EXCESS= .0000E+00 OUTFLOW= .4250E+02 BASIN STORAGE= .2248E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE         1.79    390.10    235.85      1.79      5.00    389.58    235.00        1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4218E+02 EXCESS= .0000E+00 OUTFLOW= .4218E+02 BASIN STORAGE= .2523E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE         1.79    386.39    236.40      1.77      5.00    385.05    235.00        1.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4167E+02 EXCESS= .0000E+00 OUTFLOW= .4167E+02 BASIN STORAGE= .2662E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE         2.03    203.87    238.08       .91      5.00    202.47    235.00         .91

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2143E+02 EXCESS= .0000E+00 OUTFLOW= .2143E+02 BASIN STORAGE= .2507E-03 PERCENT ERROR=    .0


*** NORMAL END OF HEC-1 ***
```

2013 MPU Ultimate Condition Reference Material

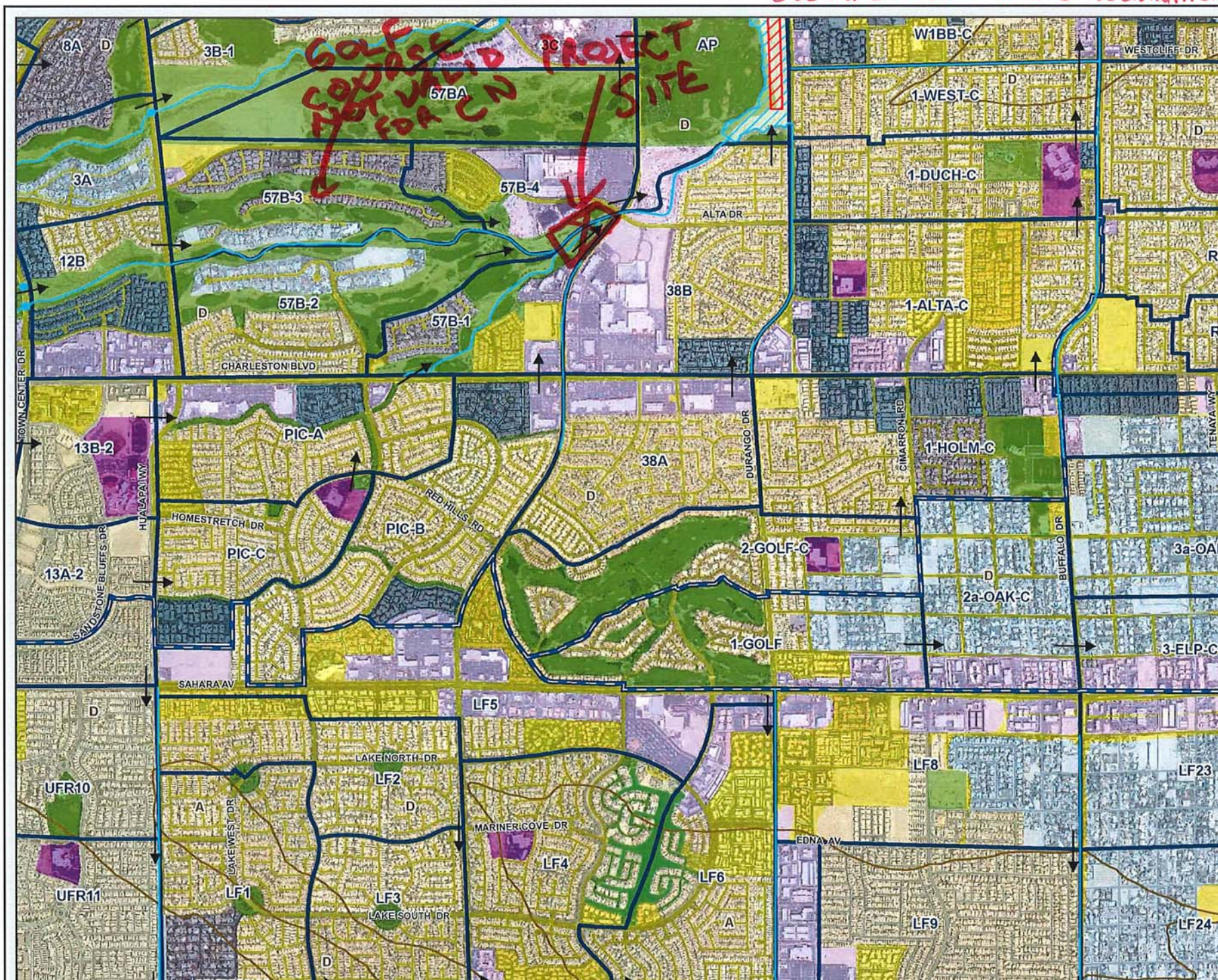
Table 4-2 Land Use Categories

PREV. ASSUMED CN FOR DEVELOPMENT AREA 4 ↓ NOT VALID PER THIS SUBMITTAL

Land Use Index Number	Description - Typical Land Uses	Impervious (%)	Open Landscaped Good Condition (%)	Open Desert Shrub Poor Condition *Natural Desert Landscaping* (%)
	Drought Ordinance Not Applied			
1	Undeveloped Land, Open Desert	0	0	100
2	Parks, Golf Courses	5	85	10
3	Rural, 0.5-1 units per acre (uses 1 unit/acre)	20	20	60
4	Low-Density Residential, 1-2 units per acre (uses 2 units/acre)	25	40	35
5	Medium-Density Residential, 2-4 units per acre (uses 3 units/acre)	29	71	0
6	High-Density Residential, 4-8 units per acre (uses 6 units/acre)	62	38	0
7	Public Facility and Residential, 8- 12 units/acre	72	28	0
8	Very High-Density Residential, 12 units/acre or more	85	15	0
9	Commercial, Retail, Casino, High Rise Condominiums	90	10	0
10	Light Industrial	70	15	15
11	Heavy Industrial	85	8	7
12	Schools	50	50	0
13	Lakes	0	0	0
	Drought Ordinance Applied			
14	Low-Density Residential, 1-2 units per acre (uses 2 units/acre)	25	20	55
15	Medium-Density Residential, 2-4 units per acre (uses 3 units/acre)	29	35	36
16	High-Density Residential, 4-8 units per acre (uses 6 units/acre)	62	19	19
17	Public Facility and Residential, 8- 12 units/acre	72	14	14
18	Very High-Density Residential, 12 units/acre or more	85	0	15
19	Commercial, Retail, Casino, High Rise Condominiums	90	0	10
20	Light Industrial	70	0	30
21	Heavy Industrial	85	0	15
22	Schools	50	30	20

The land use data used with the 2008 MPU is shown on the H-Maps of Volume 2. **Figure 4-1** shows the geographic comparison between the 2008 and 2002 MPU land use coverages in terms of percent imperviousness. The increase or decrease in impervious area represents an increase or decrease in the runoff potential for a given area.

SEE MPD HEC-1 FOR CONCENTRATION



RESPONSE TO COMMENTS ON LETTER OF MAP REVISION (LOMR) FOR ONE QUEENSRIDGE PLACE

840.007

June 2006

Prepared for:

Queensridge Towers, LLC
9755 W. Charleston Boulevard
Las Vegas, Nevada 89117
Phone: (702) 656-5955
Fax: (702) 562-0579

Federal Emergency Management Agency

Washington, D.C. 20472

SEP 21 2006

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Oscar Goodman
Mayor, City of Las Vegas
400 Stewart Avenue
Las Vegas, NV 89101

IN REPLY REFER TO:
Case No.: 06-09-B483P
Community Name: City of Las Vegas, NV
Community No.: 325276
Effective Date of This Revision: SEP 21 2006

Dear Mayor Goodman:

The Flood Insurance Rate Map for your community has been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel(s) revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Federal Insurance and Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Oakland, California, at (510) 627-7175, or the FEMA Map Assistance Center, toll free, at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Sincerely,

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

For: William R. Blanton Jr., CFM, Chief
Engineering Management Section
Mitigation Division

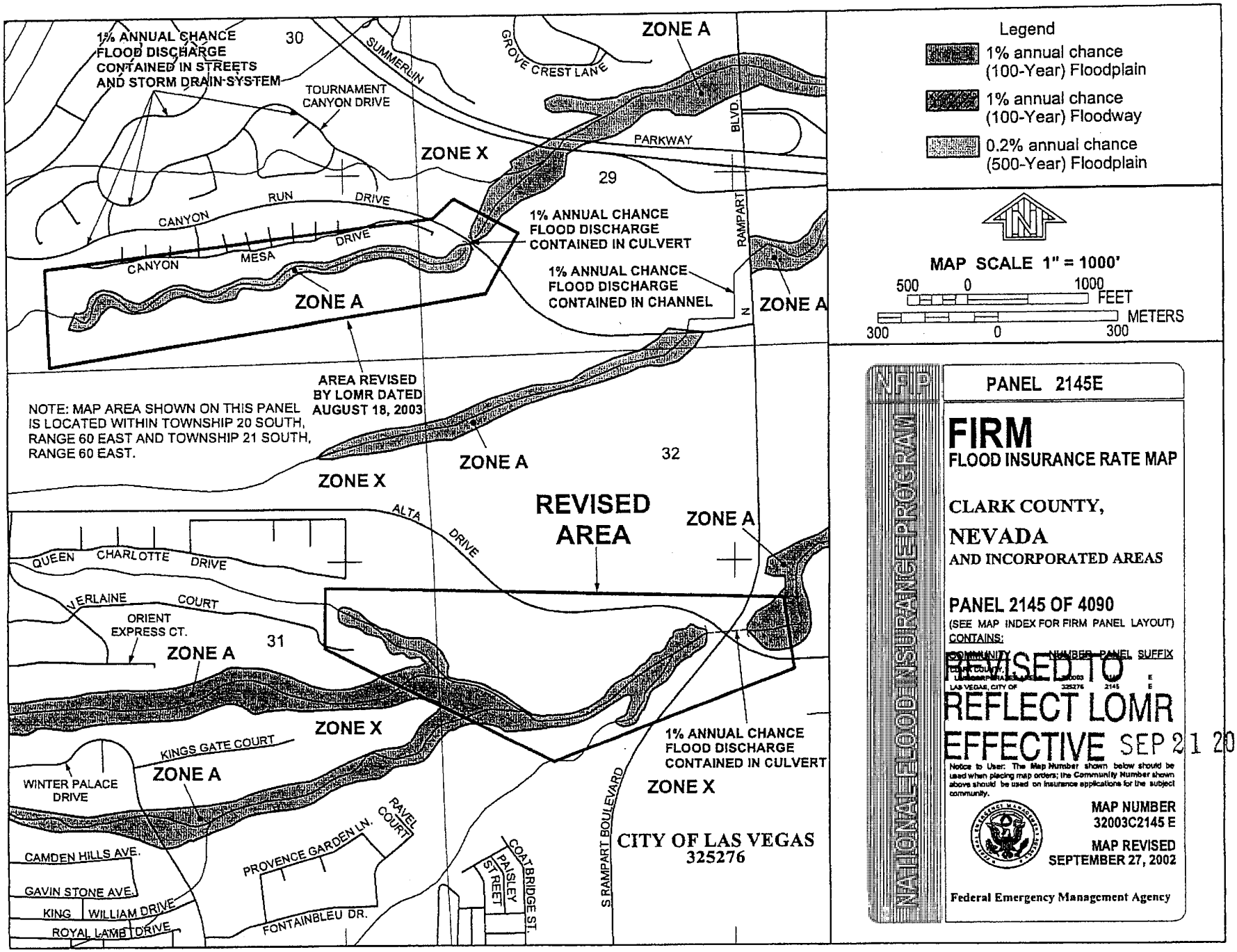
List of Enclosures:

Letter of Map Revision Determination Document
Annotated Flood Insurance Rate Map

cc: Mr. Randy Fultz, P.E.
Assistant City Engineer
City of Las Vegas

Mr. Kevin Eubanks, P.E., CFM
Assistant General Manager
Clark County Regional Flood Control District

Mr. Michael J. Ludwig, P.E.
Project Manager
Flood Control District
G.C. Wallace, Inc.



REPLY APP 1008

CLV295739

6105

 | Issue Date: SEP 2 1 2006 | Effective Date: SEP 2 1 2006 | Case No.: 06-09-B483P | LOMR-APP

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	City of Las Vegas Clark County Nevada	CULVERT	HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
	COMMUNITY NO.: 325276		
IDENTIFIER	Queensridge Place	APPROXIMATE LATITUDE & LONGITUDE: 36.165, -115.293 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 32003C2145E DATE: September 27, 2002	NO REVISION TO THE FLOOD INSURANCE STUDY REPORT

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Unnamed Wash - from approximately 3,600 feet upstream to approximately 100 feet downstream of South Rampart Boulevard

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Unnamed Wash	Zone A	Zone A	YES	YES
	Zone A	Contained	NONE	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

106979 10.3.1.0609B483 102-I-C

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse including any related appurtenances such as bridges, culverts, and other drainage structures rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

106979 10.3.1.0609B483 102-I-C

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Federal Insurance and Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

106979 10.3.1.0609B483 102-I-C

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

This revision is effective as of the date of this letter. Any requests to review or alter this determination should be made within 30 days and must be based on scientific or technical data.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

106979 10.3.1.0609B483 102-I-C

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires: August 31, 2007

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, U.S. Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: **Unnamed Wash**
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section 2) ☒ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

UPDATED TO 4497 cfs

Location	Drainage Area (Sq. Mi.)	FIS (cfs)	Revised (cfs)
Main Wash	5.19	NA	4425
Main Wash	0.02	NA	2450

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [TR-20, HEC-1, HEC-HMS etc.]
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by DHS-FEMA. This document can be found at: http://www.fema.gov/fhm/en_modl.shtm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered? ☒ Yes ☐ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	330 ft. downstream of Rampart Blvd.	60	NA	2665.4
Upstream Limit	2640 ft. upstream of Rampart Blvd.	2420	NA	2732.8

2. Hydraulic Method Used

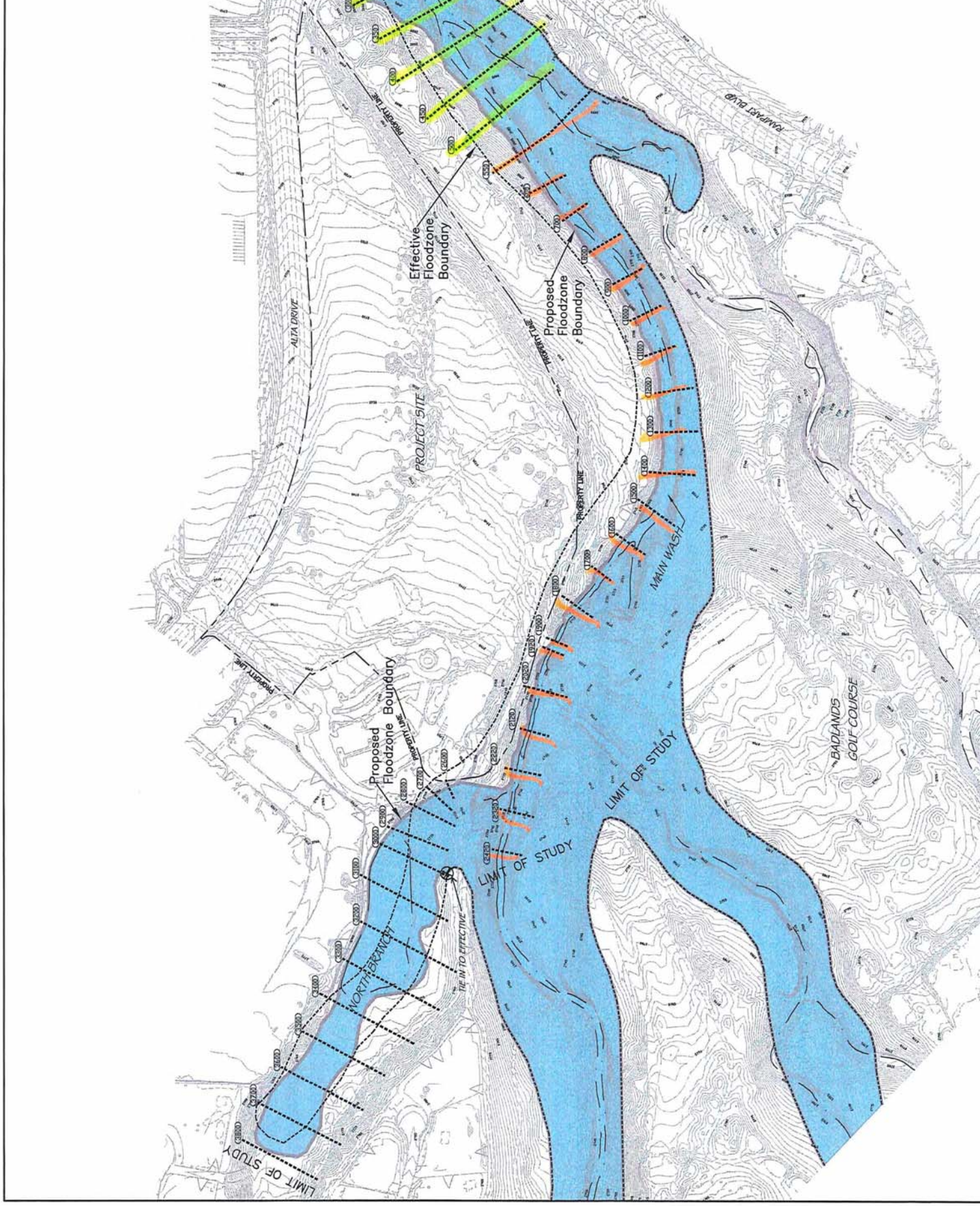
Hydraulic Analysis HEC-2 [HEC-2 , HEC-RAS, Other (Attach description)] HEC-2

TABLE 1: SUMMARY OF MODELING RESULTS

		HEC 2				HEC 6				COMPARISON				
Cross Section	Q100 Flow (cfs)	Starting Ground FL (ft)	WSE (ft)***	Depth (ft)	Velocity (ft/s)	Final Ground FL (ft)*	WSE (ft)**	Depth (ft)	Velocity (ft/s)	Ground change (ft)*	Deposit/ Scour	WSE HEC-2 vs. HEC-6 (ft)**	North site elevation (ft)	site elevation vs. HEC-2 WSE
2420	2450	2722.0	2732.8	10.8	13.2	2715.3	2729.6	14.3	12.9	-6.7	Scour	-3.2	NA	NA
2320	2450	2719.0	2729.6	10.6	15.8	2714.6	2728.4	13.8	13.0	-4.4	Scour	-1.1	NA	NA
2220	2450	2716.0	2727.1	11.1	16.0	2713.9	2725.1	11.3	16.5	-2.2	Scour	-2.0	2742.0	14.9
2120	2450	2712.0	2724.4	12.4	11.6	2707.9	2725.7	17.9	9.7	-4.1	Scour	1.3	2742.0	17.6
2020	2450	2710.0	2722.8	12.8	12.9	2706.1	2725.4	19.2	8.8	-3.9	Scour	2.5	2740.0	17.2
1920	2450	2708.0	2722.1	14.1	11.7	2704.9	2725.2	20.3	7.4	-3.1	Scour	3.1	2739.0	16.9
1900	2450	2708.0	2719.1	11.1	17.1	2705.0	2721.3	16.3	16.5	-3.0	Scour	2.2	2739.0	19.9
1800	2450	2705.0	2717.6	12.6	14.3	2702.8	2718.0	15.1	13.8	-2.2	Scour	0.4	2733.0	15.4
1700	2450	2703.0	2713.3	10.3	14.3	2702.8	2712.5	9.7	14.7	-0.2	Scour	-0.8	2732.0	18.7
1600	2450	2701.0	2707.2	6.2	11.8	2700.4	2707.2	6.8	11.6	-0.6	Scour	0.0	2734.0	26.8
1500	2450	2699.0	2706.2	7.2	9.1	2700.2	2705.7	5.4	11.1	1.2	Deposit	-0.5	2732.0	25.8
1400	2450	2698.0	2704.2	6.2	12.1	2696.6	2704.0	7.4	12.0	-1.4	Scour	-0.3	2731.0	26.8
1300	2450	2695.0	2701.3	6.3	12.4	2697.4	2701.6	4.1	12.2	2.4	Deposit	0.3	2731.0	29.7
1200	2450	2693.0	2700.8	7.8	9.0	2693.1	2699.7	6.6	12.2	0.1	Deposit	-1.1	2730.0	29.2
1100	2450	2692.0	2698.7	6.7	12.7	2692.3	2698.3	6.0	12.6	0.3	Deposit	-0.4	2728.0	29.3
1000	2450	2689.0	2695.3	6.3	12.1	2689.6	2695.4	5.8	11.8	0.6	Deposit	0.1	2727.0	31.7
900	2450	2688.0	2693.4	5.4	11.7	2687.9	2693.4	5.5	11.6	-0.1	Scour	0.1	2727.0	33.6
800	2450	2686.0	2691.7	5.7	11.8	2685.6	2691.4	5.8	11.3	-0.4	Scour	-0.3	2725.0	33.3
700	2450	2683.0	2689.6	6.6	12.7	2683.2	2689.8	6.7	12.5	0.2	Deposit	0.2	2723.0	33.4
600	2450	2682.0	2688.1	6.1	12.4	2681.9	2688.0	6.1	12.3	-0.1	Scour	-0.1	2718.0	29.9
550	2450	2679.0	2688.1	9.1	6.4	2679.6	2686.8	7.2	9.2	0.6	Deposit	-1.3	2715.0	26.9
500	4425	2677.0	2687.3	10.3	8.2	2677.5	2685.0	7.6	12.3	0.5	Deposit	-2.3	2714.0	26.7
450	4425	2676.0	2687.4	11.4	5.8	2676.7	2684.6	7.9	8.6	0.7	Deposit	-2.8	2716.0	28.6
400	4425	2674.0	2687.5	13.5	3.7	2675.3	2684.9	9.6	5.2	1.3	Deposit	-2.6	2714.0	26.5
350	4425	2673.0	2687.4	14.4	3.9	2674.0	2684.7	10.6	5.7	1.0	Deposit	-2.8	2712.0	24.6
300	4425	2671.0	2687.5	16.5	3.0	2671.9	2684.6	12.7	4.9	0.9	Deposit	-2.9	2708.0	20.5
250	4425	2670.0	2687.4	17.4	2.8	2670.7	2684.6	13.9	4.1	0.7	Deposit	-2.8	2702.0	14.6
160	4425	2667.0	2687.3	20.3	3.7	2667.1	2684.3	17.3	5.0	0.1	Deposit	-3.0	2697.0	9.7
150 (culvert)	4425	2666.6	2685.2	18.6	9.9	2666.6	2676.8	10.2	18.0	0.0	Deposit	-8.4	2697.0	11.8
140 (culvert)	4425	2659.9	2670.1	10.2	17.7	2659.9	2670.1	10.2	18.0	0.0	Deposit	0.1	NA	NA
100	4425	2660.0	2667.7	7.7	14.7	2660.1	2667.8	7.7	14.6	0.1	Deposit	0.1	NA	NA
80	4425	2658.0	2666.5	8.5	12.7	2656.5	2667.4	10.9	8.5	-1.5	Scour	0.9	NA	NA
60	4425	2656.0	2665.4	9.4	12.2	2659.3	2665.5	6.2	12.2	3.3	Deposit	0.1	NA	NA

*Final ground determined at end of 6-hour, 100-year storm.
** Maximum WSE determined at peak flow rate in 6-hour, 100-year storm.
*** Revised floodplain boundary mapping is based on HEC-2 water surface elevation.

G:\840-007\Calc\Hydrosummarytotal.xls


Effective Floodzone Boundary
Proposed Floodzone Boundary
Proposed Floodzone Boundary
PROPERTY LINE
PROPERTY LINE
PROPERTY LINE
PROPERTY LINE
RAMPART BLVD
ALTA DRIVE
PROJECT SITE
MAIN WASH
BADLANDS GOLF COURSE
LIMIT OF STUDY
LIMIT OF STUDY
LIMIT OF STUDY
NORTH BRANCH
TIE IN TO EFFECTIVE

+ 308.6

LETTER OF MAP REVISION (LOMR)
FOR
THE VILLAGE AT QUEENSRIDGE

619.2953

August 2006

Prepared for:

Great Wash, LLC
9755 W. Charleston Boulevard
Las Vegas, Nevada 89117
Phone: (702) 656-5955
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G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

FILE: QB12X12-U2.WSW

W S P G W - CIVILDESIGN Version 14.06
Program Package Serial Number: 1622
WATER SURFACE PROFILE LISTING

Date: 2-24-2006 Time: 3:29:35

QUEENSBOROUGH CULVERT - JMA ARCH STUDIOS
GCWALLACE PROJECT # 619.295
FILENAME: QB12X12-U2.WSW CDK

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-3473.910	30.000	4.332	34.332	4497.00	9.55	1.41	35.75	.00	4.33	166.56		1		0 .0
TRANS STR	-.2202					.0066	.29	4.33	1.00		.035			IR-OPEN
-3430.310	20.400	15.512	35.912	4497.00	3.94	.24	36.15	.00	8.36	131.37		2		0 .0
TRANS STR	.0119					.0007	.02	15.51	.24		.040			IR-OPEN
-3401.010	20.750	15.156	35.906	4497.00	4.20	.27	36.18	.00	7.11	110.00		3		0 .0
TRANS STR	.0110					.0001	.00	15.16	.24		.015			IR-OPEN
-3350.810	21.300	14.661	35.961	4497.00	3.83	.23	36.19	.00	5.89	112.08		4		0 .0
TRANS STR	.0141					.0001	.00	14.66	.21		.015			IR-OPEN
-3325.950	21.650	14.302	35.952	4497.00	3.94	.24	36.19	.00	5.71	107.58		5		0 .0
TRANS STR	.0160							14.302	.213		.015			IR-OPEN
-3315.950	21.610	5.925	27.735	4497.00	31.62	15.53	43.26	.00	10.29	25.00	12.000	25.000	.00	1 1.0
90.310	.0152					.0249	2.24	5.93	2.34	7.02	.015	.00	.00	BOX
-3225.640	23.160	5.731	28.911	4497.00	32.69	16.60	45.51	.00	10.29	25.00	12.000	25.000	.00	1 1.0
2.320	-.0776					.0263	.06	5.73	2.46	.00	.015	.00	.00	BOX
-3223.320	23.000	5.682	28.682	4497.00	32.98	16.89	45.57	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
70.620	.0283					.0264	1.86	12.00	2.49	5.55	.015	.00	.00	BOX
-3152.700	25.000	5.709	30.709	4497.00	32.62	16.73	47.44	.00	10.29	25.00	12.000	25.000	.00	1 1.0
17.410	.0276					.0262	.46	5.71	2.47	5.60	.015	.00	.00	BOX

Program Package Serial Number: 1622

WATER SURFACE PROFILE LISTING

Date: 2-24-2006 Time: 3:29:35

QUEENSBOROUGH CULVERT - JMA ARCH STUDIOS

GCWALLACE PROJECT # 619.295

FILENAME: Q812X12-U2.WSW CJK

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-3135.290	25.480	5.714	31.194	4497.00	32.79	16.70	47.89	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
85.300	.0279					.0260	2.21	12.00	2.47	5.58	.015	.00	.00	BOX
-3049.990	27.860	5.748	33.608	4497.00	32.60	16.50	50.11	.00	10.29	25.00	12.000	25.000	.00	1 1.0
143.470	.0279					.0253	3.63	5.75	2.45	5.58	.015	.00	.00	BOX
-2906.520	31.860	5.829	37.689	4497.00	32.15	16.05	53.73	.40	10.29	25.00	12.000	25.000	.00	1 1.0
203.401	.0278					.0238	4.83	6.22	2.39	5.58	.015	.00	.00	BOX
-2703.119	37.523	6.024	43.546	4497.00	31.11	15.02	58.57	.37	10.29	25.00	12.000	25.000	.00	1 1.0
165.794	.0278					.0214	3.54	6.39	2.28	5.58	.015	.00	.00	BOX
-2537.325	42.138	6.318	48.456	4497.00	29.66	13.66	62.11	.34	10.29	25.00	12.000	25.000	.00	1 1.0
103.695	.0278					.0188	1.95	6.65	2.12	5.58	.015	.00	.00	BOX
-2433.630	45.025	6.626	51.651	4497.00	28.28	12.42	64.07	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
60.182	.0278					.0168	1.01	12.00	1.98	5.58	.015	.00	.00	BOX
-2373.448	46.700	6.888	53.588	4497.00	27.20	11.49	65.08	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
55.228	.0278					.0150	.83	12.00	1.86	5.58	.015	.00	.00	BOX
-2318.220	48.238	7.224	55.462	4497.00	25.94	10.45	65.91	.00	10.29	25.00	12.000	25.000	.00	1 1.0
26.702	.0278					.0136	.36	7.22	1.74	5.58	.015	.00	.00	BOX
-2291.518	48.982	7.440	56.421	4497.00	25.19	9.85	66.27	.00	10.29	25.00	12.000	25.000	.00	1 1.0
34.206	.0278					.0123	.42	7.44	1.66	5.58	.015	.00	.00	BOX

FILE: QB12X12-U2.WSW

W S P G W - CIVILDESIGN Version 14.06
Program Package Serial Number: 1622
WATER SURFACE PROFILE LISTING

PAGE 3

Date: 2-24-2006 Time: 3:29:35

QUEENSBOROUGH CULVERT - JMA ARCH STUDIOS
GCWALLACE PROJECT # 619.295
FILENAME: QB12X12-U2.WSW CJK

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-2257.313	49.934	7.803	57.737	4497.00	24.01	8.95	66.69	.00	10.29	25.00	12.000	25.000	.00	1 1.0
25.506	.0278					.0109	.28	7.80	1.55	5.58	.015	.00	.00	BOX
-2231.807	50.644	8.184	58.828	4497.00	22.90	8.14	66.97	.00	10.29	25.00	12.000	25.000	.00	1 1.0
18.679	.0278					.0096	.18	8.18	1.44	5.58	.015	.00	.00	BOX
-2213.128	51.164	8.583	59.748	4497.00	21.83	7.40	67.15	.00	10.29	25.00	12.000	25.000	.00	1 1.0
13.128	.0278					.0085	.11	8.58	1.34	5.58	.015	.00	.00	BOX
-2200.000	51.530	9.002	60.532	4497.00	20.81	6.73	67.26	.00	10.29	25.00	12.000	25.000	.00	1 1.0
60.785	.0080					.0080	.49	9.00	1.25	9.00	.015	.00	.00	BOX
-2139.215	52.016	9.002	61.018	4497.00	20.81	6.73	67.75	.00	10.29	25.00	12.000	25.000	.00	1 1.0
405.355	.0080					.0077	3.13	9.00	1.25	9.00	.015	.00	.00	BOX
-1733.860	55.259	9.255	64.514	4497.00	20.24	6.36	70.88	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
54.700	.0080					.0074	.40	12.00	1.20	9.00	.015	.00	.00	BOX
-1679.160	55.697	9.355	65.051	4497.00	20.03	6.23	71.28	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
95.423	.0080					.0069	.65	12.00	1.18	9.00	.015	.00	.00	BOX
-1583.737	56.460	9.811	66.271	4497.00	19.10	5.66	71.93	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
18.737	.0080					.0061	.11	12.00	1.10	9.00	.015	.00	.00	BOX
-1565.000	56.610	10.291	66.901	4497.00	18.21	5.15	72.05	.00	10.29	25.00	12.000	25.000	.00	1 1.0
88.377	.0050					.0051	.45	10.29	1.02	10.85	.015	.00	.00	BOX
-1476.623	57.053	10.793	67.846	4497.00	17.36	4.68	72.53	.00	10.29	25.00	12.000	25.000	.00	1 1.0
257.531	.0050					.0050	1.29	10.79	.95	10.85	.015	.00	.00	BOX
-1219.092	58.343	10.853	69.196	4497.00	17.26	4.63	73.82	.00	10.29	25.00	12.000	25.000	.00	1 1.0
219.092	.0050					.0050	1.10	10.85	.94	10.85	.015	.00	.00	BOX

---------- WARNING - Flow depth near top of box conduit ----------

-1000.000	59.440	10.853	70.293	4497.00	17.26	4.63	74.92	.00	10.29	25.00	12.000	25.000	.00	1 1.0

FEMA EFFECTIVE RATE D/S OF RAMPART

ASSUMPTION TOP OF RCB @ THIS LOCATION CONSIDERED CONSERVATIVE & ACCEPTABLE

APPENDIX D

RESPONSE TO COMMENTS NO. 8, 9 AND 10
(STORM DRAIN HYDRAULIC ANALYSIS)

Mainline 1 (APSO MPU Alignment)
Manning's 'n' 0.013
(Utilized for Velocity Design)

PRELIM. PHASE 2 HYDRAULICS

```
                                                                    MAIN1.WSW
T1 THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050                        0
T2 1ST RESPONSE TO CLV COMMENTS
T3 MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)
SO  -9546.4602659.440  1                        2671.440
R   -9401.3002662.940  1      .013                                  .000    .000 0
JX  -9391.3002663.130  1  6   .013  188.000         2663.420       -60.0         .000
R   -9196.4602666.750  1      .013                                  .000    .000 0
TS  -9166.4602668.540  2      .013                                  .000
R   -9128.4302670.810  2      .013                                  .000    .000 0
R   -9038.3502671.710  2      .013                                 34.408    .000 0
R   -8662.5402675.470  2      .013                                  .000    .000 0
R   -8553.1202676.560  2      .013                                 12.539    .000 0
R   -8493.5002677.160  2      .013                                  .000    .000 0
R   -8441.4702677.683  2      .013                                -19.874    .000 0
R   -7825.4502683.840  2      .013                                  .000    .000 0
R   -7770.0502684.950  2      .013                                 -4.535    .000 0
R   -7573.6402695.710  2      .013                                -16.076    .000 0
JX  -7536.9702697.680  4  3   .013 2008.000         2697.680       -15.0         .000
R   -7361.1002710.680  4      .013                                -17.196    .000 0
R   -7235.1202715.420  4      .013                                -12.318    .000 0
R   -6922.5702727.190  4      .013                                  .000    .000 0
R   -6751.4802729.550  4      .013                                  .000    .000 0
JX  -6741.4802729.650  4  5  5.013    9.000   17.0002729.6502729.650 45.0-45.0    .000
R   -6181.4602735.100  4      .013                                  .000    .000 0
JX  -6171.4602735.200  4  6  6.013   51.000   28.0002735.1502735.150 45.0-45.0    .000
R   -6138.2902735.531  4      .013                                  .000    .000 0
R   -6058.1802735.820  4      .013                                 40.982    .000 0
R   -5813.2102738.240  4      .013                                  .000    .000 0
SH  -5813.2102738.240  4                          .000
CD   1  3   1   1.000  12.000   25.000  .000  .000   .00
CD   2  3   0    .000  12.000   14.000  .000  .000   .00
CD   3  3   0    .000   8.000   10.000  .000  .000   .00
CD   4  3   0    .000   9.000   14.000  .000  .000   .00
CD   5  4   1    .000   4.000     .000  .000  .000   .00

CD   6  4   1    .000   6.000     .000  .000  .000   .00
Q          2384.000   .0
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                                                    MAIN1.EDT
FILE: MAIN1.WSW                          W S P G W  - EDIT LISTING - Version 14.10              Date: 9-10-2017  Time:12: 2:12
                                   WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                                PAGE    1
 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
 CODE   NO   TYPE PIER/PIP WIDTH    DIAMETER  WIDTH              DROP

 CD      1    3      1    1.000   12.000   25.000    .000   .000    .00
 CD      2    3      0     .000   12.000   14.000    .000   .000    .00
 CD      3    3      0     .000    8.000   10.000    .000   .000    .00
 CD      4    3      0     .000    9.000   14.000    .000   .000    .00
 CD      5    4      1            4.000
 CD      6    4      1            6.000
                                                W S P G W                                                          PAGE NO   1
                              WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 1 IS -
                                THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
HEADING LINE NO 2 IS -
                                1ST RESPONSE TO CLV COMMENTS
HEADING LINE NO 3 IS -
                                MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)
                                                W S P G W                                                          PAGE NO   2
                              WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO   1 IS A SYSTEM OUTLET      *         *      *
                     U/S DATA   STATION    INVERT  SECT                                    W S ELEV
                               -9546.460 2659.440    1                                     2671.440
 ELEMENT NO   2 IS A REACH              *         *      *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -9401.300 2662.940    1             .013                          .000     .000      .000     0
 ELEMENT NO   3 IS A JUNCTION           *         *      *      *              *                  *                 *
                     U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                               -9391.300 2663.130    1     6     0   .013   188.000      .000  2663.420      .000 -60.000     .000
                                                                                                  RADIUS    ANGLE
                                                                                                   .000     .000
 ELEMENT NO   4 IS A REACH              *         *      *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -9196.460 2666.750    1             .013                          .000     .000      .000     0
 ELEMENT NO   5 IS A TRANSITION         *         *      *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS   ANGLE
                               -9166.460 2668.540    2             .013                          .000     .000
 ELEMENT NO   6 IS A REACH              *         *      *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -9128.430 2670.810    2             .013                          .000     .000      .000     0
 ELEMENT NO   7 IS A REACH              *         *      *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -9038.350 2671.710    2             .013                       150.000   34.408      .000     0
 ELEMENT NO   8 IS A REACH              *         *      *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -8662.540 2675.470    2             .013                          .000     .000      .000     0
 ELEMENT NO   9 IS A REACH              *         *      *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -8553.120 2676.560    2             .013                       499.984   12.539      .000     0
 ELEMENT NO  10 IS A REACH              *         *      *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -8493.500 2677.160    2             .013                          .000     .000      .000     0
 ELEMENT NO  11 IS A REACH              *         *      *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -8441.470 2677.683    2             .013                       150.001  -19.874      .000     0
 ELEMENT NO  12 IS A REACH              *         *      *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -7825.450 2683.840    2             .013                          .000     .000      .000     0
                                                W S P G W                                                          PAGE NO   3
                              WATER SURFACE PROFILE - ELEMENT CARD LISTING
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ELEMENT NO  13 IS A REACH              *          *     *
                U/S DATA   STATION    INVERT  SECT                N                          RADIUS    ANGLE     ANG PT  MAN H
                          -7770.050 2684.950    2                .013                        699.936   -4.535      .000     0
ELEMENT NO  14 IS A REACH              *          *     *
                U/S DATA   STATION    INVERT  SECT                N                          RADIUS    ANGLE     ANG PT  MAN H
                          -7573.640 2695.710    2                .013                        700.015  -16.076      .000     0
ELEMENT NO  15 IS A JUNCTION           *          *     *     *              *                  *                   *
                U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                          -7536.970 2697.680    4     3     0   .013  2008.000      .000  2697.680      .000 -15.000     .000
                                                                                                RADIUS    ANGLE
                                                                                                  .000     .000
ELEMENT NO  16 IS A REACH              *          *     *
                U/S DATA   STATION    INVERT  SECT                N                          RADIUS    ANGLE     ANG PT  MAN H
                          -7361.100 2710.680    4                .013                        585.986  -17.196      .000     0
ELEMENT NO  17 IS A REACH              *          *     *
                U/S DATA   STATION    INVERT  SECT                N                          RADIUS    ANGLE     ANG PT  MAN H
                          -7235.120 2715.420    4                .013                        585.982  -12.318      .000     0
ELEMENT NO  18 IS A REACH              *          *     *
                U/S DATA   STATION    INVERT  SECT                N                          RADIUS    ANGLE     ANG PT  MAN H
                          -6922.570 2727.190    4                .013                          .000     .000      .000     0
ELEMENT NO  19 IS A REACH              *          *     *
                U/S DATA   STATION    INVERT  SECT                N                          RADIUS    ANGLE     ANG PT  MAN H
                          -6751.480 2729.550    4                .013                          .000     .000      .000     0
ELEMENT NO  20 IS A JUNCTION           *          *     *     *              *                  *                   *
                U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                          -6741.480 2729.650    4     5     5   .013     9.000    17.000  2729.650  2729.650  45.000  -45.000
                                                                                                RADIUS    ANGLE
                                                                                                  .000     .000
ELEMENT NO  21 IS A REACH              *          *     *
                U/S DATA   STATION    INVERT  SECT                N                          RADIUS    ANGLE     ANG PT  MAN H
                          -6181.460 2735.100    4                .013                          .000     .000      .000     0
ELEMENT NO  22 IS A JUNCTION           *          *     *     *              *                  *                   *
                U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                          -6171.460 2735.200    4     6     6   .013    51.000    28.000  2735.150  2735.150  45.000  -45.000
                                                                                                RADIUS    ANGLE
                                                                                                  .000     .000
                                                W S P G W                                                          PAGE NO   4
                      WATER SURFACE PROFILE - ELEMENT CARD LISTING
ELEMENT NO  23 IS A REACH              *          *     *
                U/S DATA   STATION    INVERT  SECT                N                          RADIUS    ANGLE     ANG PT  MAN H
                          -6138.290 2735.531    4                .013                          .000     .000      .000     0
ELEMENT NO  24 IS A REACH              *          *     *
                U/S DATA   STATION    INVERT  SECT                N                          RADIUS    ANGLE     ANG PT  MAN H
                          -6058.180 2735.820    4                .013                        111.999   40.982      .000     0
ELEMENT NO  25 IS A REACH              *          *     *
                U/S DATA   STATION    INVERT  SECT                N                          RADIUS    ANGLE     ANG PT  MAN H
                          -5813.210 2738.240    4                .013                          .000     .000      .000     0
ELEMENT NO  26 IS A SYSTEM HEADWORKS                 *                        *
                U/S DATA   STATION    INVERT  SECT                                     W S ELEV
                          -5813.210 2738.240    4                                          .000
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THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050

1ST RESPONSE TO CLV COMMENTS

MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-9546.460	2659.440	5.520	2664.959	4685.00	35.37	19.42	2684.38	.00	10.58	25.00	12.000	25.000	.00	1 1.0
145.160	.0241					.0233	3.38	5.52	2.71	5.46	.013	.00	.00	BOX
-9401.300	2662.940	5.538	2668.478	4685.00	35.25	19.29	2687.77	.00	10.58	25.00	12.000	25.000	.00	1 1.0
JUNCT STR	.0190					.0253	.25	5.54	2.69		.013	.00	.00	BOX
-9391.300	2663.130	5.057	2668.187	4497.00	37.06	21.32	2689.51	.00	10.29	25.00	12.000	25.000	.00	1 1.0
21.832	.0186					.0276	.60	5.06	2.96	5.84	.013	.00	.00	BOX
-9369.468	2663.535	5.030	2668.565	4497.00	37.25	21.55	2690.11	.00	10.29	25.00	12.000	25.000	.00	1 1.0
173.008	.0186					.0297	5.14	5.03	2.99	5.84	.013	.00	.00	BOX
-9196.460	2666.750	4.796	2671.546	4497.00	39.07	23.70	2695.25	.00	10.29	25.00	12.000	25.000	.00	1 1.0
TRANS STR	.0597					.0234	.70	4.80	3.21		.013	.00	.00	BOX
-9166.460	2668.540	9.115	2677.655	4497.00	35.24	19.28	2696.94	.00	12.00	14.00	12.000	14.000	.00	0 .0
11.062	.0597					.0148	.16	9.12	2.06	5.45	.013	.00	.00	BOX
-9155.398	2669.200	9.274	2678.474	4497.00	34.64	18.63	2697.10	.00	12.00	14.00	12.000	14.000	.00	0 .0
26.969	.0597					.0137	.37	9.27	2.00	5.45	.013	.00	.00	BOX
-9128.430	2670.810	9.726	2680.537	4497.00	33.02	16.94	2697.47	12.00	12.00	14.00	12.000	14.000	.00	0 .0
90.080	.0100					.0130	1.17	12.00	1.87	10.74	.013	.00	.00	BOX
-9038.350	2671.710	9.619	2681.329	4497.00	33.39	17.32	2698.65	.00	12.00	14.00	12.000	14.000	.00	0 .0
78.165	.0100					.0134	1.05	9.62	1.90	10.73	.013	.00	.00	BOX

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WATER SURFACE PROFILE LISTING Date: 9-10-2017 Time:12: 2:15

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050

1ST RESPONSE TO CLV COMMENTS

MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip

L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
-8960.185	2672.492	9.519	2682.011	4497.00	33.74	17.68	2699.69	.00	12.00	14.00	12.000	14.000	.00	0	.0
297.645	.0100					.0145	4.30	9.52	1.93	10.73	.013	.00	.00	BOX	
-8662.540	2675.470	9.076	2684.546	4497.00	35.39	19.45	2704.00	1.09	12.00	14.00	12.000	14.000	.00	0	.0
109.420	.0100					.0158	1.72	10.17	2.07	10.75	.013	.00	.00	BOX	
-8553.120	2676.560	8.890	2685.450	4497.00	36.13	20.27	2705.72	.00	12.00	14.00	12.000	14.000	.00	0	.0
59.620	.0101					.0164	.98	8.89	2.14	10.71	.013	.00	.00	BOX	
-8493.500	2677.160	8.786	2685.946	4497.00	36.56	20.76	2706.70	12.00	12.00	14.00	12.000	14.000	.00	0	.0
52.030	.0101					.0169	.88	12.00	2.17	10.71	.013	.00	.00	BOX	
-8441.470	2677.683	8.692	2686.375	4497.00	36.96	21.21	2707.58	.00	12.00	14.00	12.000	14.000	.00	0	.0
91.115	.0100					.0176	1.61	8.69	2.21	10.73	.013	.00	.00	BOX	
-8350.354	2678.594	8.519	2687.113	4497.00	37.70	22.07	2709.19	.00	12.00	14.00	12.000	14.000	.00	0	.0
195.179	.0100					.0193	3.76	8.52	2.28	10.73	.013	.00	.00	BOX	
-8155.175	2680.545	8.123	2688.667	4497.00	39.54	24.28	2712.95	.00	12.00	14.00	12.000	14.000	.00	0	.0
173.168	.0100					.0218	3.78	8.12	2.45	10.73	.013	.00	.00	BOX	
-7982.007	2682.275	7.745	2690.020	4497.00	41.47	26.71	2716.73	.00	12.00	14.00	12.000	14.000	.00	0	.0
156.557	.0100					.0248	3.88	7.74	2.63	10.73	.013	.00	.00	BOX	
-7825.450	2683.840	7.384	2691.225	4497.00	43.50	29.38	2720.61	1.18	12.00	14.00	12.000	14.000	.00	0	.0
55.400	.0200					.0266	1.47	8.56	2.82	8.19	.013	.00	.00	BOX	

Program Package Serial Number: 3074
WATER SURFACE PROFILE LISTING Date: 9-10-2017 Time:12: 2:15
THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
1ST RESPONSE TO CLV COMMENTS
MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip	
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
-7770.049	2684.950	7.333	2692.283	4497.00	43.80	29.79	2722.08	1.19	12.00	14.00	12.000	14.000	.00	0	.0
.571	.0548					.0268	.02	8.52	2.85	5.62	.013	.00	.00	BOX	
-7769.478	2684.981	7.335	2692.316	4497.00	43.79	29.78	2722.09	1.19	12.00	14.00	12.000	14.000	.00	0	.0

79.386	.0548					.0252	2.00	8.53	2.85	5.62	.013	.00	.00	BOX	
-7690.092	2689.330	7.693	2697.023	4497.00	41.75	27.07	2724.09	1.08	12.00	14.00	12.000	14.000	.00	0	.0
64.042	.0548					.0222	1.42	8.78	2.65	5.62	.013	.00	.00	BOX	
-7626.051	2692.839	8.069	2700.907	4497.00	39.81	24.61	2725.52	.98	12.00	14.00	12.000	14.000	.00	0	.0
52.411	.0548					.0196	1.03	9.05	2.47	5.62	.013	.00	.00	BOX	
-7573.640	2695.710	8.463	2704.173	4497.00	37.96	22.37	2726.54	.00	12.00	14.00	12.000	14.000	.00	0	.0
JUNCT STR	.0537					.0290	1.06	9.53	2.30		.013	.00	.00	BOX	
-7536.970	2697.680	4.132	2701.812	2489.00	43.03	28.75	2730.56	1.37	9.00	14.00	9.000	14.000	.00	0	.0
29.004	.0739					.0386	1.12	5.51	3.73	3.33	.013	.00	.00	BOX	
-7507.966	2699.824	4.213	2704.037	2489.00	42.20	27.65	2731.69	1.32	9.00	14.00	9.000	14.000	.00	0	.0
59.558	.0739					.0352	2.09	5.53	3.62	3.33	.013	.00	.00	BOX	
-7448.408	2704.226	4.419	2708.645	2489.00	40.23	25.13	2733.78	1.20	9.00	14.00	9.000	14.000	.00	0	.0
47.935	.0739					.0308	1.47	5.62	3.37	3.33	.013	.00	.00	BOX	
-7400.473	2707.770	4.635	2712.404	2489.00	38.36	22.85	2735.25	1.09	9.00	14.00	9.000	14.000	.00	0	.0
39.373	.0739					.0269	1.06	5.73	3.14	3.33	.013	.00	.00	BOX	

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THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050

1ST RESPONSE TO CLV COMMENTS

MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-7361.100	2710.680	4.861	2715.541	2489.00	36.58	20.77	2736.31	.99	9.00	14.00	9.000	14.000	.00	0 .0
11.954	.0376					.0250	.30	5.85	2.92	4.21	.013	.00	.00	BOX
-7349.146	2711.130	4.881	2716.011	2489.00	36.42	20.60	2736.61	.98	9.00	14.00	9.000	14.000	.00	0 .0
114.026	.0376					.0233	2.66	5.87	2.91	4.21	.013	.00	.00	BOX
-7235.121	2715.420	5.119	2720.539	2489.00	34.73	18.73	2739.27	.00	9.00	14.00	9.000	14.000	.00	0 .0
33.618	.0377					.0212	.71	5.12	2.70	4.21	.013	.00	.00	BOX
-7201.503	2716.686	5.208	2721.894	2489.00	34.14	18.09	2739.99	.00	9.00	14.00	9.000	14.000	.00	0 .0

76.424	.0377						.0195	1.49	5.21	2.64	4.21	.013		.00	.00	BOX
-7125.079	2719.564	5.462	2725.026	2489.00	32.55	16.45	2741.48	.00	9.00	14.00	9.000	14.000		.00	0	.0
59.686	.0377						.0171	1.02	5.46	2.45	4.21	.013		.00	.00	BOX
-7065.393	2721.812	5.729	2727.541	2489.00	31.03	14.95	2742.49	.00	9.00	14.00	9.000	14.000		.00	0	.0
47.626	.0377						.0150	.71	5.73	2.28	4.21	.013		.00	.00	BOX
-7017.767	2723.605	6.009	2729.614	2489.00	29.59	13.59	2743.21	.00	9.00	14.00	9.000	14.000		.00	0	.0
38.483	.0377						.0132	.51	6.01	2.13	4.21	.013		.00	.00	BOX
-6979.283	2725.054	6.302	2731.356	2489.00	28.21	12.36	2743.71	.00	9.00	14.00	9.000	14.000		.00	0	.0
31.280	.0377						.0116	.36	6.30	1.98	4.21	.013		.00	.00	BOX
-6948.003	2726.232	6.610	2732.842	2489.00	26.90	11.23	2744.08	.00	9.00	14.00	9.000	14.000		.00	0	.0
25.433	.0377						.0102	.26	6.61	1.84	4.21	.013		.00	.00	BOX

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WATER SURFACE PROFILE LISTING Date: 9-10-2017 Time:12: 2:15

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050

1ST RESPONSE TO CLV COMMENTS

MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch	
-6922.570	2727.190	6.932	2734.122	2489.00	25.65	10.21	2744.34	.00	9.00	14.00	9.000	14.000	.00	0	.0
72.405	.0138					.0092	.67	6.93	1.72	6.04	.013	.00	.00	BOX	
-6850.165	2728.189	7.113	2735.301	2489.00	25.00	9.70	2745.00	.00	9.00	14.00	9.000	14.000	.00	0	.0
98.685	.0138					.0084	.83	7.11	1.65	6.04	.013	.00	.00	BOX	
-6751.480	2729.550	7.460	2737.010	2489.00	23.83	8.82	2745.83	.00	9.00	14.00	9.000	14.000	.00	0	.0
JUNCT STR	.0100					.0081	.08	7.46	1.54		.013	.00	.00	BOX	
-6741.480	2729.650	7.218	2736.868	2463.00	24.37	9.23	2746.09	.00	9.00	14.00	9.000	14.000	.00	0	.0
129.880	.0097					.0082	1.06	7.22	1.60	6.83	.013	.00	.00	BOX	
-6611.600	2730.914	7.353	2738.266	2463.00	23.93	8.89	2747.16	.00	9.00	14.00	9.000	14.000	.00	0	.0
202.245	.0097					.0075	1.52	7.35	1.56	6.83	.013	.00	.00	BOX	
-6409.355	2732.882	7.712	2740.594	2463.00	22.81	8.08	2748.68	.00	9.00	14.00	9.000	14.000	.00	0	.0
115.294	.0097					.0066	.76	7.71	1.45	6.83	.013	.00	.00	BOX	

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-6294.061  2734.004   8.088  2742.092  2463.00  21.75   7.35  2749.44    .00   9.00   14.00   9.000  14.000   .00   0   .0
   70.307     .0097                                      .0058     .41   8.09   1.35    6.83    .013     .00   .00  BOX
-6223.753  2734.688   8.483  2743.171  2463.00  20.74   6.68  2749.85    .00   9.00   14.00   9.000  14.000   .00   0   .0
   42.293     .0097                                      .0052     .22   8.48   1.25    6.83    .013     .00   .00  BOX
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
♀ FILE: MAIN1.WSW                          W S P G W - CIVILDESIGN Version 14.08                          PAGE    6
                         Program Package Serial Number: 3074
                                     WATER SURFACE PROFILE LISTING                  Date: 9-10-2017  Time:12: 2:15
                   THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
                     1ST RESPONSE TO CLV COMMENTS
                       MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)
****************************************************************************************************************** ********
          | Invert  |  Depth  |  Water  |    Q    |  Vel    Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
 Station  |  Elev   |  (FT)   |  Elev   |  (CFS)  | (FPS)   Head |  Grd.El.|  Elev |  Depth |  Width |Dia.-FT|or I.D.|  ZL  |Prs/Pip
L/Elem    |Ch Slope |         |         |         |        SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  |X-Fall|  ZR  |Type Ch
*********|*********|********|********|********|*******|*******|********|*******|********|********|*******|*******|*****|*******
-6181.460  2735.100   8.897  2743.997  2463.00  19.77   6.07  2750.07    .00   9.00   14.00   9.000  14.000   .00   0   .0
JUNCT STR   .0100                                          .0058     .06   8.90   1.17            .013     .00   .00  BOX
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
-6171.460  2735.200   7.637  2742.837  2384.00  22.30   7.72  2750.56    .00   9.00   14.00   9.000  14.000   .00   0   .0
   33.170     .0100                                      .0066     .22   7.64   1.42    6.60    .013     .00   .00  BOX
-6138.290  2735.531   7.750  2743.281  2384.00  21.97   7.50  2750.78    .94   9.00   14.00   9.000  14.000   .00   0   .0
   80.110     .0036                                      .0068     .54   8.69   1.39    9.00    .013     .00   .00  BOX
-6058.180  2735.820   7.502  2743.323  2384.00  22.70   8.00  2751.32    .00   9.00   14.00   9.000  14.000   .00   0   .0
   96.197     .0099                                      .0067     .65   7.50   1.46    6.62    .013     .00   .00  BOX
-5961.983  2736.770   7.800  2744.571  2384.00  21.83   7.40  2751.97    .00   9.00   14.00   9.000  14.000   .00   0   .0
   75.744     .0099                                      .0060     .46   7.80   1.38    6.62    .013     .00   .00  BOX
-5886.239  2737.519   8.181  2745.699  2384.00  20.82   6.73  2752.43    .00   9.00   14.00   9.000  14.000   .00   0   .0
   46.544     .0099                                      .0053     .25   8.18   1.28    6.62    .013     .00   .00  BOX
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
-5839.695  2737.978   8.580  2746.559  2384.00  19.85   6.12  2752.67    .00   9.00   14.00   9.000  14.000   .00   0   .0
   26.485     .0099                                      .0061     .16   8.58   1.19    6.62    .013     .00   .00  BOX
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
♀ FILE: MAIN1.WSW                          W S P G W - CIVILDESIGN Version 14.08                          PAGE    7
                         Program Package Serial Number: 3074
                                     WATER SURFACE PROFILE LISTING                  Date: 9-10-2017  Time:12: 2:15
                   THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
                     1ST RESPONSE TO CLV COMMENTS
```

MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-5813.210	2738.240	9.000	2747.240	2384.00	18.92	5.56	2752.80	.00	9.00	14.00	9.000	14.000	.00	0 .0

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050

1ST RESPONSE TO CLV COMMENTS

MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

```
-9546.46    .I    W     CH             E                                                    .    R
-9510.21    .                                                                               .
-9473.97    .                                                                               .
-9437.72    .                                                                               .
-9401.48    .                                                                               .
-9365.23    .  I     W     CH            E                                                  .    JX
-9328.99    .  I     W    C H              E                                                .    R
-9292.74    .   I    W     C H             E                                                .    R
-9256.50    .                                                                               .
-9220.25    .                                                                               .
-9184.01    .       I    W     C H                E                                         .    TX
```

```
-9147.76   .        I        W  H              E                                  .   R
-9111.52   .         I        W  H              E                                  .   R
-9075.27   .           I        W  H            E                                  .   R
-9039.03   .                                                                       .
-9002.78   .            I        W H             E                                 .   R
-8966.54   .                                                                       .
-8930.29   .            I         W H              E                               .   R
-8894.05   .                                                                       .
-8857.80   .                                                                       .
-8821.56   .                                                                       .
-8785.31   .                                                                       .
-8749.07   .                                                                       .
-8712.82   .                                                                       .
-8676.58   .                                                                       .
-8640.33   .                I       W S H              E                           .   R
-8604.09   .                                                                       .
-8567.84   .                                                                       .
-8531.60   .                 I       W   H              E                          .   R
-8495.35   .                                                                       .
```

```
-8459.11   .                I        W  H                E                                        .   R
-8422.86   .                 I       W   H                 E                                       .   R
-8386.62   .                                                                                         .
-8350.37   .                                                                                         .
-8314.13   .                  I       W   H                  E                                      .   R
-8277.88   .                                                                                         .
-8241.63   .                                                                                         .
-8205.39   .                                                                                         .
-8169.14   .                                                                                         .
-8132.90   .                    I       W   H                    E                                  .   R
-8096.65   .                                                                                         .
-8060.41   .                                                                                         .
-8024.16   .                                                                                         .
-7987.92   .                                                                                         .
-7951.67   .                      I      W    H                      E                             .   R
-7915.43   .                                                                                         .
-7879.18   .                                                                                         .
-7842.94   .                                                                                         .
-7806.69   .                        I      WS  H                        E                           .   R
```

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-7770.45   .                                                                                  .
-7734.20   .                        I      WS   H                        E                   .   R
-7697.96   .                        I      WS   H                        E                   .   R
-7661.71   .                             I      WS  H                      E                  .   R
-7625.47   .                                I       WS  H                    E               .   R
-7589.22   .                                                                                  .
-7552.98   .                                   I       W S H                  E              .   JX
-7516.73   .                                      I    WS   H                        E        .   R
-7480.49   .                                         I   W S  H                      E        .   R
-7444.24   .                                             I    WS   H                    E     .   R
-7408.00   .                                                                                  .
-7371.75   .                                                 I    WS   H                  E  .   R
-7335.51   .                                                    I     WS  H                E  .   R
-7299.26   .                                                    I    WS   H                E  .   R
-7263.02   .                                                                                  .
-7226.77   .                                                         I     W   H              E  .   R
-7190.53   .                                                           I    W   H              E  .   R
-7154.28   .                                                                                  .
-7118.04   .                                                              I     W   H           E  .   R
```

```
-7081.79    .                                                                  .
-7045.54    .                                  I     W   H           E         .    R
-7009.30    .                                    I      W  H          E        .    R
-6973.05    .                                      I      W H          E       .    R
-6936.81    .                                       I      W  H        E       .    R
-6900.56    .                                        I      W  H       E       .    R
-6864.32    .                                                                  .
-6828.07    .                                         I       W H       E      .    R
-6791.83    .                                                                  .
-6755.58    .                                                                  .
-6719.34    .                                            I       WH       E    .    JX
-6683.09    .                                            I      W H       E    .    R
-6646.85    .                                                                  .
-6610.60    .                                             I       W H      E   .    R
-6574.36    .                                                                  .
-6538.11    .                                                                  .
-6501.87    .                                                                  .
-6465.62    .                                                                  .
-6429.38    .                                                                  .
```

```
-6393.13   .                                                                  I       W H      E     .    R
-6356.89   .                                                                                          .
-6320.64   .                                                                                          .
-6284.40   .                                                                  I        WH      E    .    R
-6248.15   .                                                                                          .
-6211.91   .                                                                   I        WH     E    .    R
-6175.66   .                                                                    I        H      E   .    JX
-6139.42   .                                                                    I       WH      E   .    R
-6103.17   .                                                                    I       WSH     E   .    R
-6066.93   .                                                                                          .
-6030.68   .                                                                    I       W H      E  .    R
-5994.44   .                                                                                          .
-5958.19   .                                                                     I        WH      E .    R
-5921.95   .                                                                                          .
-5885.70   .                                                                      I        WH     E .    R
-5849.46   .                                                                                          .
-5813.21   .                                                                       I        H     E .    R
          2659.440  2668.776  2678.112  2687.448  2696.784  2706.120  2715.456  2724.792  2734.127  2743.463  2752.799
```

N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   S = SUPER-ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

Mainline 1 (APSO MPU Alignment)
Manning's 'n' 0.015
(Utilized for HGL Design & MAIN2 Starting WSE)

```
T1 THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050                        0
T2 1ST RESPONSE TO CLV COMMENTS
T3 MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)
SO  -9546.4602659.440  1                          2671.440
R   -9401.3002662.940  1      .015                                  .000    .000 0
JX  -9391.3002663.130  1  6   .015  188.000         2663.420       -60.0         .000
R   -9196.4602666.750  1      .015                                  .000    .000 0
TS  -9166.4602668.540  2      .015                                  .000
R   -9128.4302670.810  2      .015                                  .000    .000 0
R   -9038.3502671.710  2      .015                                34.408    .000 0
R   -8662.5402675.470  2      .015                                  .000    .000 0
R   -8553.1202676.560  2      .015                                12.539    .000 0
R   -8493.5002677.160  2      .015                                  .000    .000 0
R   -8441.4702677.683  2      .015                               -19.874    .000 0
R   -7825.4502683.840  2      .015                                  .000    .000 0
R   -7770.0502684.950  2      .015                                -4.535    .000 0
R   -7573.6402695.710  2      .015                               -16.076    .000 0
JX  -7536.9702697.680  4  3   .015 2008.000         2697.680       -15.0         .000
R   -7361.1002710.680  4      .015                               -17.196    .000 0
R   -7235.1202715.420  4      .015                               -12.318    .000 0
R   -6922.5702727.190  4      .015                                  .000    .000 0
R   -6751.4802729.550  4      .015                                  .000    .000 0
JX  -6741.4802729.650  4  5  5.015    9.000   17.0002729.6502729.650 45.0-45.0    .000
R   -6181.4602735.100  4      .015                                  .000    .000 0
JX  -6171.4602735.200  4  6  6.015   51.000   28.0002735.1502735.150 45.0-45.0    .000
R   -6138.2902735.531  4      .015                                  .000    .000 0
R   -6058.1802735.820  4      .015                                40.982    .000 0
R   -5813.2102738.240  4      .015                                  .000    .000 0
SH  -5813.2102738.240  4                              .000
CD   1  3   1   1.000  12.000   25.000  .000  .000   .00
CD   2  3   0    .000  12.000   14.000  .000  .000   .00
CD   3  3   0    .000   8.000   10.000  .000  .000   .00
CD   4  3   0    .000   9.000   14.000  .000  .000   .00
CD   5  4   1    .000   4.000     .000  .000  .000   .00

CD   6  4   1    .000   6.000     .000  .000  .000   .00
Q          2384.000   .0
```

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FILE: Main1-015.WSW                    W S P G W  - EDIT LISTING - Version 14.10          Date: 9-10-2017  Time: 1:41:22
                                 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                          PAGE    1
 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
 CODE   NO   TYPE PIER/PIP WIDTH    DIAMETER  WIDTH              DROP

 CD      1    3      1    1.000   12.000   25.000    .000   .000    .00
 CD      2    3      0     .000   12.000   14.000    .000   .000    .00
 CD      3    3      0     .000    8.000   10.000    .000   .000    .00
 CD      4    3      0     .000    9.000   14.000    .000   .000    .00
 CD      5    4      1            4.000
 CD      6    4      1            6.000
                                          W S P G W                                                          PAGE NO   1
                          WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 1 IS -
                            THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
HEADING LINE NO 2 IS -
                            1ST RESPONSE TO CLV COMMENTS
HEADING LINE NO 3 IS -
                            MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)
                                          W S P G W                                                          PAGE NO   2
                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                    W S ELEV
                               -9546.460 2659.440    1                                     2671.440
 ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -9401.300 2662.940    1             .015                          .000     .000      .000     0
 ELEMENT NO   3 IS A JUNCTION          *         *     *     *             *                     *                *
                     U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                               -9391.300 2663.130    1     6     0   .015   188.000      .000  2663.420      .000 -60.000     .000
                                                                                                RADIUS    ANGLE
                                                                                                  .000     .000
 ELEMENT NO   4 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -9196.460 2666.750    1             .015                          .000     .000      .000     0
 ELEMENT NO   5 IS A TRANSITION        *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS   ANGLE
                               -9166.460 2668.540    2             .015                          .000     .000
 ELEMENT NO   6 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -9128.430 2670.810    2             .015                          .000     .000      .000     0
 ELEMENT NO   7 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -9038.350 2671.710    2             .015                       150.000   34.408      .000     0
 ELEMENT NO   8 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -8662.540 2675.470    2             .015                          .000     .000      .000     0
 ELEMENT NO   9 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -8553.120 2676.560    2             .015                       499.984   12.539      .000     0
 ELEMENT NO  10 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -8493.500 2677.160    2             .015                          .000     .000      .000     0
 ELEMENT NO  11 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                         RADIUS    ANGLE     ANG PT  MAN H
                               -8441.470 2677.683    2             .015                       150.001  -19.874      .000     0
 ELEMENT NO  12 IS A REACH             *         *     *
```

```
                U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                          -7825.450 2683.840    2              .015                           .000     .000      .000     0
                                                                                                                PAGE NO   3
                                                W S P G W
                     WATER SURFACE PROFILE - ELEMENT CARD LISTING
ELEMENT NO  13 IS A REACH            *         *     *
                U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                          -7770.050 2684.950    2              .015                        699.936   -4.535      .000     0
ELEMENT NO  14 IS A REACH            *         *     *
                U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                          -7573.640 2695.710    2              .015                        700.015  -16.076      .000     0
ELEMENT NO  15 IS A JUNCTION         *         *     *     *              *                    *                *
                U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                          -7536.970 2697.680    4     3     0   .015  2008.000      .000  2697.680      .000 -15.000     .000
                                                                                          RADIUS    ANGLE
                                                                                            .000     .000
ELEMENT NO  16 IS A REACH            *         *     *
                U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                          -7361.100 2710.680    4              .015                        585.986  -17.196      .000     0
ELEMENT NO  17 IS A REACH            *         *     *
                U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                          -7235.120 2715.420    4              .015                        585.982  -12.318      .000     0
ELEMENT NO  18 IS A REACH            *         *     *
                U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                          -6922.570 2727.190    4              .015                           .000     .000      .000     0
ELEMENT NO  19 IS A REACH            *         *     *
                U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                          -6751.480 2729.550    4              .015                           .000     .000      .000     0
ELEMENT NO  20 IS A JUNCTION         *         *     *     *              *                    *                *
                U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                          -6741.480 2729.650    4     5     5   .015     9.000    17.000  2729.650  2729.650  45.000  -45.000
                                                                                          RADIUS    ANGLE
                                                                                            .000     .000
ELEMENT NO  21 IS A REACH            *         *     *
                U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                          -6181.460 2735.100    4              .015                           .000     .000      .000     0
ELEMENT NO  22 IS A JUNCTION         *         *     *     *              *                    *                *
                U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                          -6171.460 2735.200    4     6     6   .015    51.000    28.000  2735.150  2735.150  45.000  -45.000
                                                                                          RADIUS    ANGLE
                                                                                            .000     .000
                                                W S P G W                                                       PAGE NO   4
                     WATER SURFACE PROFILE - ELEMENT CARD LISTING
ELEMENT NO  23 IS A REACH            *         *     *
                U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                          -6138.290 2735.531    4              .015                           .000     .000      .000     0
ELEMENT NO  24 IS A REACH            *         *     *
                U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                          -6058.180 2735.820    4              .015                        111.999   40.982      .000     0
ELEMENT NO  25 IS A REACH            *         *     *
                U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                          -5813.210 2738.240    4              .015                           .000     .000      .000     0
ELEMENT NO  26 IS A SYSTEM HEADWORKS                 *                    *
                U/S DATA   STATION    INVERT  SECT                                   W S ELEV
                          -5813.210 2738.240    4                                       .000
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♀ FILE: Main1-015.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 9-10-2017 Time: 1:41:25

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050

1ST RESPONSE TO CLV COMMENTS

MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-9546.460	2659.440	6.122	2665.562	4685.00	31.89	15.79	2681.35	.00	10.58	25.00	12.000	25.000	.00	1 1.0
145.160	.0241					.0235	3.42	6.12	2.32	6.08	.015	.00	.00	BOX
-9401.300	2662.940	6.141	2669.081	4685.00	31.79	15.69	2684.77	.00	10.58	25.00	12.000	25.000	.00	1 1.0
JUNCT STR	.0190					.0257	.26	6.14	2.31		.015	.00	.00	BOX
-9391.300	2663.130	5.576	2668.706	4497.00	33.60	17.53	2686.24	.00	10.29	25.00	12.000	25.000	.00	1 1.0
76.439	.0186					.0290	2.21	5.58	2.56	6.50	.015	.00	.00	BOX
-9314.860	2664.550	5.433	2669.983	4497.00	34.49	18.47	2688.45	.00	10.29	25.00	12.000	25.000	.00	1 1.0
118.400	.0186					.0320	3.79	5.43	2.66	6.50	.015	.00	.00	BOX
-9196.460	2666.750	5.180	2671.930	4497.00	36.17	20.32	2692.25	.00	10.29	25.00	12.000	25.000	.00	1 1.0
TRANS STR	.0597					.0246	.74	5.18	2.86		.015	.00	.00	BOX
-9166.459	2668.540	10.224	2678.764	4497.00	31.42	15.33	2694.09	.00	12.00	14.00	12.000	14.000	.00	0 .0
4.035	.0597					.0149	.06	10.22	1.73	6.05	.015	.00	.00	BOX
-9162.424	2668.781	10.316	2679.097	4497.00	31.14	15.05	2694.15	.00	12.00	14.00	12.000	14.000	.00	0 .0
18.883	.0597					.0139	.26	10.32	1.71	6.05	.015	.00	.00	BOX
-9143.541	2669.908	10.820	2680.728	4497.00	29.69	13.69	2694.41	.00	12.00	14.00	12.000	14.000	.00	0 .0
15.111	.0597					.0123	.19	10.82	1.59	6.05	.015	.00	.00	BOX

---------- WARNING - Flow depth near top of box conduit ----------

♀ FILE: Main1-015.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 9-10-2017 Time: 1:41:25

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050

1ST RESPONSE TO CLV COMMENTS

MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-9128.430	2670.810	11.348	2682.158	4497.00	28.31	12.44	2694.60	12.00	12.00	14.00	12.000	14.000	.00	0 .0
90.080	.0100					.0117	1.06	12.00	1.48	12.00	.015	.00	.00	BOX

```
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
-9038.350  2671.710  11.220  2682.930  4497.00  28.63  12.73  2695.66    .00  12.00  14.00  12.000  14.000  .00   0   .0
  129.147    .0100                                        .0122     1.58  11.22   1.51  12.00    .015     .00  .00  BOX
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
-8909.202  2673.002  11.008  2684.010  4497.00  29.18  13.22  2697.23    .00  12.00  14.00  12.000  14.000  .00   0   .0
  246.662    .0100                                        .0133     3.28  11.01   1.55  12.00    .015     .00  .00  BOX
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
-8662.540  2675.470  10.495  2685.965  4497.00  30.61  14.54  2700.51    .41  12.00  14.00  12.000  14.000  .00   0   .0
  109.420    .0100                                        .0146     1.59  10.90   1.66  12.00    .015     .00  .00  BOX
-8553.120  2676.560  10.228  2686.788  4497.00  31.41  15.32  2702.10    .00  12.00  14.00  12.000  14.000  .00   0   .0
   59.620    .0101                                        .0153      .91  10.23   1.73  12.00    .015     .00  .00  BOX
-8493.500  2677.160  10.075  2687.235  4497.00  31.88  15.78  2703.02   1.47  12.00  14.00  12.000  14.000  .00   0   .0
   52.030    .0101                                        .0159      .83  11.55   1.77  12.00    .015     .00  .00  BOX
```


Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 9-10-2017 Time: 1:41:25

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
1ST RESPONSE TO CLV COMMENTS
MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

```
Station   | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip
L/Elem    | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall          | ZR | Type Ch
-8441.471  2677.683   9.936  2687.620  4497.00  32.33  16.23  2703.85    .00  12.00  14.00  12.000  14.000  .00   0   .0
  101.334    .0100                                        .0168     1.70   9.94   1.81  12.00    .015     .00  .00  BOX
-8340.137  2678.696   9.650  2688.346  4497.00  33.29  17.21  2705.55    .00  12.00  14.00  12.000  14.000  .00   0   .0
  148.024    .0100                                        .0186     2.75   9.65   1.89  12.00    .015     .00  .00  BOX
-8192.112  2680.176   9.201  2689.376  4497.00  34.91  18.93  2708.30    .00  12.00  14.00  12.000  14.000  .00   0   .0
  132.917    .0100                                        .0210     2.79   9.20   2.03  12.00    .015     .00  .00  BOX
-8059.195  2681.504   8.772  2690.276  4497.00  36.62  20.82  2711.10    .00  12.00  14.00  12.000  14.000  .00   0   .0
  121.449    .0100                                        .0238     2.89   8.77   2.18  12.00    .015     .00  .00  BOX
-7937.746  2682.718   8.364  2691.082  4497.00  38.40  22.90  2713.98    .00  12.00  14.00  12.000  14.000  .00   0   .0
  112.296    .0100                                        .0269     3.02   8.36   2.34  12.00    .015     .00  .00  BOX
-7825.450  2683.840   7.975  2691.815  4497.00  40.28  25.19  2717.01   1.01  12.00  14.00  12.000  14.000  .00   0   .0
   55.400    .0200                                        .0290     1.61   8.98   2.51   9.14    .015     .00  .00  BOX
-7770.050  2684.950   7.883  2692.833  4497.00  40.75  25.78  2718.62   1.03  12.00  14.00  12.000  14.000  .00   0   .0
```

41.882	.0548					.0285	1.19	8.91	2.56	6.25	.015	.00	.00	BOX		
-7728.168	2687.244	8.091	2695.335	4497.00	39.70	24.47	2719.81	.98	12.00	14.00	12.000	14.000	.00	0	.0	
63.416	.0548					.0259	1.64	9.07	2.46	6.25	.015	.00	.00	BOX		
-7664.752	2690.719	8.486	2699.204	4497.00	37.85	22.25	2721.45	.89	12.00	14.00	12.000	14.000	.00	0	.0	
50.451	.0548					.0229	1.16	9.38	2.29	6.25	.015	.00	.00	BOX		

Program Package Serial Number: 3074
WATER SURFACE PROFILE LISTING Date: 9-10-2017 Time: 1:41:25

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
1ST RESPONSE TO CLV COMMENTS
MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-7614.301	2693.482	8.900	2702.382	4497.00	36.09	20.23	2722.61	.81	12.00	14.00	12.000	14.000	.00	0 .0
40.661	.0548					.0202	.82	9.71	2.13	6.25	.015	.00	.00	BOX
-7573.640	2695.710	9.334	2705.044	4497.00	34.41	18.39	2723.43	.00	12.00	14.00	12.000	14.000	.00	0 .0
JUNCT STR	.0537					.0320	1.17	10.21	1.98		.015	.00	.00	BOX
-7536.970	2697.680	4.370	2702.051	2489.00	40.68	25.69	2727.75	1.23	9.00	14.00	9.000	14.000	.00	0 .0
34.316	.0739					.0437	1.50	5.60	3.43	3.67	.015	.00	.00	BOX
-7502.654	2700.217	4.470	2704.687	2489.00	39.77	24.56	2729.25	1.17	9.00	14.00	9.000	14.000	.00	0 .0
58.771	.0739					.0396	2.33	5.64	3.32	3.67	.015	.00	.00	BOX
-7443.882	2704.561	4.688	2709.249	2489.00	37.92	22.33	2731.58	1.07	9.00	14.00	9.000	14.000	.00	0 .0
45.911	.0739					.0347	1.59	5.76	3.09	3.67	.015	.00	.00	BOX
-7397.972	2707.954	4.917	2712.872	2489.00	36.16	20.30	2733.17	.97	9.00	14.00	9.000	14.000	.00	0 .0
36.872	.0739					.0304	1.12	5.89	2.87	3.67	.015	.00	.00	BOX
-7361.100	2710.680	5.157	2715.837	2489.00	34.47	18.45	2734.29	.88	9.00	14.00	9.000	14.000	.00	0 .0
125.980	.0376					.0267	3.36	6.04	2.68	4.66	.015	.00	.00	BOX
-7235.120	2715.420	5.399	2720.819	2489.00	32.93	16.84	2737.66	.00	9.00	14.00	9.000	14.000	.00	0 .0
65.677	.0377					.0239	1.57	5.40	2.50	4.66	.015	.00	.00	BOX
-7169.443	2717.893	5.581	2723.475	2489.00	31.85	15.75	2739.23	.00	9.00	14.00	9.000	14.000	.00	0 .0
71.446	.0377					.0214	1.53	5.58	2.38	4.66	.015	.00	.00	BOX

Program Package Serial Number: 3074
WATER SURFACE PROFILE LISTING Date: 9-10-2017 Time: 1:41:25

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
1ST RESPONSE TO CLV COMMENTS
MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-7097.997	2720.584	5.854	2726.438	2489.00	30.37	14.32	2740.76	.00	9.00	14.00	9.000	14.000	.00	0 .0
53.933	.0377					.0188	1.01	5.85	2.21	4.66	.015	.00	.00	BOX
-7044.064	2722.615	6.140	2728.754	2489.00	28.96	13.02	2741.77	.00	9.00	14.00	9.000	14.000	.00	0 .0
41.848	.0377					.0165	.69	6.14	2.06	4.66	.015	.00	.00	BOX
-7002.216	2724.191	6.439	2730.630	2489.00	27.61	11.84	2742.47	.00	9.00	14.00	9.000	14.000	.00	0 .0
32.953	.0377					.0145	.48	6.44	1.92	4.66	.015	.00	.00	BOX
-6969.263	2725.432	6.754	2732.185	2489.00	26.32	10.76	2742.95	.00	9.00	14.00	9.000	14.000	.00	0 .0
26.091	.0377					.0128	.33	6.75	1.79	4.66	.015	.00	.00	BOX
-6943.172	2726.414	7.083	2733.497	2489.00	25.10	9.78	2743.28	.00	9.00	14.00	9.000	14.000	.00	0 .0
20.602	.0377					.0113	.23	7.08	1.66	4.66	.015	.00	.00	BOX
-6922.570	2727.190	7.429	2734.619	2489.00	23.93	8.89	2743.51	.00	9.00	14.00	9.000	14.000	.00	0 .0
91.047	.0138					.0101	.92	7.43	1.55	6.72	.015	.00	.00	BOX
-6831.522	2728.446	7.692	2736.138	2489.00	23.11	8.29	2744.43	.00	9.00	14.00	9.000	14.000	.00	0 .0
80.042	.0138					.0091	.73	7.69	1.47	6.72	.015	.00	.00	BOX
-6751.480	2729.550	8.068	2737.618	2489.00	22.04	7.54	2745.16	.00	9.00	14.00	9.000	14.000	.00	0 .0
JUNCT STR	.0100					.0089	.09	8.07	1.37		.015	.00	.00	BOX
-6741.480	2729.650	7.748	2737.397	2463.00	22.71	8.01	2745.40	.00	9.00	14.00	9.000	14.000	.00	0 .0
98.917	.0097					.0092	.91	7.75	1.44	7.60	.015	.00	.00	BOX

Program Package Serial Number: 3074
WATER SURFACE PROFILE LISTING Date: 9-10-2017 Time: 1:41:25

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
1ST RESPONSE TO CLV COMMENTS
MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-6642.563	2730.613	7.800	2738.413	2463.00	22.55	7.90	2746.31	.00	9.00	14.00	9.000	14.000	.00	0 .0
287.478	.0097					.0086	2.46	7.80	1.42	7.60	.015	.00	.00	BOX

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-6355.085  2733.410   8.181  2741.591   2463.00   21.50    7.18  2748.77     .00    9.00   14.00    9.000   14.000   .00   0    .0
 116.480    .0097                                          .0076     .88    8.18    1.32    7.60     .015      .00   .00  BOX
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
-6238.604  2734.544   8.580  2743.124   2463.00   20.50    6.53  2749.65     .00    9.00   14.00    9.000   14.000   .00   0    .0
  57.145    .0097                                          .0067     .38    8.58    1.23    7.60     .015      .00   .00  BOX
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
-6181.460  2735.100   9.000  2744.100   2463.00   19.55    5.93  2750.03     .00    9.00   14.00    9.000   14.000   .00   0    .0
JUNCT STR   .0100                                          .0095     .10    9.00    1.15             .015      .00   .00  BOX
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
-6171.460  2735.200   9.707  2744.907   2384.00   18.92    5.56  2750.47     .00    9.00   14.00    9.000   14.000   .00   0    .0
  33.170    .0100                                          .0095     .32    9.71    1.11    7.35     .015      .00   .00  BOX
-6138.290  2735.531   9.692  2745.223   2384.00   18.92    5.56  2750.78     .00    9.00   14.00    9.000   14.000   .00   0    .0
  80.110    .0036                                          .0095     .76     .00    1.11    9.00     .015      .00   .00  BOX
```


Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 9-10-2017 Time: 1:41:25

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
1ST RESPONSE TO CLV COMMENTS
MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

```
**********************************************************************************************************************************
         | Invert  |  Depth  |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
 Station |  Elev   |  (FT)   |  Elev   |  (CFS)  |  (FPS)   Head |  Grd.El.|  Elev |  Depth |  Width |Dia.-FT|or I.D.|  ZL  |Prs/Pip
         |         |         |         |         |         SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  |X-Fall|  ZR  |Type Ch
 L/Elem  |Ch Slope |         |         |         |         |     |         |       |        |        |       |       |      |      |
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****|*******
-6058.180  2735.820  10.916  2746.736   2384.00   18.92    5.56  2752.29     .00    9.00   14.00    9.000   14.000   .00   0    .0
 244.970    .0099                                          .0095     2.33   10.92    1.11    7.37     .015      .00   .00  BOX
-5813.210  2738.240  10.827  2749.067   2384.00   18.92    5.56  2754.63     .00    9.00   14.00    9.000   14.000   .00   0    .0
```

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050

1ST RESPONSE TO CLV COMMENTS

MAIN1 FACILITY (CCRFCD 'APSO' MPU FACILITY)

```
-9546.46    .I     W    CH          E                                                                                    .    R

-9507.97    .                                                                                                             .
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```
-9469.49   .                                                                  .
-9431.00   .                                                                  .
-9392.51   .  I     W   C H        E                                          .  JX
-9354.02   .  I    W    C H          E                                         .  R
-9315.54   .                                                                  .
-9277.05   .    I    W    CH           E                                      .  R
-9238.56   .                                                                  .
-9200.08   .                                                                  .
-9161.59   .      I    W    C H            E                                  .  TX
-9123.10   .        I         W H            E                                .  R
-9084.61   .        I         W H            E                                .  R
-9046.13   .         I          WH           E                               .  R
-9007.64   .          I          WH          E                               .  R
-8969.15   .           I          WH           E                              .  R
-8930.67   .                                                                  .
-8892.18   .             I         WH           E                             .  R
-8853.69   .                                                                  .
-8815.21   .                                                                  .
-8776.72   .                                                                  .
-8738.23   .                                                                  .
```

```
-8699.74   .                                                                  .
-8661.26   .              I         WSH            E                          .   R
-8622.77   .                                                                  .
-8584.28   .                                                                  .
-8545.79   .               I         W H           E                          .   R
-8507.31   .                                                                  .
-8468.82   .                I         WSH           E                         .   R
-8430.33   .                 I        W H            E                        .   R
-8391.85   .                                                                  .
-8353.36   .                                                                  .
-8314.87   .                  I        W H              E                     .   R
-8276.38   .                                                                  .
-8237.90   .                                                                  .
-8199.41   .                                                                  .
-8160.92   .                   I        W  H               E                  .   R
-8122.44   .                                                                  .
-8083.95   .                                                                  .
-8045.46   .                    I       W  H                 E                .   R
-8006.98   .                                                                  .
-7968.49   .                                                                  .
```

```
-7930.00   .                    I       W   H                 E                                  .   R
-7891.51   .                                                                                       .
-7853.03   .                                                                                       .
-7814.54   .                     I       WS  H                    E                               .   R
-7776.05   .                                                                                       .
-7737.57   .                      I       WS  H                     E                              .   R
-7699.08   .                         I      WS  H                     E                            .   R
-7660.59   .                            I       WS  H                   E                          .   R
-7622.10   .                                                                                       .
-7583.62   .                                I        W  H                E                         .   R
-7545.13   .                                   I       WS H               E                         .   JX
-7506.64   .                                     I   W S  H                    E                    .   R
-7468.16   .                                       I    WS   H                   E                 .   R
-7429.67   .                                            I    WS  H                 E               .   R
-7391.18   .                                               I     WS  H               E             .   R
-7352.69   .                                                  I     WS  H             E            .   R
-7314.21   .                                                                                       .
-7275.72   .                                                                                       .
-7237.23   .                                                                                       .
-7198.75   .                                                     I     W   H            E          .   R
-7160.26   .                                                        I     W  H           E         .   R
```

```
-7121.77   .                                                                  .
-7083.28   .                                  I     W  H          E           .   R
-7044.80   .                                                                  .
-7006.31   .                                    I     W  H          E         .   R
-6967.82   .                                      I     W  H         E        .   R
-6929.34   .                                        I      W H        E       .   R
-6890.85   .                                         I     W H        E       .   R
-6852.36   .                                          I     W H       E       .   R
-6813.88   .                                           I       WH       E     .   R
-6775.39   .                                                                  .
-6736.90   .                                            I        WH      E    .   JX
-6698.41   .                                            I       W H      E    .   R
-6659.93   .                                                                  .
-6621.44   .                                             I       W H      E   .   R
-6582.95   .                                                                  .
-6544.46   .                                                                  .
-6505.98   .                                                                  .
-6467.49   .                                                                  .
-6429.00   .                                                                  .
-6390.52   .                                                                  .
```

```
-6352.03   .                                                                  I        WH     E       .    R
-6313.54   .                                                                                          .
-6275.06   .                                                                                          .
-6236.57   .                                                                  I        WH     E       .    R
-6198.08   .                                                                                          .
-6159.59   .                                                                   I        H      E      .    JX
-6121.11   .                                                                   I        H      E      .    R
-6082.62   .                                                                   I        HW     E      .    R
-6044.13   .                                                                    I        H W     E   .    R
-6005.65   .                                                                                          .
-5967.16   .                                                                                          .
-5928.67   .                                                                                          .
-5890.18   .                                                                                          .
-5851.70   .                                                                                          .
-5813.21   .                                                                       I         H W     E.    R
          2659.440  2668.958  2678.477  2687.996  2697.514  2707.033  2716.551  2726.070  2735.588  2745.107  2754.626
```

N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   S = SUPER-ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT

```
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY
```

Mainline 2 (APP2 MPU Alignment)
Manning's 'n' 0.013
(Utilized for Velocity Design)

```
                                                                    MAIN2.WSW
T1 THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050                          0
T2 1ST RESPONSE TO CLV COMMENTS
T3 MAIN2 FACILITY (CCRFCD 'APP2' MPU FACILITY)
SO  -2775.6102697.680  1                          2705.040
R   -2648.9802712.970  1      .013                              64.780    .000 0
R   -2556.6802716.660  1      .013                                .000    .000 0
R   -2435.6102721.500  1      .013                             -61.936    .000 0
R   -2218.9802726.000  1      .013                                .000    .000 0
R   -2160.3602727.220  1      .013                              29.988    .000 0
R   -1847.1002733.740  1      .013                                .000    .000 0
R   -1764.2102734.560  1      .013                             -42.404    .000 0
R   -1468.1802740.500  1      .013                                .000    .000 0
SH  -1468.1802740.500  1                                .000
CD   1  3   0    .000   8.000   10.000  .000  .000   .00
Q          2004.000   .0
```

```
FILE: MAIN2.WSW                          W S P G W  - EDIT LISTING - Version 14.10              Date: 9-10-2017  Time: 2: 0:35
                                   WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                                PAGE    1
 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
 CODE   NO   TYPE PIER/PIP WIDTH    DIAMETER  WIDTH              DROP

 CD      1    3      0     .000    8.000   10.000    .000   .000    .00
                                                     W S P G W                                                          PAGE NO   1
                            WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 1 IS -
                              THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
HEADING LINE NO 2 IS -
                              1ST RESPONSE TO CLV COMMENTS
HEADING LINE NO 3 IS -
                              MAIN2 FACILITY (CCRFCD 'APP2' MPU FACILITY)
                                                     W S P G W                                                          PAGE NO   2
                            WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                        W S ELEV
                               -2775.610 2697.680    1                                          2705.040
 ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                            RADIUS    ANGLE     ANG PT  MAN H
                               -2648.980 2712.970    1             .013                          112.000   64.780      .000     0
 ELEMENT NO   3 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                            RADIUS    ANGLE     ANG PT  MAN H
                               -2556.680 2716.660    1             .013                           .000     .000      .000     0
 ELEMENT NO   4 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                            RADIUS    ANGLE     ANG PT  MAN H
                               -2435.610 2721.500    1             .013                          111.999  -61.936      .000     0
 ELEMENT NO   5 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                            RADIUS    ANGLE     ANG PT  MAN H
                               -2218.980 2726.000    1             .013                           .000     .000      .000     0
 ELEMENT NO   6 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                            RADIUS    ANGLE     ANG PT  MAN H
                               -2160.360 2727.220    1             .013                          112.001   29.988      .000     0
 ELEMENT NO   7 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                            RADIUS    ANGLE     ANG PT  MAN H
                               -1847.100 2733.740    1             .013                           .000     .000      .000     0
 ELEMENT NO   8 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                            RADIUS    ANGLE     ANG PT  MAN H
                               -1764.210 2734.560    1             .013                          112.000  -42.404      .000     0
 ELEMENT NO   9 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                            RADIUS    ANGLE     ANG PT  MAN H
                               -1468.180 2740.500    1             .013                           .000     .000      .000     0
 ELEMENT NO  10 IS A SYSTEM HEADWORKS                *                         *
                     U/S DATA   STATION    INVERT  SECT                                        W S ELEV
                               -1468.180 2740.500    1                                           .000
```

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-2775.610	2697.680	4.467	2702.147	2004.00	44.87	31.26	2733.40	8.00	8.00	10.00	8.000	10.000	.00	0 .0
31.701	.1207					.0464	1.47	8.00	3.74	3.22	.013	.00	.00	BOX
-2743.909	2701.508	4.661	2706.169	2004.00	43.00	28.70	2734.87	8.00	8.00	10.00	8.000	10.000	.00	0 .0
29.911	.1207					.0411	1.23	8.00	3.51	3.22	.013	.00	.00	BOX
-2713.998	2705.119	4.888	2710.008	2004.00	40.99	26.10	2736.10	8.00	8.00	10.00	8.000	10.000	.00	0 .0
25.234	.1207					.0362	.91	8.00	3.27	3.22	.013	.00	.00	BOX
-2688.764	2708.166	5.127	2713.293	2004.00	39.09	23.72	2737.02	8.00	8.00	10.00	8.000	10.000	.00	0 .0
21.453	.1207					.0319	.68	8.00	3.04	3.22	.013	.00	.00	BOX
-2667.311	2710.757	5.377	2716.134	2004.00	37.27	21.57	2737.70	8.00	8.00	10.00	8.000	10.000	.00	0 .0
18.331	.1207					.0281	.52	8.00	2.83	3.22	.013	.00	.00	BOX
-2648.980	2712.970	5.640	2718.610	2004.00	35.53	19.61	2738.22	.00	8.00	10.00	8.000	10.000	.00	0 .0
92.300	.0400					.0249	2.30	5.64	2.64	4.82	.013	.00	.00	BOX
-2556.680	2716.660	5.892	2722.552	2004.00	34.01	17.96	2740.52	8.00	8.00	10.00	8.000	10.000	.00	0 .0
59.628	.0400					.0224	1.34	8.00	2.47	4.82	.013	.00	.00	BOX
-2497.052	2719.044	6.111	2725.155	2004.00	32.79	16.70	2741.85	8.00	8.00	10.00	8.000	10.000	.00	0 .0
61.442	.0400					.0201	1.24	8.00	2.34	4.82	.013	.00	.00	BOX
-2435.610	2721.500	6.409	2727.909	2004.00	31.27	15.18	2743.09	.00	8.00	10.00	8.000	10.000	.00	0 .0
216.630	.0208					.0183	3.97	6.41	2.18	6.18	.013	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip

L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
-2218.980	2726.000	6.555	2732.555	2004.00	30.57	14.51	2747.07	8.00	8.00	10.00	8.000	10.000	.00	0	.0
58.620	.0208					.0176	1.03	8.00	2.10	6.17	.013	.00	.00	BOX	
-2160.360	2727.220	6.611	2733.831	2004.00	30.31	14.27	2748.10	.00	8.00	10.00	8.000	10.000	.00	0	.0
152.971	.0208					.0168	2.57	6.61	2.08	6.17	.013	.00	.00	BOX	
-2007.389	2730.404	6.806	2737.209	2004.00	29.45	13.46	2750.67	.00	8.00	10.00	8.000	10.000	.00	0	.0
160.289	.0208					.0152	2.44	6.81	1.99	6.17	.013	.00	.00	BOX	
-1847.100	2733.740	7.138	2740.878	2004.00	28.08	12.24	2753.12	8.00	8.00	10.00	8.000	10.000	.00	0	.0
82.890	.0099					.0147	1.22	8.00	1.85	8.00	.013	.00	.00	BOX	
-1764.210	2734.560	6.980	2741.540	2004.00	28.71	12.80	2754.34	.00	8.00	10.00	8.000	10.000	.00	0	.0
126.526	.0201					.0144	1.82	6.98	1.92	6.26	.013	.00	.00	BOX	
-1637.684	2737.099	7.272	2744.371	2004.00	27.56	11.79	2756.16	.00	8.00	10.00	8.000	10.000	.00	0	.0
99.833	.0201					.0129	1.29	7.27	1.80	6.26	.013	.00	.00	BOX	

---------- WARNING - Flow depth near top of box conduit ----------

-1537.851	2739.102	7.627	2746.729	2004.00	26.28	10.72	2757.45	.00	8.00	10.00	8.000	10.000	.00	0	.0
69.671	.0201					.0143	1.00	7.63	1.68	6.26	.013	.00	.00	BOX	

---------- WARNING - Flow depth near top of box conduit ----------

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 9-10-2017 Time: 2: 0:38

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050

1ST RESPONSE TO CLV COMMENTS

MAIN2 FACILITY (CCRFCD 'APP2' MPU FACILITY)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip

L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
-1468.180	2740.500	8.000	2748.500	2004.00	25.05	9.74	2758.24	.00	8.00	10.00	8.000	10.000	.00	0	.0

MAIN2 FACILITY (CCRFCD 'APP2' MPU FACILITY)

```
-2775.61   .I      W     H                                    E                                  .   R
-2748.93   .                                                                                      .
-2722.25   .     I       W    H                                E                                  .   R
-2695.56   .           I       W    H                            E                                  .   R
-2668.88   .              I       W    H                          E                                  .   R
-2642.20   .                   I       W   H                        E                                  .   R
-2615.52   .                       I       W   H                    E                                  .   R
-2588.83   .                                                                                      .
-2562.15   .                                                                                      .
-2535.47   .                           I        W  H                      E                        .   R
-2508.79   .                                                                                      .
-2482.11   .                               I        W  H                     E                      .   R
-2455.42   .                                                                                      .
-2428.74   .                                   I        W  H                    E                  .   R
-2402.06   .                                                                                      .
-2375.38   .                                                                                      .
-2348.69   .                                                                                      .
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-2322.01   .                                                                  .
-2295.33   .                                                                  .
-2268.65   .                                                                  .
-2241.97   .                                                                  .
-2215.28   .                        I         W H                   E         .   R
-2188.60   .                                                                  .
-2161.92   .                                                                  .
-2135.24   .                         I         W H                   E        .   R
-2108.55   .                                                                  .
-2081.87   .                                                                  .
-2055.19   .                                                                  .
-2028.51   .                                                                  .
-2001.82   .                                I        W H                 E   .   R
-1975.14   .                                                                  .
-1948.46   .                                                                  .
-1921.78   .                                                                  .
-1895.10   .                                                                  .
-1868.41   .                                                                  .
-1841.73   .                                     I          WH            E   .   R
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-1815.05    .                                                                                                     .
-1788.37    .                                                                                                     .
-1761.68    .                                                            I           W H                  E       .    R
-1735.00    .                                                                                                     .
-1708.32    .                                                                                                     .
-1681.64    .                                                                                                     .
-1654.96    .                                                                                                     .
-1628.27    .                                                                 I           WH                 E    .    R
-1601.59    .                                                                                                     .
-1574.91    .                                                                                                     .
-1548.23    .                                                                                                     .
-1521.54    .                                                                    I           WH                E  .    R
-1494.86    .                                                                                                     .
-1468.18    .                                                                      I            H                E.    R
            .
          2697.680  2703.736  2709.793  2715.849  2721.906  2727.962  2734.018  2740.075  2746.131  2752.188  2758.244

N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   S = SUPER-ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
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   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY
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Mainline 2 (APP2 MPU Alignment)
Manning's 'n' 0.015
(Utilized for HGL Design)

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                                                                    MAIN2-015.WSW
T1 THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050                          0
T2 1ST RESPONSE TO CLV COMMENTS
T3 MAIN2 FACILITY (CCRFCD 'APP2' MPU FACILITY)
SO  -2775.6102697.680  1                          2705.040
R   -2648.9802712.970  1      .015                                64.780    .000 0
R   -2556.6802716.660  1      .015                                  .000    .000 0
R   -2435.6102721.500  1      .015                               -61.936    .000 0
R   -2218.9802726.000  1      .015                                  .000    .000 0
R   -2160.3602727.220  1      .015                                29.988    .000 0
R   -1847.1002733.740  1      .015                                  .000    .000 0
R   -1764.2102734.560  1      .015                               -42.404    .000 0
R   -1468.1802740.500  1      .015                                  .000    .000 0
SH  -1468.1802740.500  1                                .000
CD   1  3   0    .000   8.000   10.000  .000  .000   .00
Q          2004.000   .0
```

W S P G W - CIVILDESIGN Version 14.08
Program Package Serial Number: 3074
WATER SURFACE PROFILE LISTING
Date: 9-10-2017 Time: 2: 2:54

THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
1ST RESPONSE TO CLV COMMENTS
MAIN2 FACILITY (CCRFCD 'APP2' MPU FACILITY)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-2775.610	2697.680	4.716	2702.396	2004.00	42.49	28.04	2730.43	8.00	8.00	10.00	8.000	10.000	.00	0 .0
12.551	.1207					.0552	.69	8.00	3.45	3.57	.015	.00	.00	BOX
-2763.060	2699.195	4.794	2703.989	2004.00	41.81	27.14	2731.13	8.00	8.00	10.00	8.000	10.000	.00	0 .0
31.915	.1207					.0508	1.62	8.00	3.37	3.57	.015	.00	.00	BOX
-2731.145	2703.049	5.027	2708.076	2004.00	39.86	24.67	2732.75	8.00	8.00	10.00	8.000	10.000	.00	0 .0
26.273	.1207					.0447	1.17	8.00	3.13	3.57	.015	.00	.00	BOX
-2704.872	2706.221	5.273	2711.494	2004.00	38.01	22.43	2733.92	8.00	8.00	10.00	8.000	10.000	.00	0 .0
21.905	.1207					.0394	.86	8.00	2.92	3.57	.015	.00	.00	BOX
-2682.967	2708.866	5.530	2714.396	2004.00	36.24	20.39	2734.79	8.00	8.00	10.00	8.000	10.000	.00	0 .0
18.419	.1207					.0348	.64	8.00	2.72	3.57	.015	.00	.00	BOX
-2664.548	2711.090	5.800	2716.890	2004.00	34.55	18.54	2735.43	8.00	8.00	10.00	8.000	10.000	.00	0 .0
15.568	.1207					.0307	.48	8.00	2.53	3.57	.015	.00	.00	BOX
-2648.980	2712.970	6.083	2719.053	2004.00	32.94	16.85	2735.90	.00	8.00	10.00	8.000	10.000	.00	0 .0
92.300	.0400					.0272	2.51	6.08	2.35	5.37	.015	.00	.00	BOX
-2556.680	2716.660	6.366	2723.026	2004.00	31.48	15.39	2738.41	8.00	8.00	10.00	8.000	10.000	.00	0 .0
3.338	.0400					.0255	.09	8.00	2.20	5.37	.015	.00	.00	BOX
-2553.342	2716.793	6.379	2723.172	2004.00	31.42	15.33	2738.50	8.00	8.00	10.00	8.000	10.000	.00	0 .0
67.628	.0400					.0240	1.62	8.00	2.19	5.37	.015	.00	.00	BOX

W S P G W - CIVILDESIGN Version 14.08
Program Package Serial Number: 3074
WATER SURFACE PROFILE LISTING
Date: 9-10-2017 Time: 2: 2:54
THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
1ST RESPONSE TO CLV COMMENTS
MAIN2 FACILITY (CCRFCD 'APP2' MPU FACILITY)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch

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-2485.714  2719.497    6.690  2726.187   2004.00   29.96   13.93  2740.12    8.00    8.00   10.00    8.000   10.000   .00   0    .0
                                                            .0212     1.06    8.00    2.04    5.37     .015      .00   .00  BOX
 50.104     .0400
-2435.610  2721.500    7.016  2728.517   2004.00   28.56   12.67  2741.18     .00    8.00   10.00    8.000   10.000   .00   0    .0
                                                            .0196     4.24    7.02    1.90    6.90     .015      .00   .00  BOX
216.630     .0208
-2218.980  2726.000    7.121  2733.121   2004.00   28.14   12.30  2745.42    8.00    8.00   10.00    8.000   10.000   .00   0    .0
                                                            .0190     1.12    8.00    1.86    6.90     .015      .00   .00  BOX
 58.620     .0208
-2160.360  2727.220    7.164  2734.384   2004.00   27.97   12.15  2746.53     .00    8.00   10.00    8.000   10.000   .00   0    .0
                                                            .0185     2.31    7.16    1.84    6.90     .015      .00   .00  BOX
124.765     .0208
-2035.595  2729.817    7.290  2737.107   2004.00   27.49   11.73  2748.84     .00    8.00   10.00    8.000   10.000   .00   0    .0
                                                            .0170     3.21    7.29    1.79    6.90     .015      .00   .00  BOX
188.495     .0208                     -------------------- WARNING - Flow depth near top of box conduit --------------------
-1847.100  2733.740    7.646  2741.386   2004.00   26.21   10.67  2752.05    8.00    8.00   10.00    8.000   10.000   .00   0    .0
                                                            .0169     1.40    8.00    1.67    8.00     .015      .00   .00  BOX
 82.890     .0099                     -------------------- WARNING - Flow depth near top of box conduit --------------------
-1764.210  2734.560    7.351  2741.911   2004.00   27.26   11.54  2753.45     .00    8.00   10.00    8.000   10.000   .00   0    .0
                                                            .0169     2.91    7.35    1.77    7.00     .015      .00   .00  BOX
172.136     .0201                     -------------------- WARNING - Flow depth near top of box conduit --------------------
♀ FILE: MAIN2-015.WSW                          W S P G W - CIVILDESIGN Version 14.08                                    PAGE    3
                                   Program Package Serial Number: 3074
                                                WATER SURFACE PROFILE LISTING                    Date: 9-10-2017  Time: 2: 2:54
                                THE SEVENTY - THE 435 (PHASE 1), GCW JOB NO. 840-050
                                  1ST RESPONSE TO CLV COMMENTS
                                    MAIN2 FACILITY (CCRFCD 'APP2' MPU FACILITY)
*****************************************************************************************************************************************
         | Invert  |  Depth  |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
 Station |  Elev   |  (FT)   |  Elev   |  (CFS)  | (FPS)   Head  |  Grd.El.|  Elev |  Depth |  Width |Dia.-FT|or I.D.|  ZL  |Prs/Pip
L/Elem   |Ch Slope |         |         |         |         SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR  |Type Ch
*********|*********|*********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****|*******
-1592.074  2738.014    7.627  2745.641   2004.00   26.28   10.72  2756.36     .00    8.00   10.00    8.000   10.000   .00   0    .0
                                                            .0191     2.36    7.63    1.68    7.00     .015      .00   .00  BOX
123.894     .0201                     -------------------- WARNING - Flow depth near top of box conduit --------------------
-1468.180  2740.500    8.000  2748.500   2004.00   25.05    9.74  2758.24     .00    8.00   10.00    8.000   10.000   .00   0    .0
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-2775.61   .I     W    H                                  E                                  .   R
-2748.93   .  I      W   H                                 E                                  .   R
-2722.25   .       I       W   H                            E                                  .   R
-2695.56   .            I      W   H                          E                                  .   R
-2668.88   .                I       W  H                         E                                  .   R
-2642.20   .                    I       W  H                        E                                  .   R
-2615.52   .                       I        W  H                      E                                  .   R
-2588.83   .                                                                                     .
-2562.15   .                                                                                     .
-2535.47   .                            I        W  H                    E                        .   R
-2508.79   .                            I         W H                    E                        .   R
-2482.11   .                                 I         W H                   E                    .   R
-2455.42   .                                                                                     .
-2428.74   .                                   I         W H                 E                    .   R
-2402.06   .                                                                                     .
-2375.38   .                                                                                     .
-2348.69   .                                                                                     .
-2322.01   .                                                                                     .
-2295.33   .                                                                                     .
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-2268.65   .                                                                  .
-2241.97   .                                                                  .
-2215.28   .                I          WH                  E                  .   R
-2188.60   .                                                                  .
-2161.92   .                                                                  .
-2135.24   .                  I          WH                  E                .   R
-2108.55   .                                                                  .
-2081.87   .                                                                  .
-2055.19   .                                                                  .
-2028.51   .                      I          WH                  E            .   R
-2001.82   .                                                                  .
-1975.14   .                                                                  .
-1948.46   .                                                                  .
-1921.78   .                                                                  .
-1895.10   .                                                                  .
-1868.41   .                                                                  .
-1841.73   .                           I          H                  E        .   R
-1815.05   .                                                                  .
-1788.37   .                                                                  .
-1761.68   .                           I          WH                  E       .   R
-1735.00   .                                                                  .
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  -1708.32    .                                                                                                     .
  -1681.64    .                                                                                                     .
  -1654.96    .                                                                                                     .
  -1628.27    .                                                                                                     .
  -1601.59    .                                                                                                     .
  -1574.91    .                                                                  I            H                E    .    R
  -1548.23    .                                                                                                     .
  -1521.54    .                                                                                                     .
  -1494.86    .                                                                                                     .
  -1468.18    .                                                                      I            H                E.    R
            2697.680  2703.736  2709.793  2715.849  2721.906  2727.962  2734.018  2740.075  2746.131  2752.188  2758.244

N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   S = SUPER-ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY
```

Interim Collection Hydraulic Calculations (MAIN1)

Worksheet for Interim Open-Top RCB - MAIN2 Flow

Project Description

Friction Method	Manning Formula	
Solve For	Normal Depth	

Input Data

Roughness Coefficient	0.015		
Channel Slope	5.50	%	
Bottom Width	14.00	ft	
Discharge	2004.00	ft³/s	→ MAIN 2 FLOW THRU OPEN-TOP RCB

Results

Normal Depth	3.50	ft	→ +18" FREEBOARD ⇒ 5.0' DEPTH CONTAINMENT PROVIDED (MIN.)
Flow Area	49.02	ft²	
Wetted Perimeter	21.00	ft	
Hydraulic Radius	2.33	ft	
Top Width	14.00	ft	
Critical Depth	8.60	ft	
Critical Slope	0.00466	ft/ft	
Velocity	40.88	ft/s	
Velocity Head	25.97	ft	
Specific Energy	29.47	ft	
Froude Number	3.85		
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.50	ft
Critical Depth	8.60	ft
Channel Slope	5.50	%
Critical Slope	0.00466	ft/ft

Cross Section for Interim Open-Top RCB - MAIN2 Flow

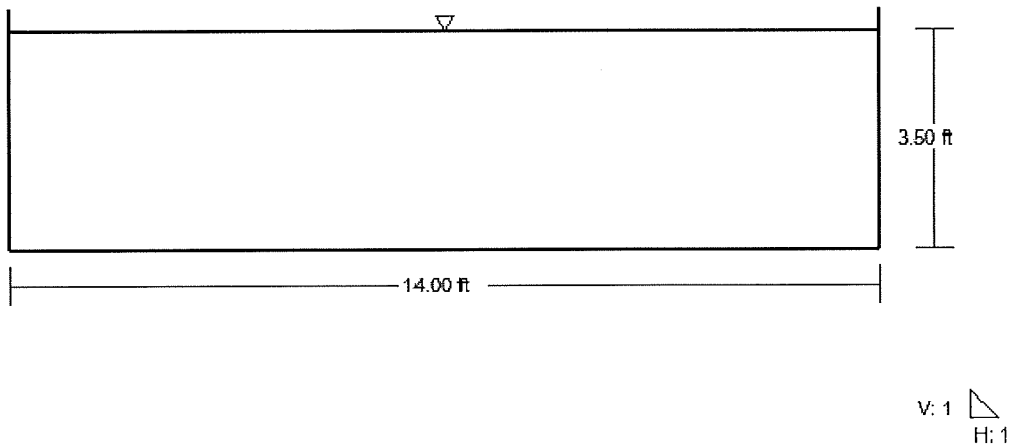
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	5.50	%
Normal Depth	3.50	ft
Bottom Width	14.00	ft
Discharge	2004.00	ft^3/s

Cross Section Image



Worksheet for Interim Graded Channel to Open-Top RCB

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040		→ D_{50}=12" RIPRAP
Channel Slope	1.00	%	
Left Side Slope	2.00	ft/ft (H:V)	
Right Side Slope	2.00	ft/ft (H:V)	
Bottom Width	45.00	ft	→ MIN. WIDTH OF DITCH
Discharge	2450.00	ft³/s	

Results

Normal Depth	4.82	ft	
Flow Area	263.54	ft²	
Wetted Perimeter	66.57	ft	
Hydraulic Radius	3.96	ft	
Top Width	64.29	ft	
Critical Depth	4.23	ft	
Critical Slope	0.01580	ft/ft	
Velocity	9.30	ft/s	
Velocity Head	1.34	ft	
Specific Energy	6.17	ft	→ RIPRAP PROVIDED UP TO MIN. 2697.0' (TOP OF WEIR) + 6.17' = 2704.0-FT
Froude Number	0.81		
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	4.82	ft
Critical Depth	4.23	ft
Channel Slope	1.00	%

Worksheet for Interim Graded Channel to Open-Top RCB

GVF Output Data

Critical Slope	0.01580	ft/ft

Cross Section for Interim Graded Channel to Open-Top RCB

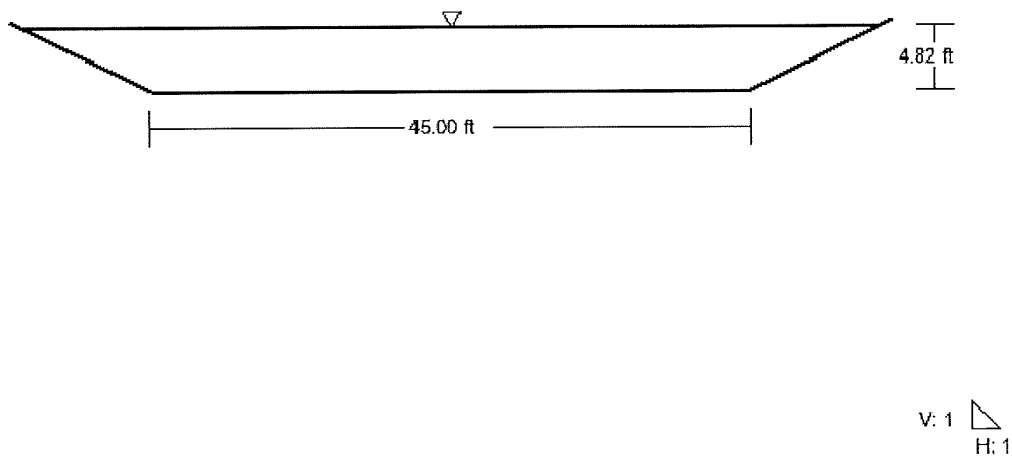
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	1.00	%
Normal Depth	4.82	ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	45.00	ft
Discharge	2450.00	ft^3/s

Cross Section Image



Worksheet for Interim Collector Open-Top RCB Weir

Project Description

Solve For	Headwater Elevation

Input Data

Discharge	2450.00	ft³/s
Crest Elevation	2697.00	ft
Weir Coefficient	3.00	US
Crest Length	45.00	ft

Results

Headwater Elevation	2703.91	ft → +1' FREEBOARD = 2704.9'
Headwater Height Above Crest	6.91	ft
Flow Area	310.77	ft²
Velocity	7.88	ft/s
Wetted Perimeter	58.81	ft
Top Width	45.00	ft

2704.9' < 2705' MASS GRADE ROAD

2703.9' INTERIM WSE < ULT. COND. MAIN1 HGL (2705.0')

∴ NO BACKUP INTO MAIN2 STORM DRAIN.

Cross Section for Interim Collector Open-Top RCB Weir

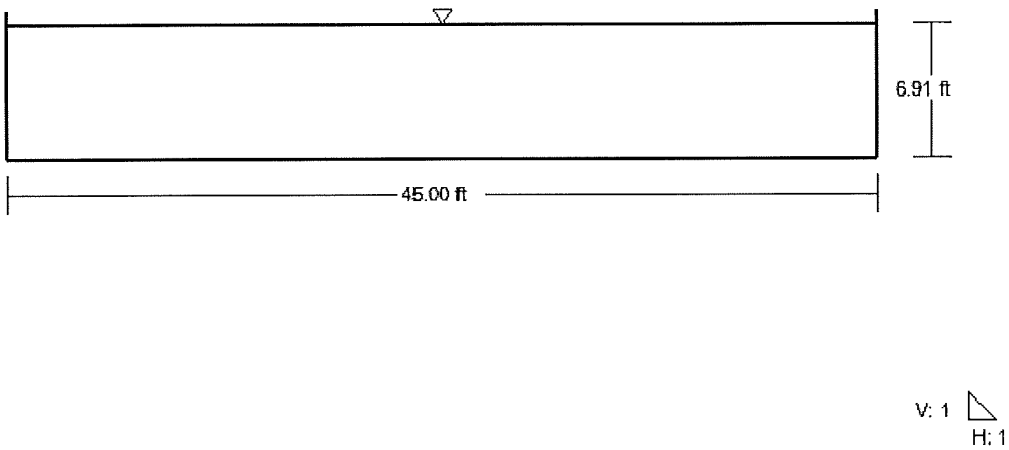
Project Description

Solve For	Headwater Elevation

Input Data

Discharge	2450.00	ft³/s
Headwater Elevation	2703.91	ft
Crest Elevation	2697.00	ft
Weir Coefficient	3.00	US
Crest Length	45.00	ft

Cross Section Image



Interim Collection Hydraulic Calculations (MAIN2)

706.1.1.2 *Transition Length*

The length of the transition section should be long enough to keep the streamlines smooth and nearly parallel throughout the expanding (contracting) section. Experimental data and performance of existing structures have to be used to estimate the minimum transition length necessary to maintain the stated flow conditions. Based on this information, the minimum length of the transition section shall be as follows:

$$L_t = \geq 0.5\, L_c\, (T_w) = 0.5(4.5)(10) \geq 22.5' \text{ MIN.} \quad (739)$$

$\Downarrow$

$\therefore$ 25' TRANSITION OK

Where L_t = Minimum Transition Length (ft)

L_c = Length Coefficient

T_w = Difference in the Top Width of the Normal Water Surface Upstream and Downstream of the Transition

20'W → 10'W = 10' = T_w

IMPROVED INLET

For an approach flow velocity less than 12 feet per second, L_c = 4.5. This represents a 4.5 (length) to 1.0 (width) wall expansion or contraction with the angle of expansion or contraction of 12.5 degrees from the channel centerline. For an approach flow velocity equal to or greater than 12 feet per second, L_c = 10.0. This represents a 10.0 (length) to 1.0 (width) expansion or contraction with the angle of expansion or contraction of about 5.75 degrees from the channel centerline.

The transition length equation is not applicable to cylinder-quadrant or square-ended transitions.

706.1.2 Bends

The allowed radius of curvature in sub-critical channels is based on a theoretical maximum allowed rise in the super-elevated water surface of 0.5 feet. Therefore, the minimum allowed radius of curvature of the channel centerline shall be determined from the following equation:

$$r = C\,(V^2\, T_w) / S_e\,(g) \quad (740)$$

Where r = Radius of Curvature (ft)

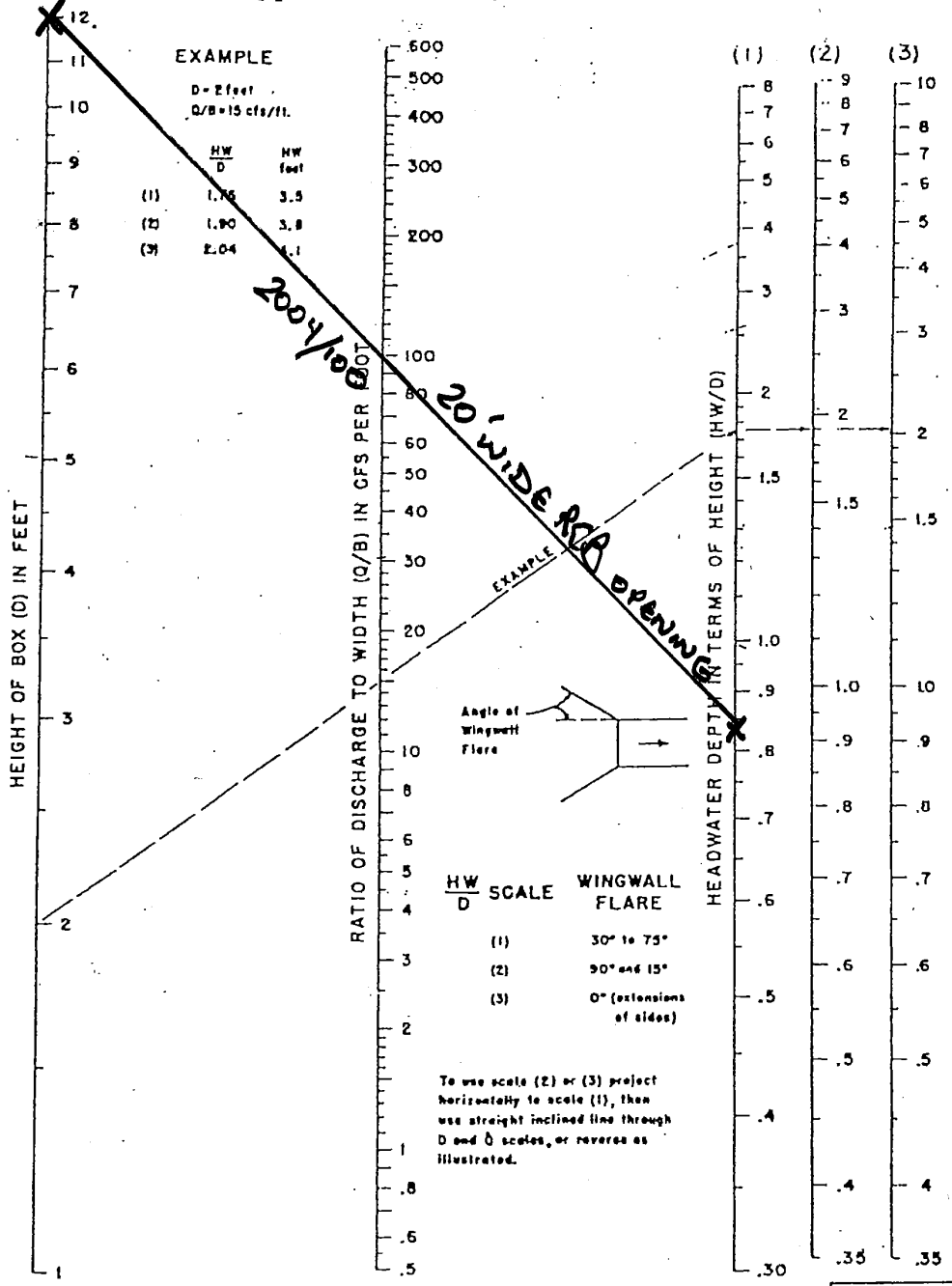
C = Super-Elevation Coefficient (= 1 for Sub-Critical Flow)

S_e = Super-Elevation Water Surface Increase (ft)

MAIN 2 (2004 cfs) CCRFCD ALIGNMENT

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL BOX CULVERT



HW/D = 0.83
(2' FREEBOARD)
BRIDGE CRITERIA

20'x12' RCB INTERIM IMPROVED INLET

Revision	Date

WRC ENGINEERING	REFERENCE: USDOT, FHWA, HDS No.5, 1985	FIGURE 1004

Worksheet for Overflow MAIN2

Project Description

Solve For	Headwater Elevation

Input Data

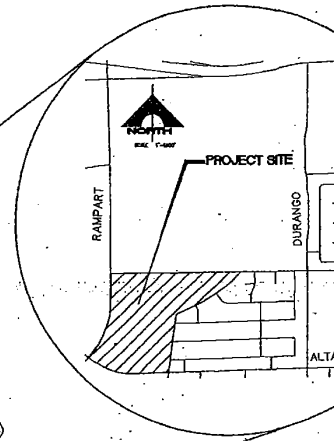
Discharge	2004.00	ft^3/s
Crest Elevation	2741.00	ft
Weir Coefficient	3.00	US
Crest Length	30.00	ft

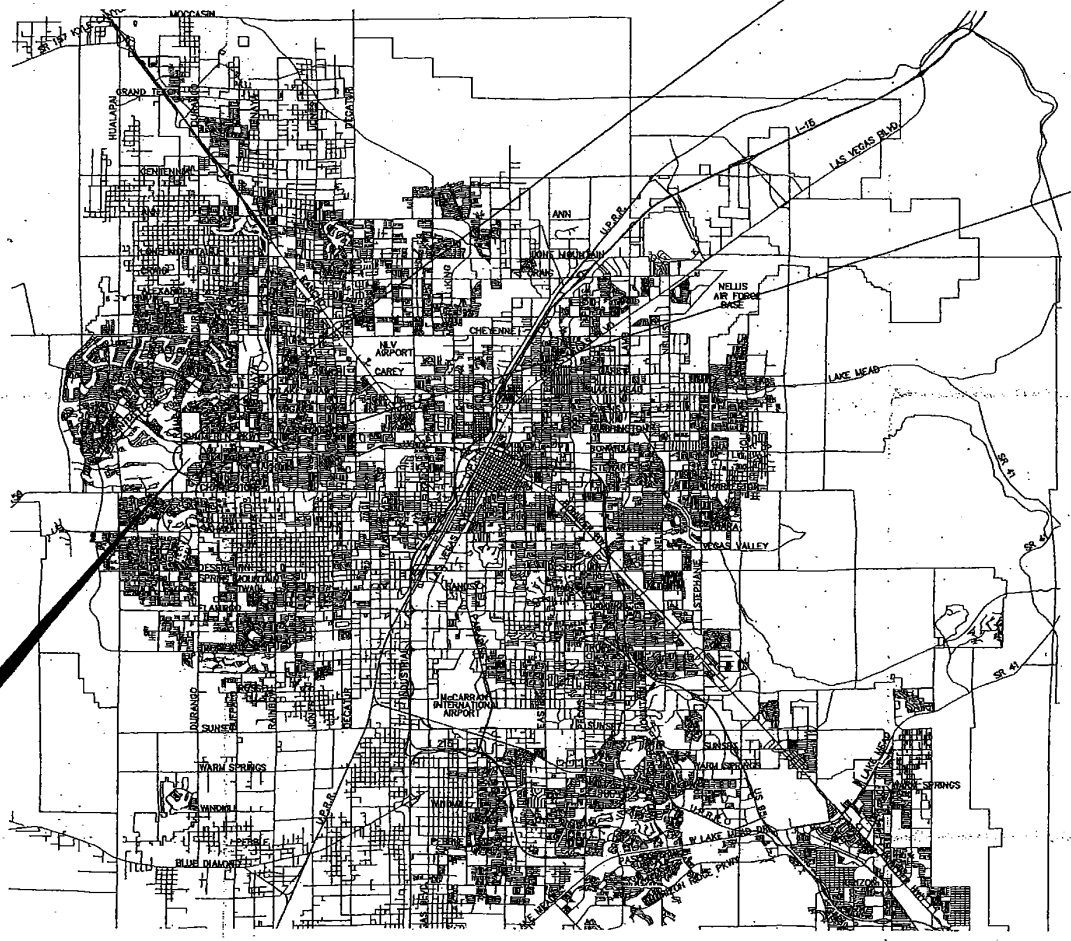
Results

Headwater Elevation	2748.91	ft < 2749.0' ADJ. FFE
Headwater Height Above Crest	7.91	ft
Flow Area	237.44	ft^2
Velocity	8.44	ft/s
Wetted Perimeter	45.83	ft
Top Width	30.00	ft

Referenced Downstream APSO Improvement Plans

IMPROVEMENT PLANS
FOR
THE VILLAGE AT QUEENSRIDGE
CULVERT
CITY OF LAS VEGAS
STATE OF NEVADA
APN# 138-32-601-003





NOTE: ALL LAND SURFACE AREA DISTURBANCES OVER 1 ACRE REQUIRE A STORMWATER DISCHARGE PERMIT ISSUED BY THE DIVISION OF ENVIRONMENTAL PROTECTION (NDEP). A PHASED CONSTRUCTION UNIT IN A CONTIGUOUS SUBDIVISION IS CONSID UNDER CONSTRUCTION UNTIL ALL STRIPPED OR DISTURBED SU AREAS HAVE BEEN COVERED BY PAVING, BUILDING CONSTRUC PLANTING. A STORMWATER DISCHARGE PERMIT APPLICATION ASSOCIATED INFORMATION MAY BE DOWNLOADED FROM THE W HTTP://WWW.STATE.NV.US/NDEP/BWQC/STORM01.HTM PROJECTS THAT DISTURB MORE THAN ONE ACRE OF LAND MU SUBMIT TO NDEP A "NOTICE OF INTENT" FOR INCLUSION UNDE STORMWATER PERMIT NO. NVR100000 ALONG WITH THE APPRO FILING FEE.

BASIS OF BEARING

SOUTH 00°32'07" EAST, BEING THE BEARING OF THE CENTERLI "RAMPART BOULEVARD" AS SHOWN BY MAP THEREOF ON FILE 84, PAGE 83 OF SURVEYS IN THE COUNTY RECORDER'S OFFICE COUNTY, NEVADA, LYING WITHIN THE NORTH HALF (N 1/2) OF 32, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LA CLARK COUNTY, NEVADA.

BENCHMARK

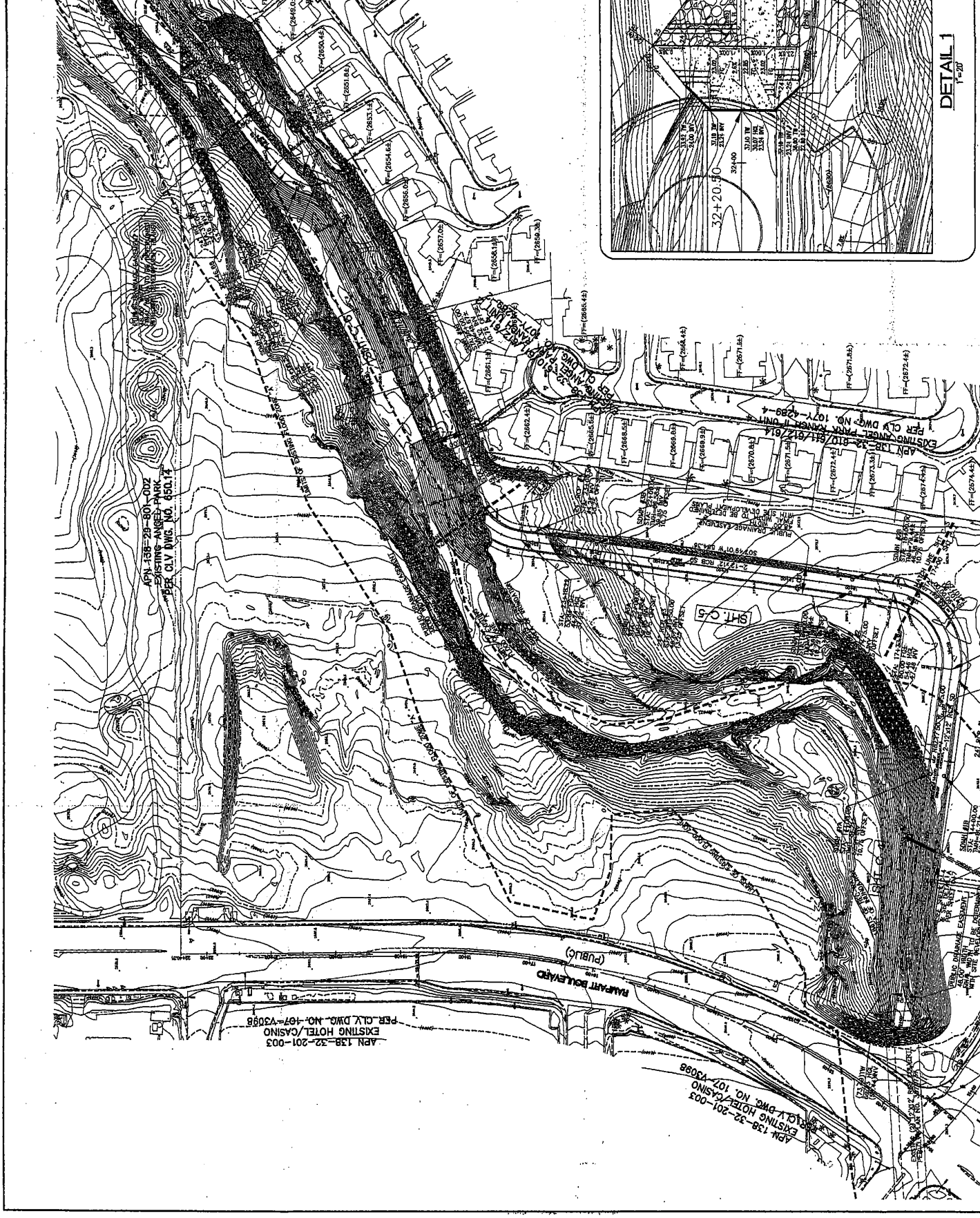
RIVET AND PLATE IN TOP OF CURB @ TOWN CENTER AND VILLAGE CENTER ON WEST EDGE OF ROUNDABOUT.

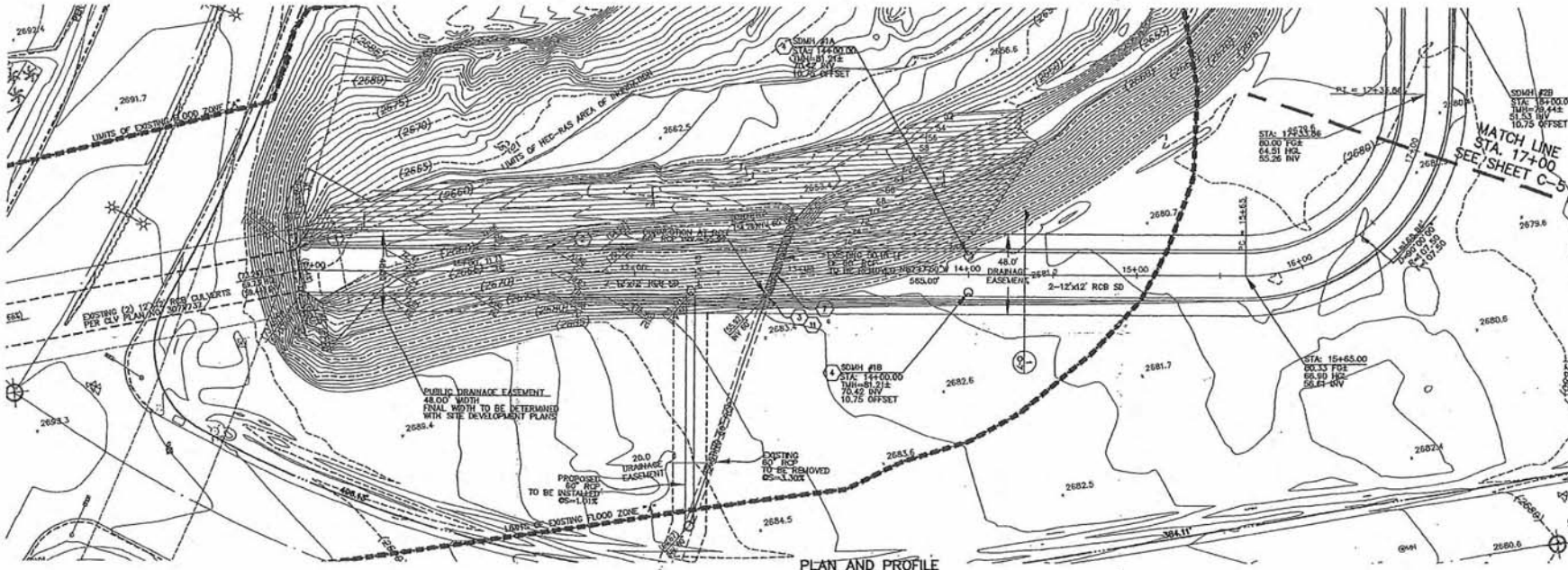
CITY OF LAS VEGAS BENCHMARK 0LV00 32E5
LOCATED ON THE NORTHEAST CORNER OF ALTA DR. AND UPPE
NAVD 88 ELEVATION = 814.1281 METERS, 2671.02 FEET

SUMMERLIN ELEVATION: 2726.11 FEET

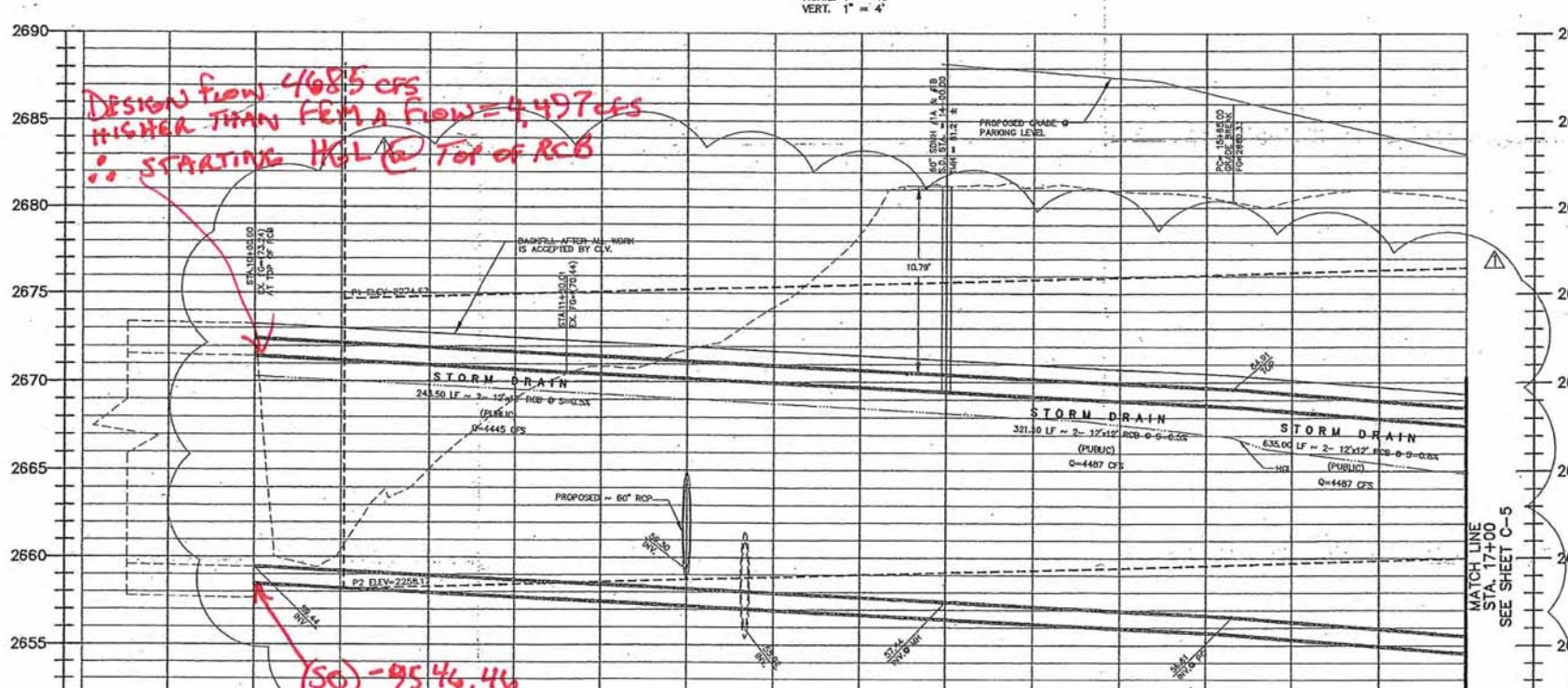
NOTE: ADD 2.27' TO THE CURRENTLY USED SUMMERLIN BENCH TO EQUAL TO THE APPROVED CITY OF LAS VEGAS BENC

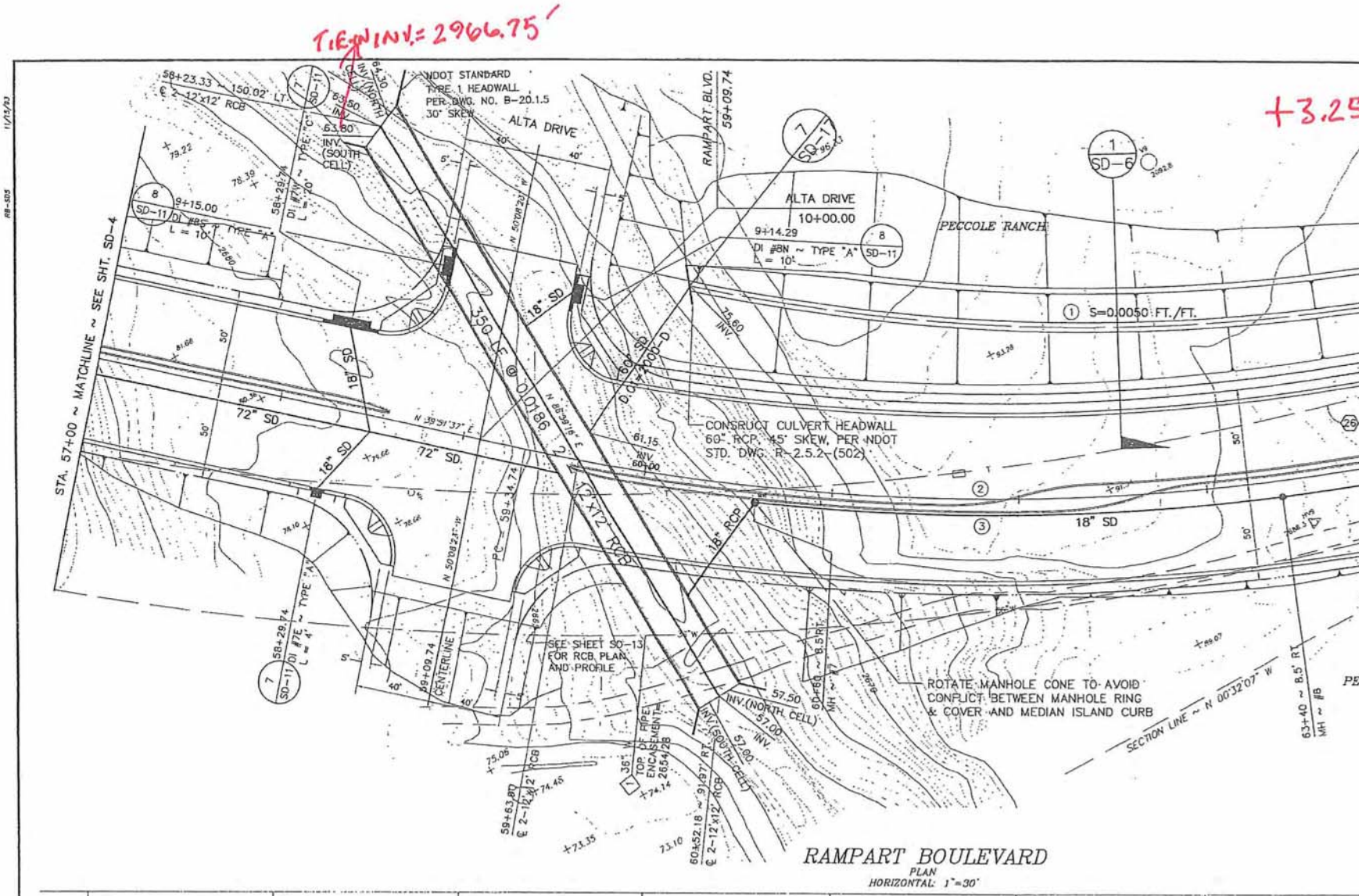
REPLY APP 1081


DETAIL 1
1"=20'
32+20.50
SHT. C-5
APN 138-29-801-002
EXISTING ANGEL PARK
PER CLV DWG. NO. 650.14
APN 138-32-201-003
EXISTING HOTEL/CASINO
PER CLV DWG. NO. 107-V3098
RAMPART BOULEVARD
(PUBLIC)



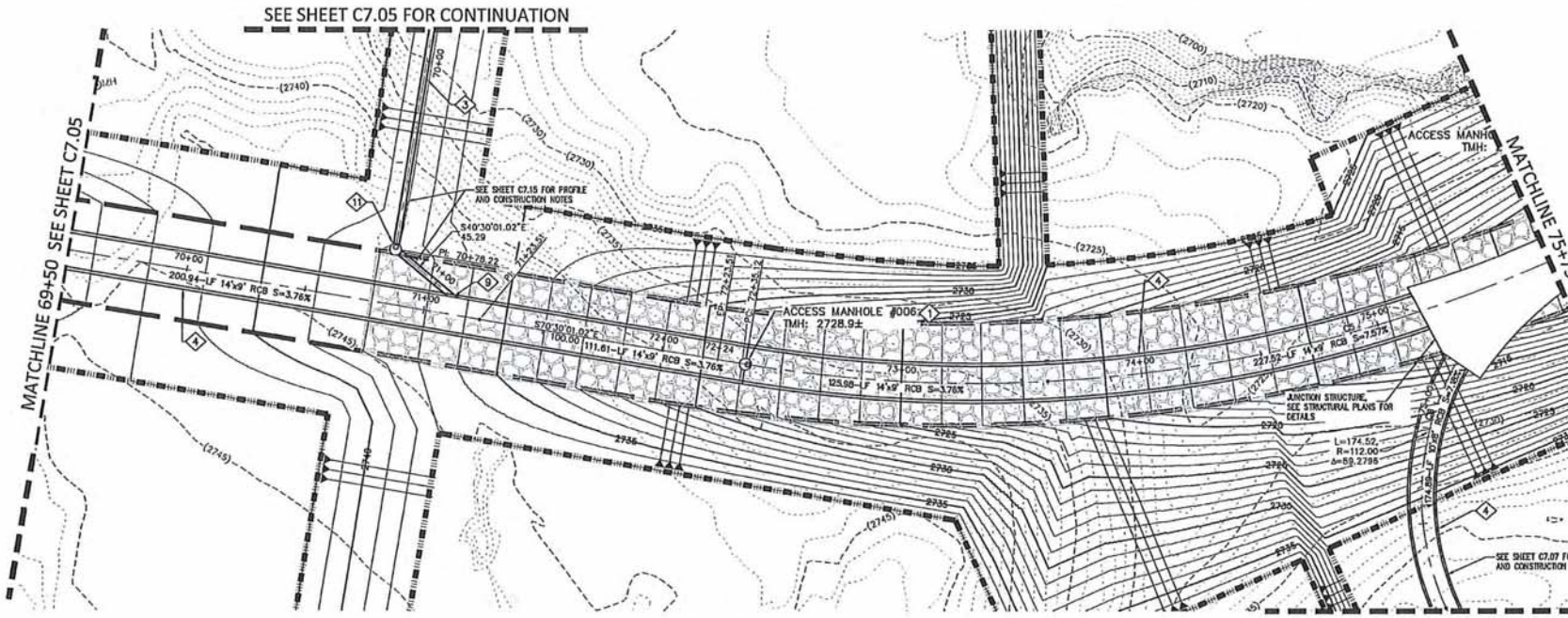
PLAN AND PROFILE
SCALE
HORIZ. 1" = 40'
VERT. 1" = 4'





REPLY APP 1084

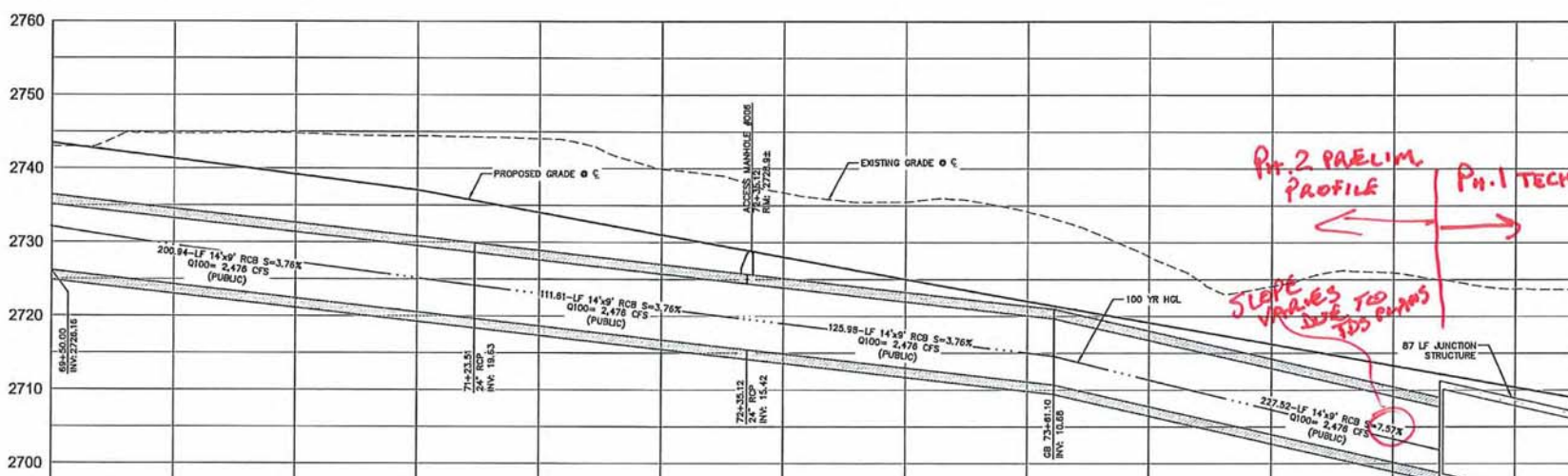
Preliminary Phase 2 Storm Drain Profiles
(Re-included Profile Sheets from TDS)



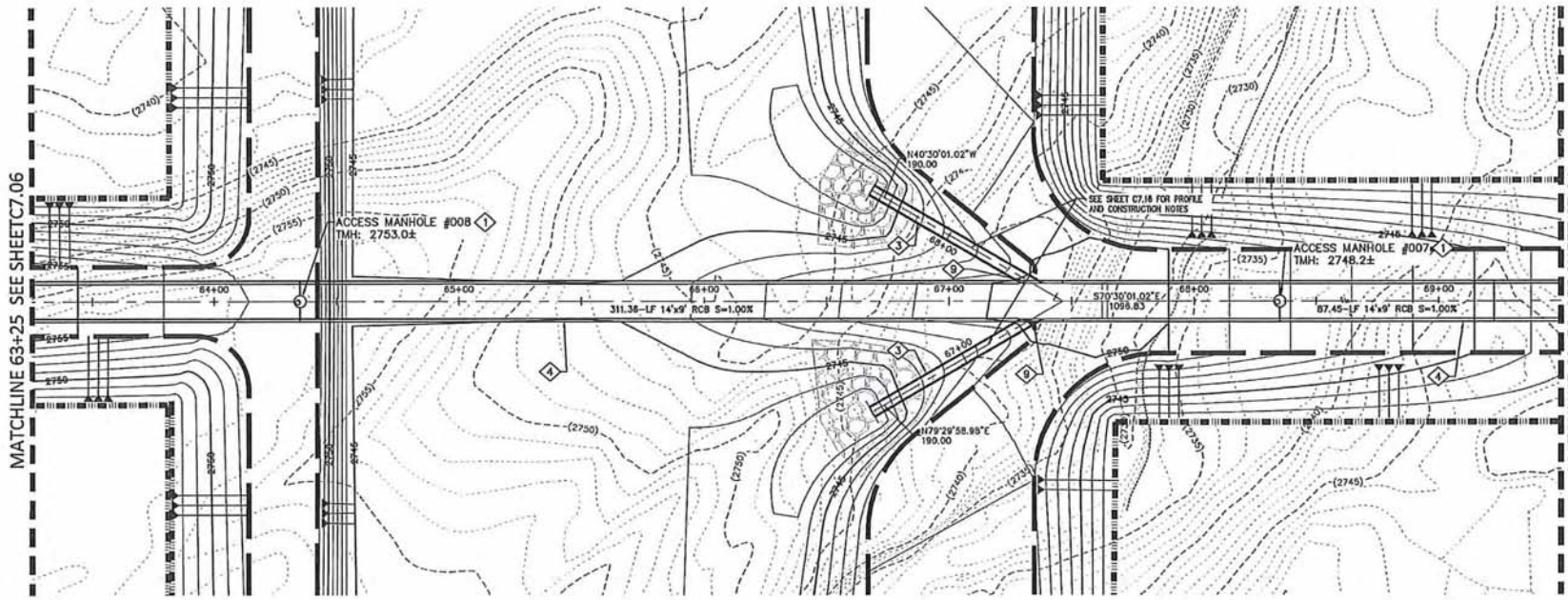
STORM DRAIN PLAN

HORIZ SCALE: 1" = 30'
VERT SCALE: 1" = 10'

Curve Table			
Curve #	Length	Radius	Del
C5	509.90	586.00	049.8

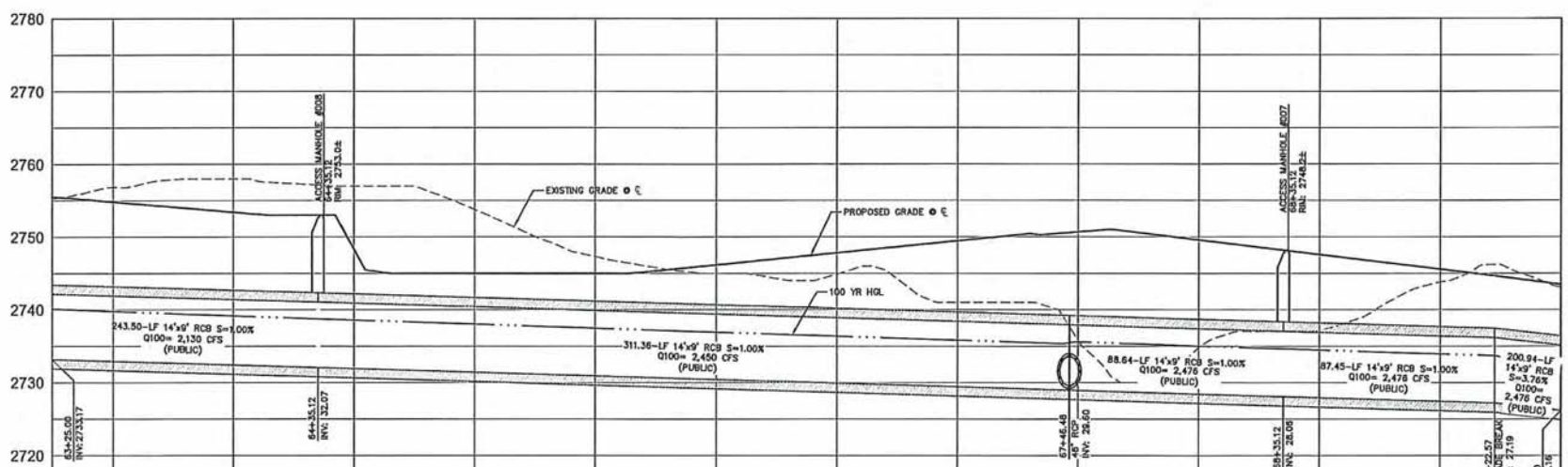


REPLY APP 1086

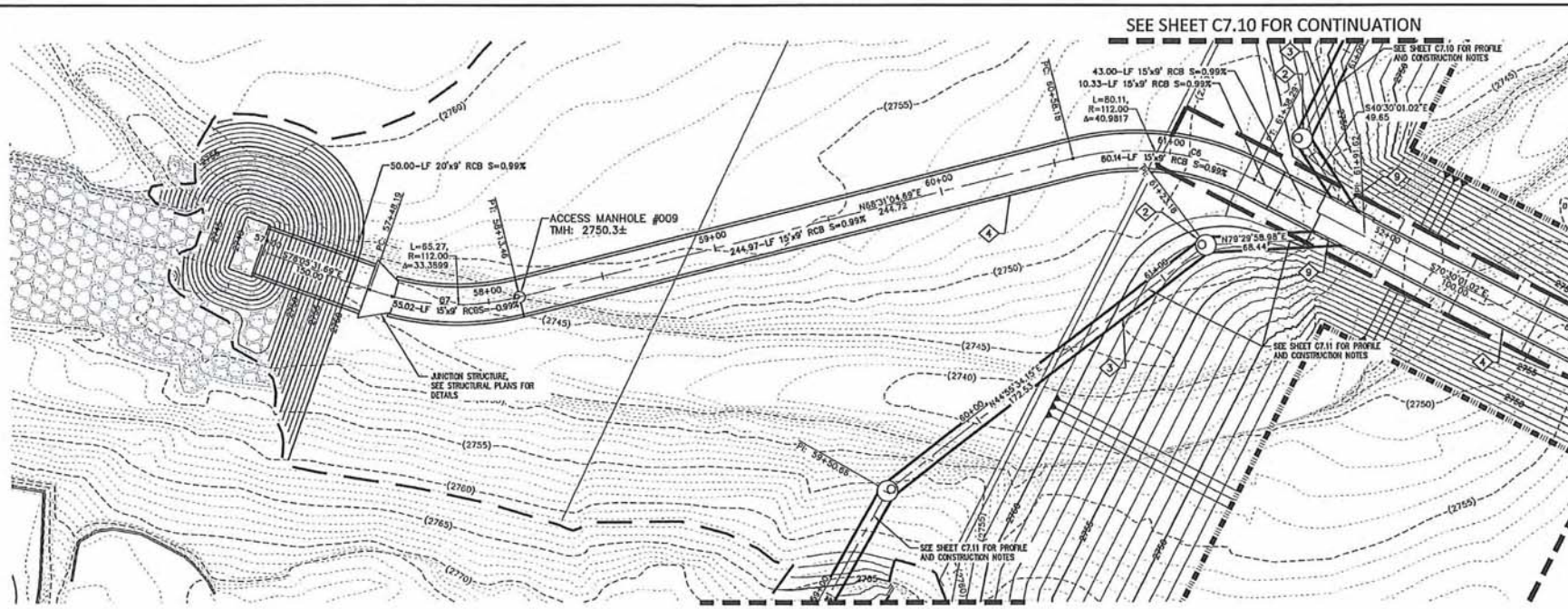


STORM DRAIN PLAN

HORIZ SCALE: 1" = 30'
VERT SCALE: 1" = 10'



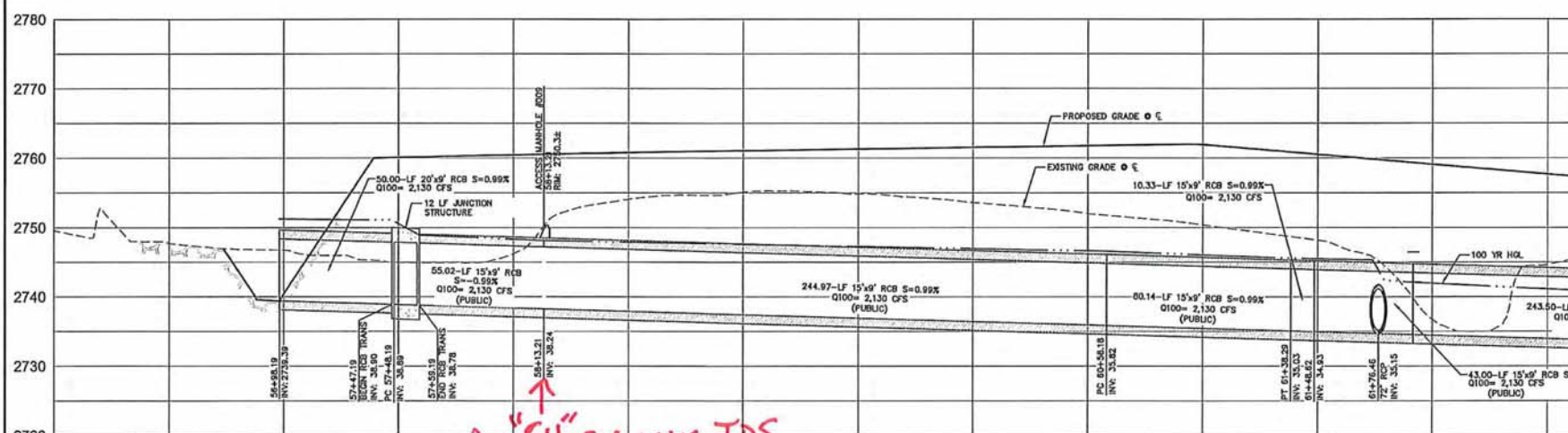
REPLY APP 1087



STORM DRAIN PLAN

HORIZ SCALE: 1" = 30'
VERT SCALE: 1" = 10'

Curve Table			
Curve #	Length	Radius	De
C6	80.11	112.00	040.
C7	65.27	112.00	033.



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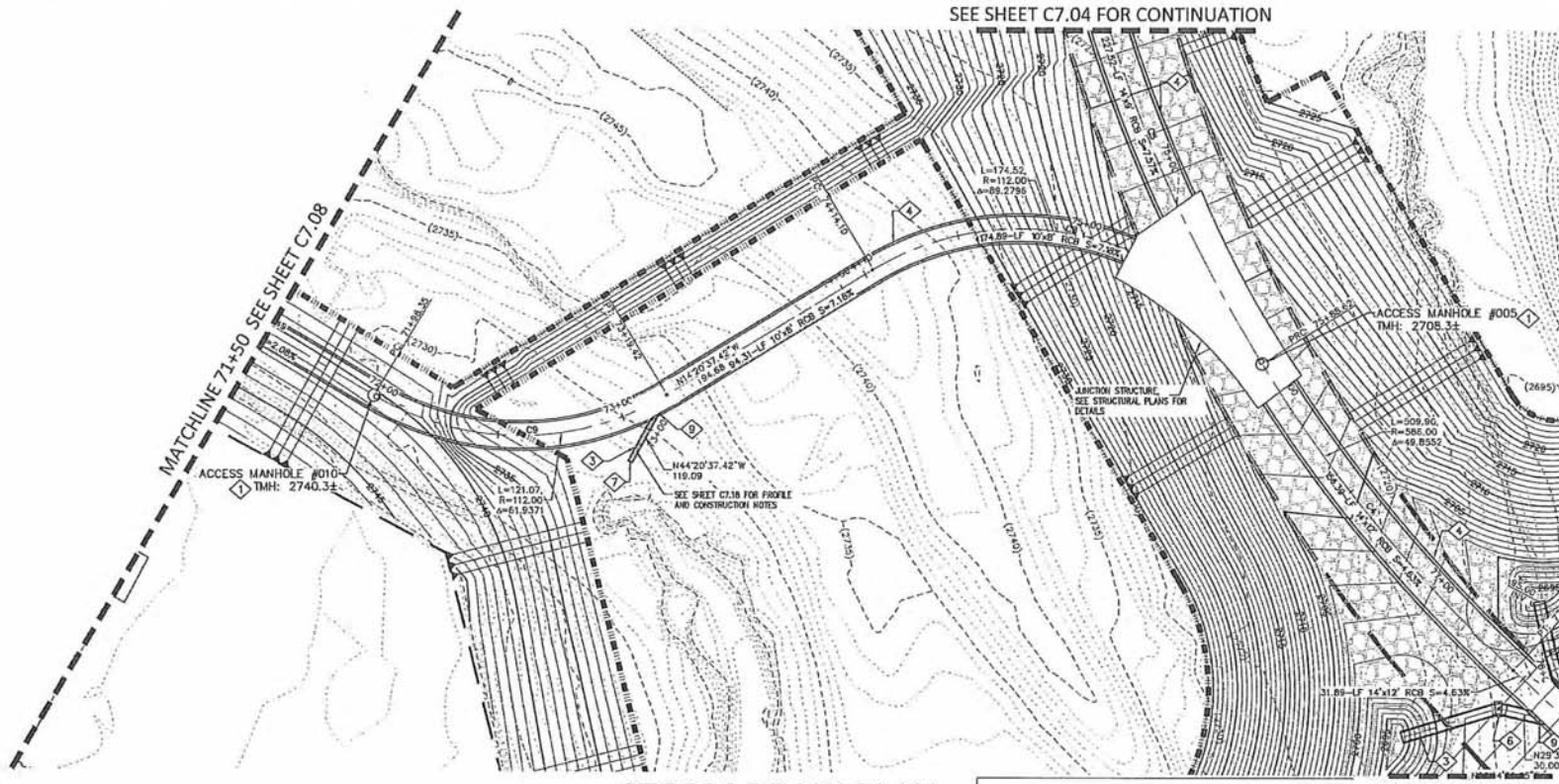
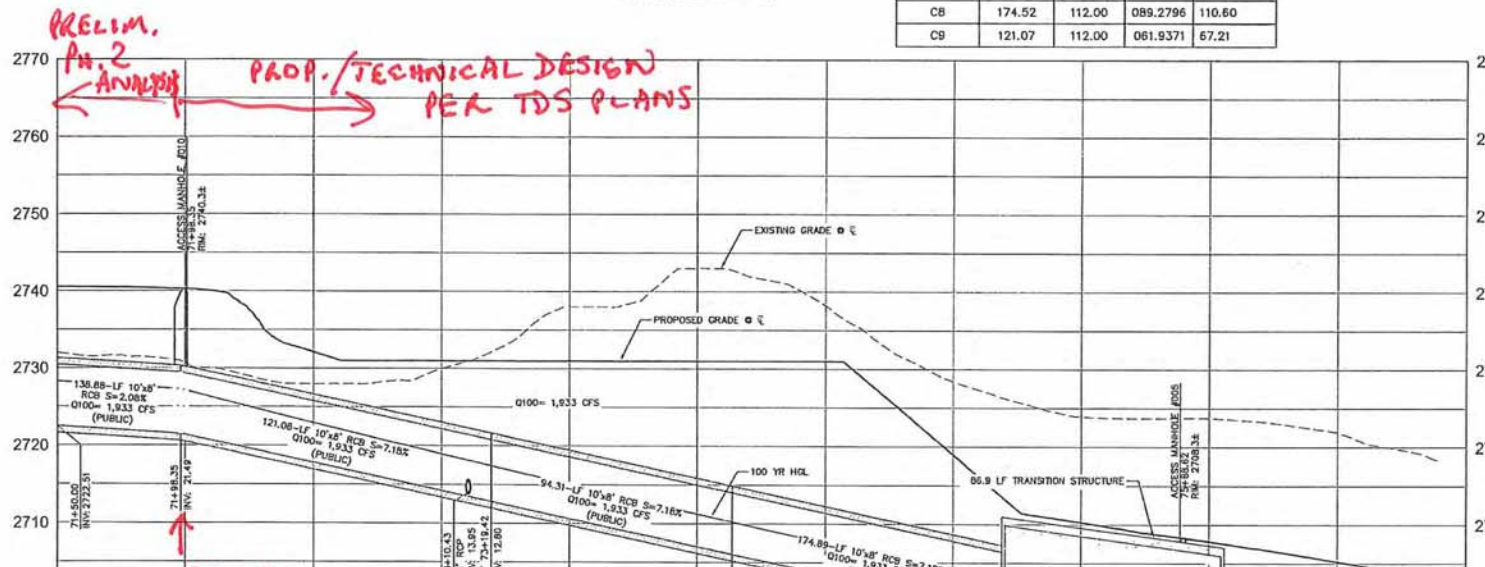


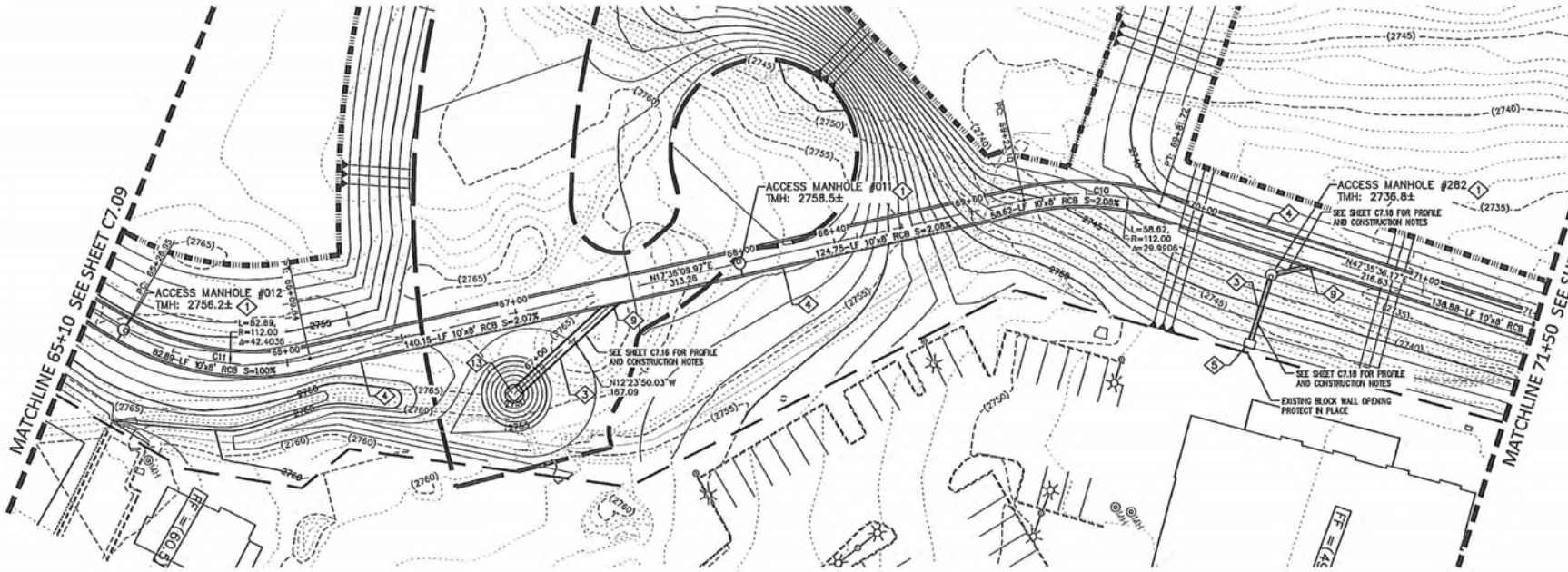
STORM DRAIN PLAN

HORIZ SCALE: 1" = 30'
VERT SCALE: 1" = 10'

Curve Table				
Curve #	Length	Radius	Delta	Tangent
C8	174.52	112.00	089.2796	110.60
C9	121.07	112.00	061.9371	67.21



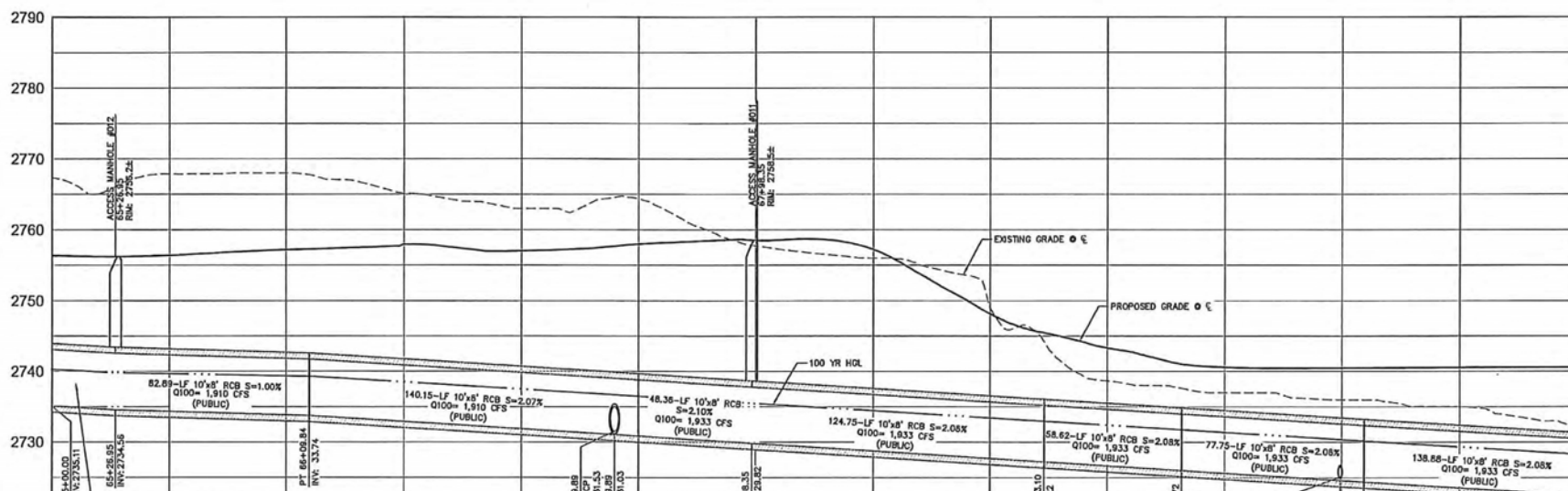
REPLY APP 1089



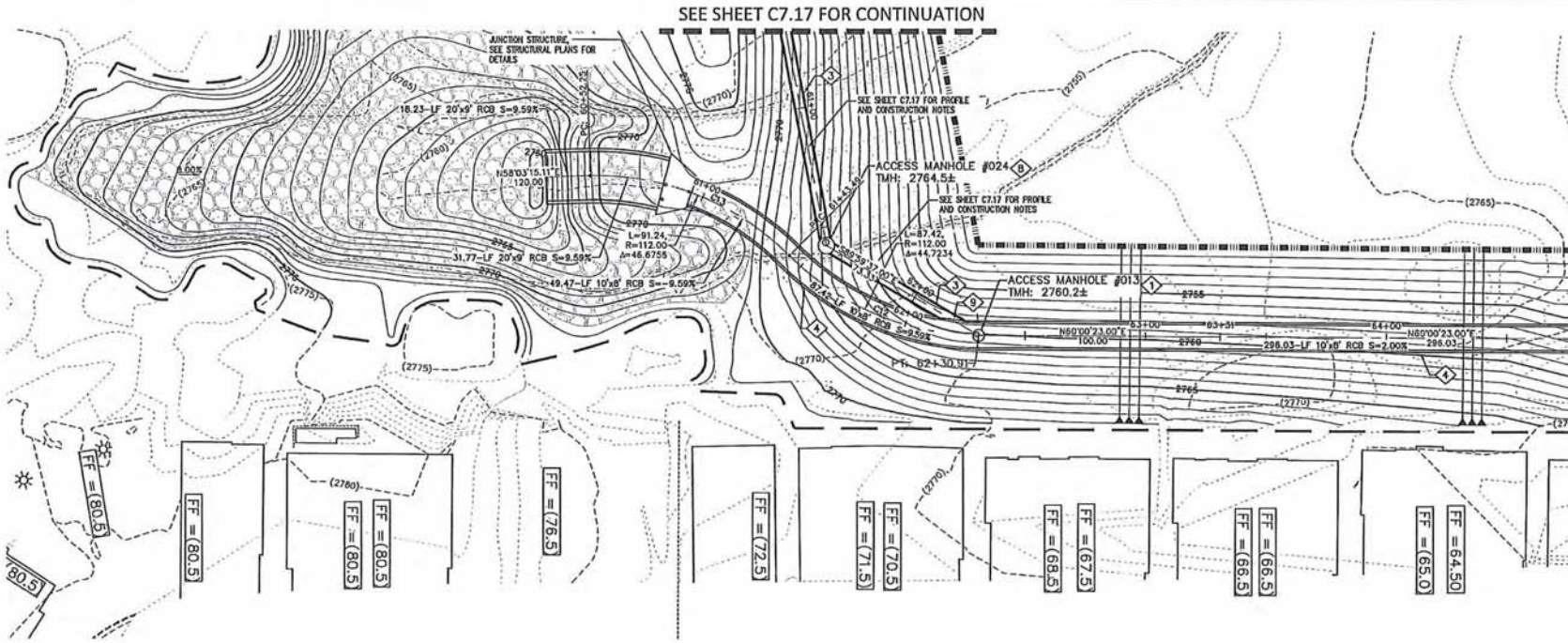
STORM DRAIN PLAN

HORIZ SCALE: 1" = 30'
VERT SCALE: 1" = 10'

Curve Table			
Curve #	Length	Radius	Del
C10	58.62	112.00	029.9
C11	82.89	112.00	042.4



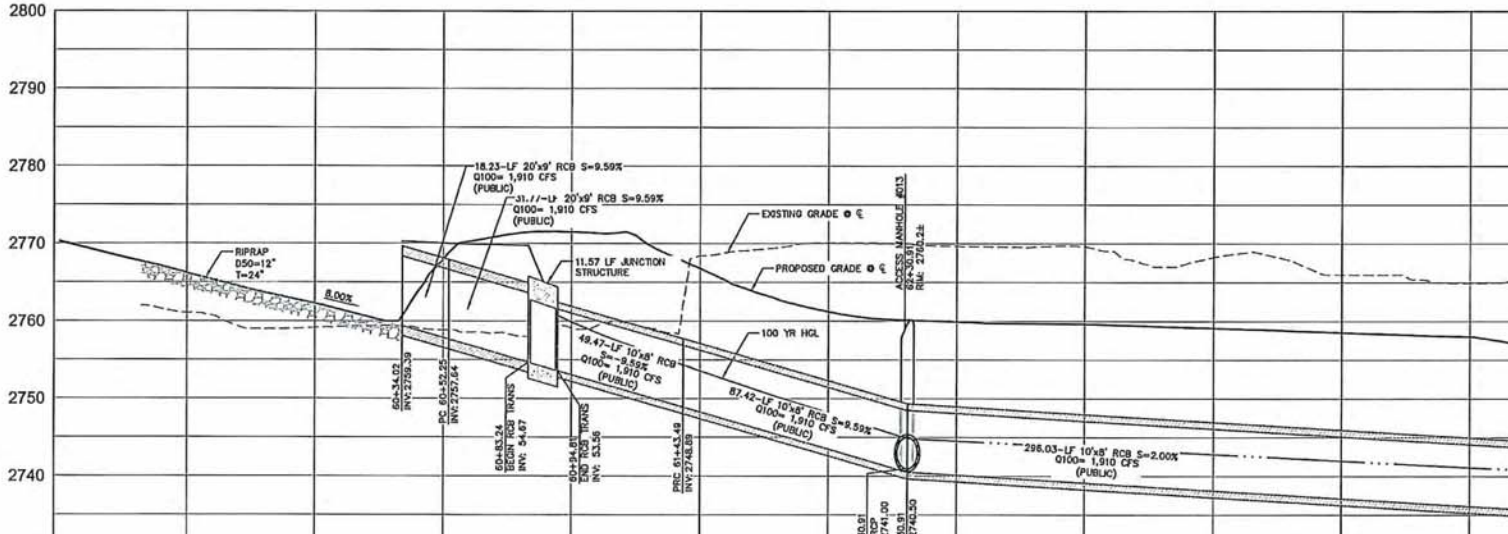
REPLY APP 1090



STORM DRAIN PLAN

HORIZ SCALE: 1" = 30'
VERT SCALE: 1" = 10'

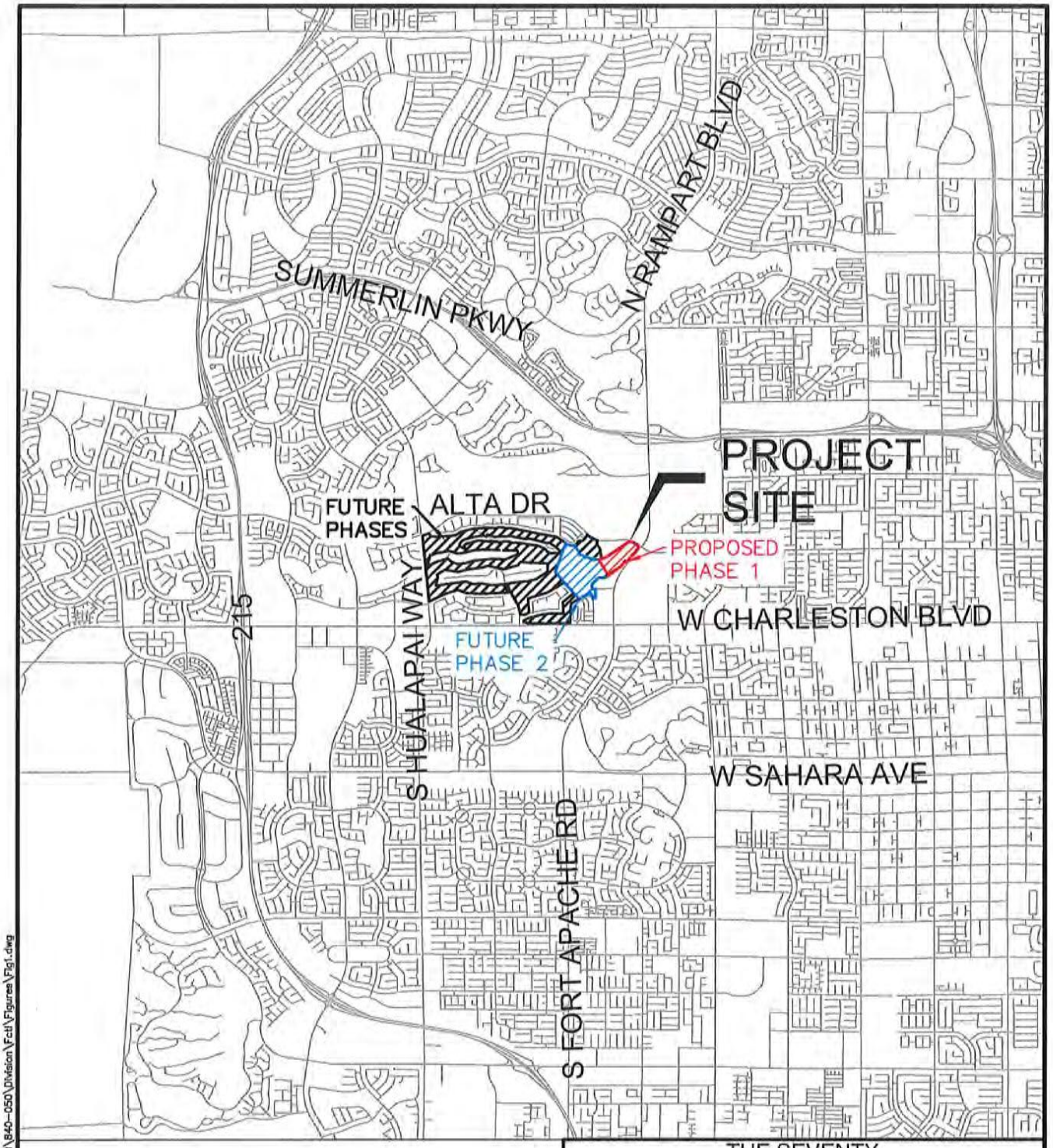
Curve Table			
Curve #	Length	Radius	Del
C12	87.42	112.00	044.7
C13	91.24	112.00	046.6



REPLY APP 1091

APPENDIX E

REVISED DRAINAGE EXHIBITS



THE SEVENTY
SEVENTY ACRES LLC, FORE STARS LTD, AND 180 LAND CO LLC

GRAPHIC SCALE

5000 0 2500 5000

(IN FEET)

1 inch = 5000 ft.

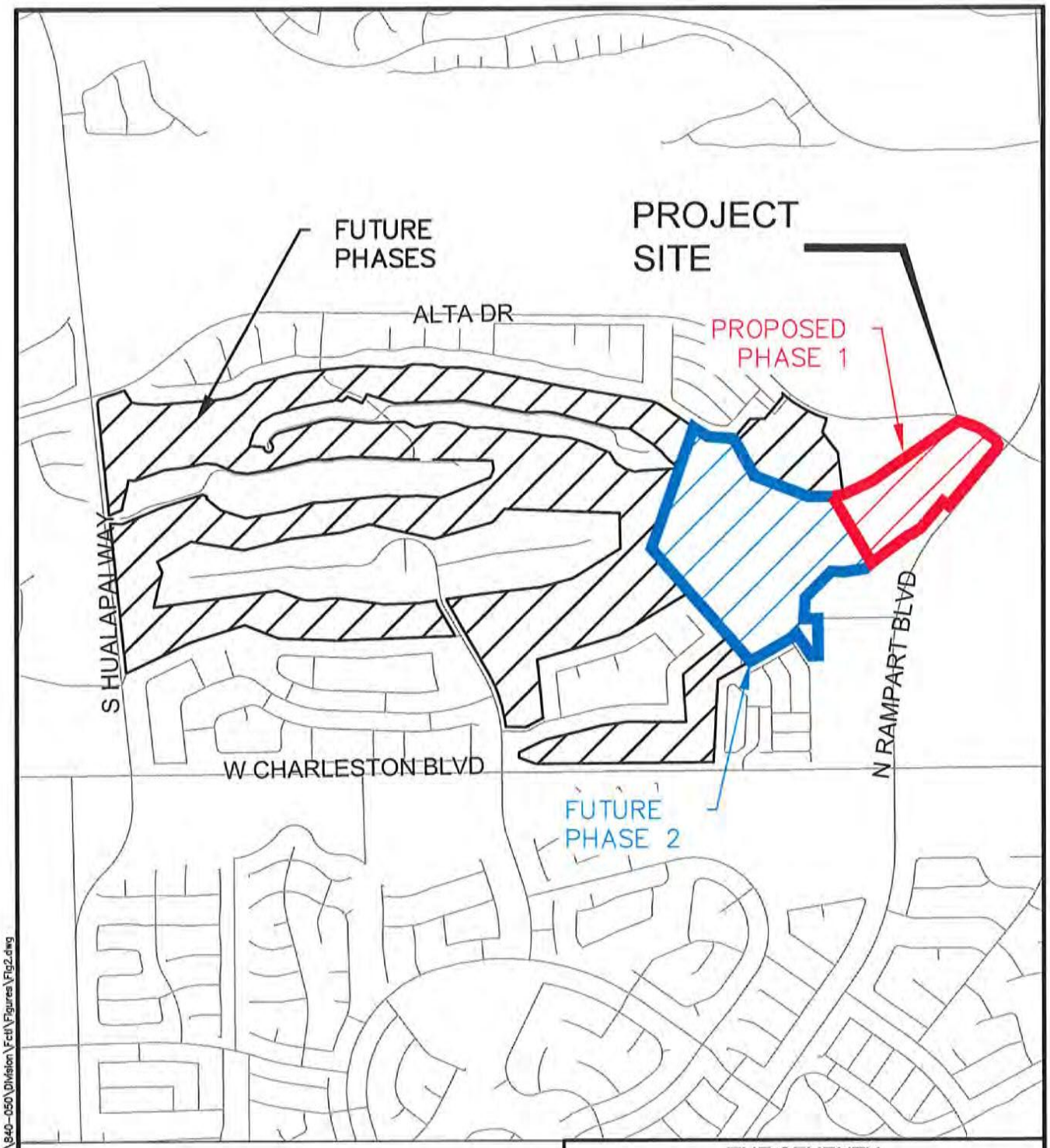
NORTH

FIGURE 1

VICINITY MAP

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

nbaggs 08-25-17 14:17:06 F:\Projects\800\840-050\Division\Fctl\Figures\Fig1.dwg



GRAPHIC SCALE

1200 0 600 1200

(IN FEET)

1 inch = 1200 ft.

NORTH

THE SEVENTY
SEVENTY ACRES LLC, FORE STARS LTD, AND 180 LAND CO LLC

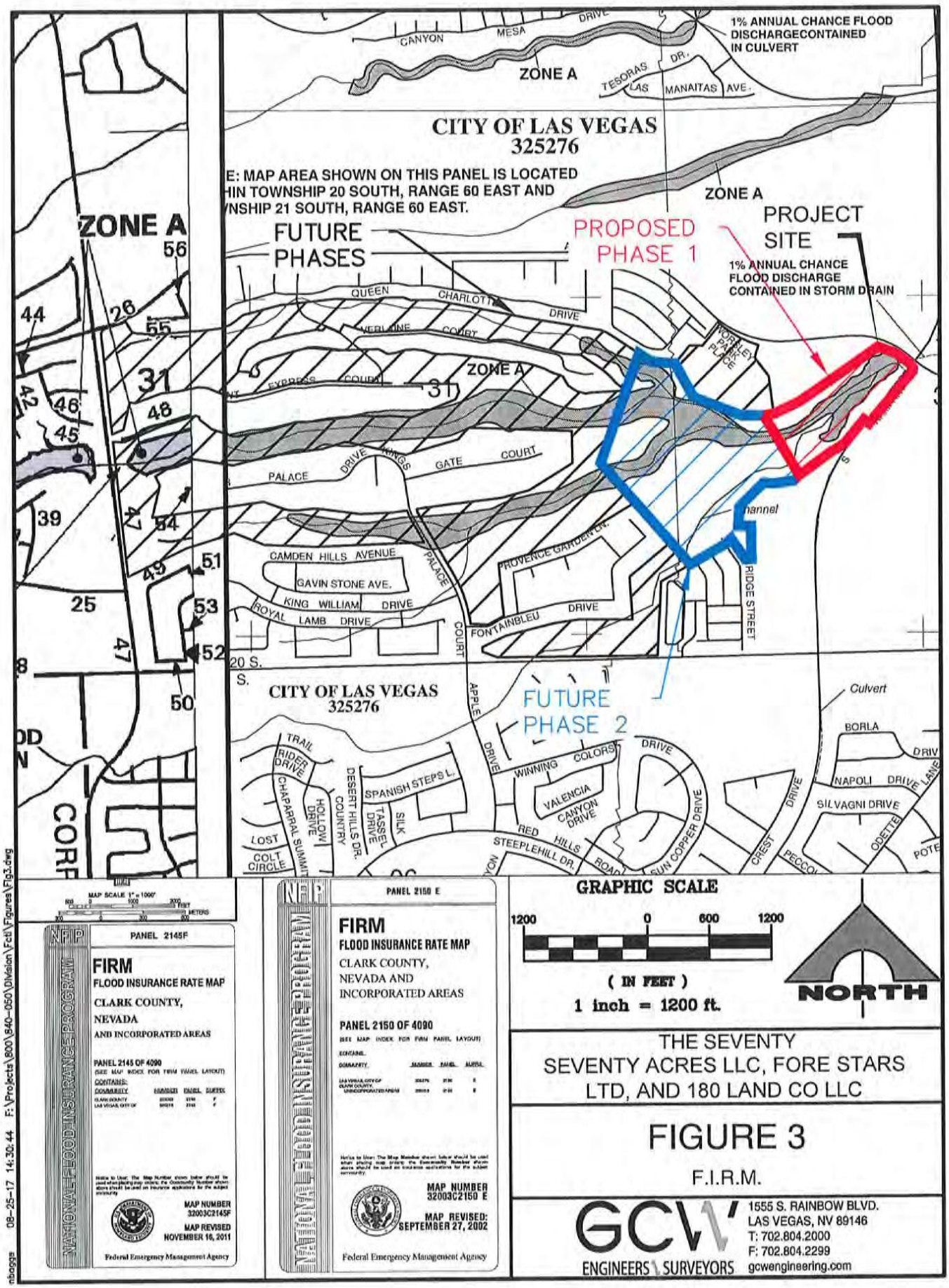
FIGURE 2

LOCATION MAP

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

08-25-17 14:25:12 F:\Projects\800\840-050\Division\Fctl\Figures\Fig2.dwg

nbaggs


1% ANNUAL CHANCE FLOOD DISCHARGECONTAINED IN CULVERT
ZONE A
CANYON
MESA
DRIVE
TESORAS
DR.
LAS
MANAITAS
AVE.
CITY OF LAS VEGAS
325276
E: MAP AREA SHOWN ON THIS PANEL IS LOCATED
HIN TOWNSHIP 20 SOUTH, RANGE 60 EAST AND
WNSHIP 21 SOUTH, RANGE 60 EAST.
ZONE A
FUTURE PHASES
PROPOSED PHASE 1
PROJECT SITE
1% ANNUAL CHANCE FLOOD DISCHARGE CONTAINED IN STORM DRAIN
QUEEN
CHARLOTTE
DRIVE
WERLINE
COURT
EXPRESS
COURT
ZONE A
PALACE
DRIVE
KINGS
GATE
COURT
CAMDEN HILLS AVENUE
GAVIN STONE AVE.
KING WILLIAM
DRIVE
ROYAL
LAMB
DRIVE
PALACE
COURT
PROVENCE GARDEN LN.
FONTAINBLEU
DRIVE
RIDGE STREET
CITY OF LAS VEGAS
325276
FUTURE PHASE 2
APPLE
DRIVE
Culvert
TRAIL
RIDER DRIVE
CHAPARRAL SUMMIT
HOLLOW DRIVE
DESERT HILLS DR.
COUNTRY
SPANISH STEPS L.
TASSEL DRIVE
SILK
LOST
COLT CIRCLE
WINNING
COLORS
DRIVE
VALENCIA
CANYON DRIVE
RED
HILLS
STEEPLEHILL DR.
SUN COPPER DRIVE
CREST
DRIVE
BORLA
NAPOLI
DRIVE
SILVAGNI DRIVE
ODETTE
MAP SCALE 1" = 1000'
PANEL 2145F
FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY,
NEVADA
AND INCORPORATED AREAS
PANEL 2145 OF 4090
MAP NUMBER
32003C2145F
MAP REVISED
NOVEMBER 16, 2011
Federal Emergency Management Agency
PANEL 2150 E
FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY,
NEVADA AND
INCORPORATED AREAS
PANEL 2150 OF 4090
MAP NUMBER
32003C2150 E
MAP REVISED:
SEPTEMBER 27, 2002
Federal Emergency Management Agency
GRAPHIC SCALE
1200 0 600 1200
(IN FEET)
1 inch = 1200 ft.
NORTH
THE SEVENTY
SEVENTY ACRES LLC, FORE STARS
LTD, AND 180 LAND CO LLC
FIGURE 3
F.I.R.M.
GCW
ENGINEERS \ SURVEYORS
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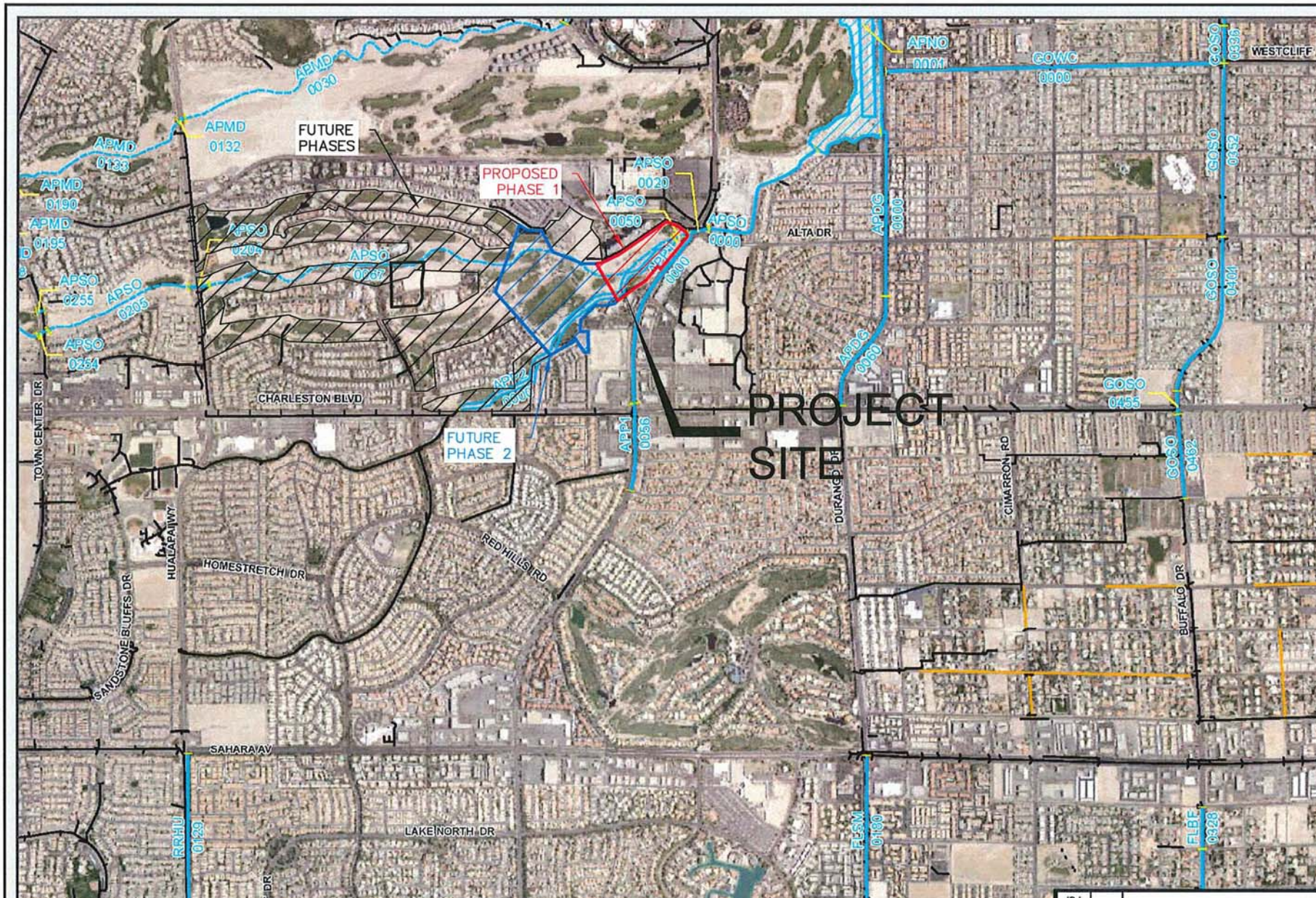

ID / River Mile	Status	Facility Description
APMD		ANGEL PARK - MIDDLE BRANCH
0027	E	1: 12' X 10' and 2: 12' X 2' RCBC @ Canyon Run
0030	E	Natural Wash
0132	E	2: 12'x10' RCBC @ Hualapai
0133	E	Natural Wash
APNO		ANGEL PARK NORTH
0001	E	1,512 ac-ft Angel Park Detenlion Basin
APP1		ANGEL PARK - PECCOLE 1

REPLY APP 1096