PETRA GROUP, INC.
CIVIL ENGINEERING – SURVEYING
13840 DOS PALMAS ROAD
VICTORVILLE, CA 92392

PHONE: (760) 792-9875
FAX: (760) 241-9153
www.petraengineering.com

PRELIMINARY DRAINAGE STUDY

TTM 18516
APN 0583-291-01-0000
& 0583-301-01-0000

RECEIVED
JAN 04 2008
PLANNING DIVISION

LOCATED BETWEEN
PALO VERDE ROAD AND
PIONEER DRIVE

SAN BERNARDINO COUNTY
CALIFORNIA

PREPARED FOR
DONNA YERMAN
49430 ASPEN DRIVE
MORONGO VALLEY, CA 92256

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LOCATED BETWEEN
PALO VERDE ROAD
AND PIONEER DRIVE

SAN BERNARDINO COUNTY
CALIFORNIA

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- 70' Wide Channel Capacity Calculation
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- Hydrologic Soils Group Map

REGISTERED PROFESSIONAL ENGINEER
NASHAT I. MUWANES
No. C 67518
Exp. 06/30/09
CIVIL
STATE OF CALIFORNIA

HYDROLOGY

Rational Method as described in the San Bernardino County Hydrology Manual was used to calculate Onsite and Offsite Q_{100}. The Unit Hydrograph Method as described in the San Bernardino County Hydrology Manual was used to calculate the Offsite Q_{100}.The Soil Type obtained from the "S.C.S." Soils Group Map for the South-Central area of the San Bernardino County is Soil Group "B". The calculations are based on Soil Group "B". The Rainfall Intensity is based on the "San Bernardino County" Standard Intensity-Duration Curves Data.

DISCUSSION

EXISTING CONDITIONS

The **69.34** acres parcel map of **APN# 0583-291-01-0000 & 0583-301-01-0000** is presently vacant. The existing use of the site is Vacant RL. There are no indications that the site has ever been developed. Similar vacant lands bound the site to the Northeast. A well developed residential development bounds the site to the Southeast of property with few more developments on all others sides. The Palo Verde Road, San Jacinto Street and Pioneer Drive, which provide access to the site, are unimproved dirt roads. The area in general slopes from the Northwest to the Southeast with a $\pm$ 6 % slope.

EXISTING SITE DRAINAGE

The area in study generally drains from the Northwest to the Southeast. There is no indication that site is located in any zone of the flood insurance rate map for the San Bernardino county.

There is 876.76 acres of offsite drainage area that will affect our study site. (Refer Watershed Map).

The surrounding properties that contribute to the offsite drainage area are to the Northwest of our study site. There will be no street improvement or grading at this time.

There is no significant change in the drainage character following future development of the project site. The surface water onsite runoff generated from the proposed site will be conveyed to the North East boundary of the project site, without causing objectionable backwater, excessive velocities, erosion or unduly affecting local traffic.

The proposed drainage plan, the existing and proposed topography and flow paths will be shown on the grading plans, which will cover the proposed development site and will be submitted to the County of San Bernardino. The plan also will show that the proposed drainage conditions from the development site will have no negative impact in the neighboring lots.

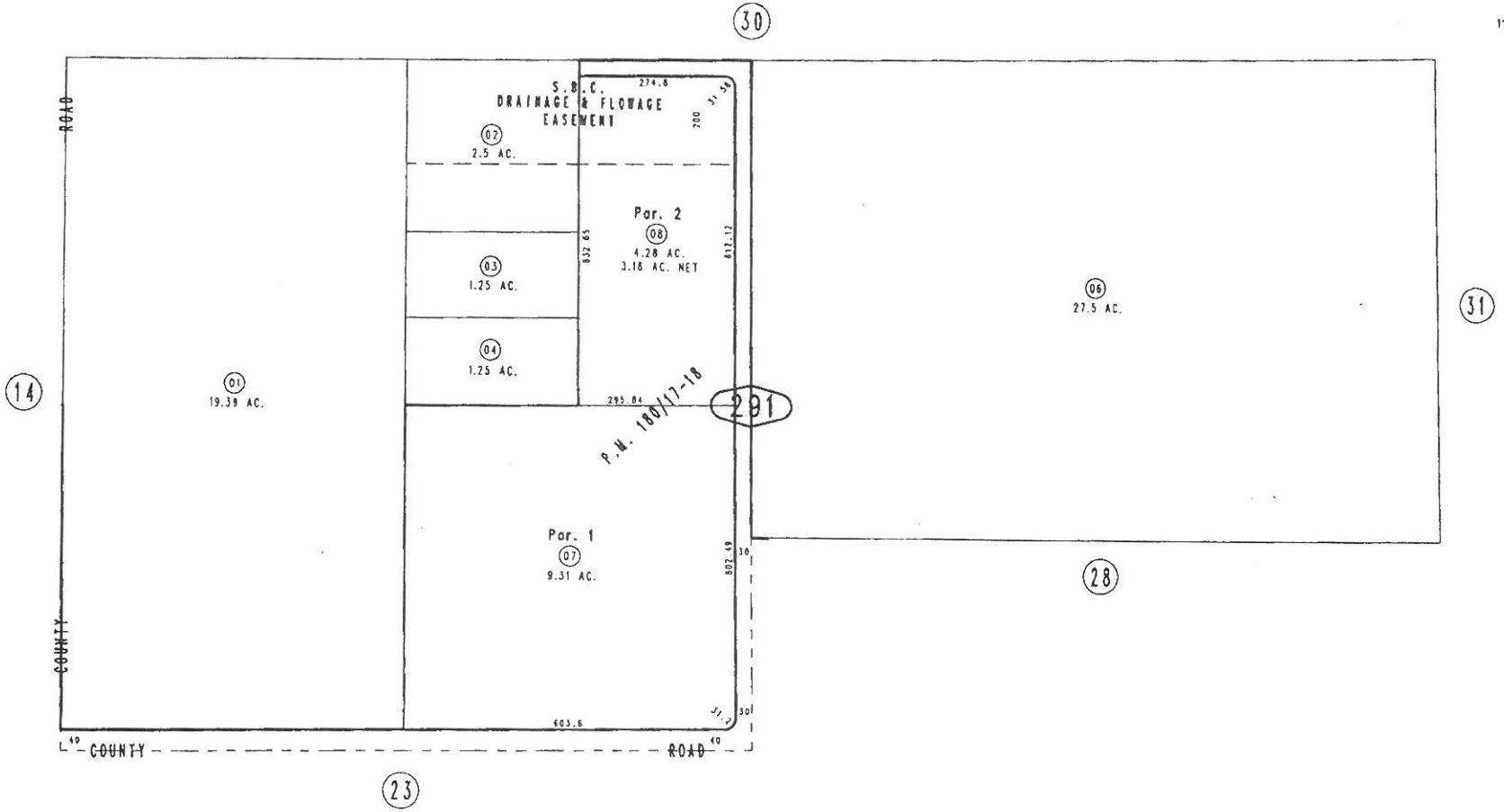
THIS MAP IS FOR THE PURPOSE OF AD VALOREM TAXATION ONLY.

Ptn. S.1/2, N.W.1/4 Sec.28, T.1S.,R.4E., S.B.B.&M.

Morongo Unified
Tax Rate Area
94068

0583-29

1"=200'



January 2005

Parcel Map No. 14764, P.M. 180/17-18

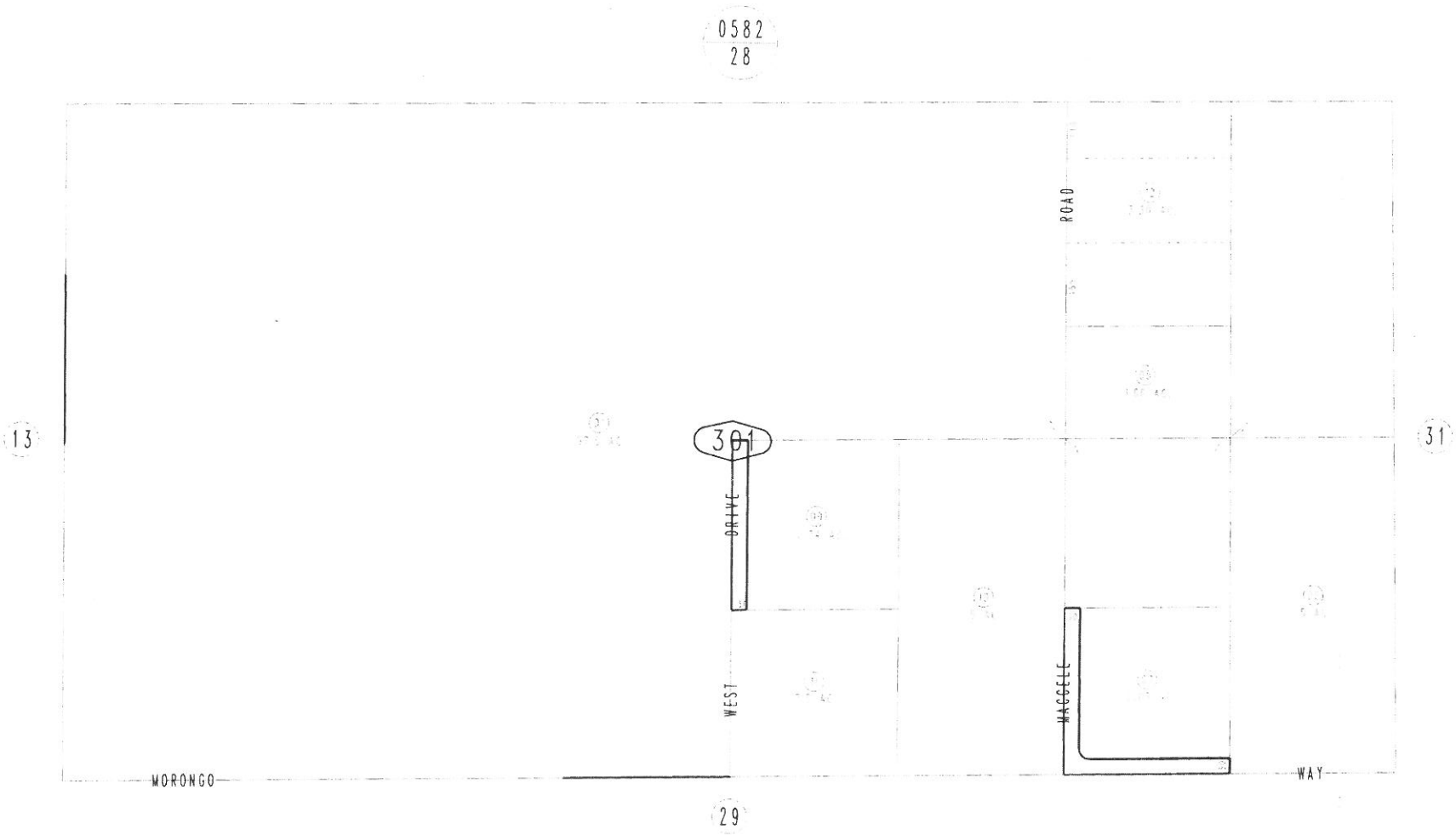
Assessor's Map
Book 0583 Page 29
San Bernardino County

REVISED

N.1/2, N.W.1/4 Sec.28, T.1S.,R.4E., S.B.B.&M.

Morongo Unified
Tax Rate Area
94011

0583- 30



January 2005

Assessor's Map
Book 0583 Page 30
San Bernardino County

TENTATIVE TRACT MAP 18516

BEING A SUBDIVISION OF PORTION OF SECTION 28, TOWNSHIP 1 SOUTH, RANGE 4 EAST, SAN BERNARDINO BASE AND MERIDIAN.

PETRA GROUP NOVEMBER, 2007

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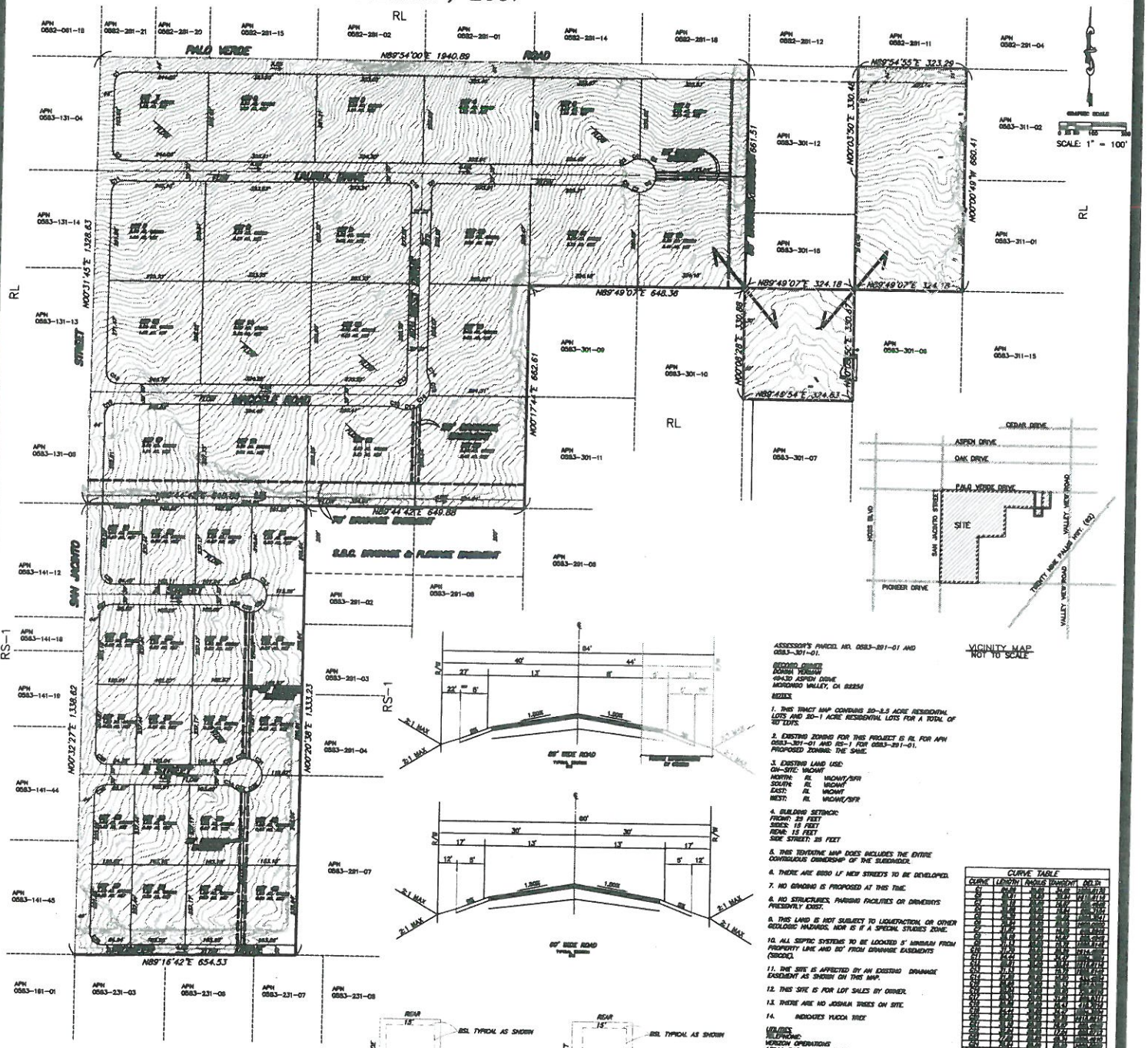

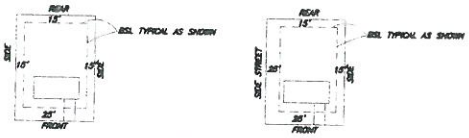

TYPICAL BUILDING SETBACKS

ASSESSOR'S PARCEL NO. 0583-291-01 AND 0583-301-01.

OWNER/ DEVELOPER
JOHNN YOUNG
49430 ASPEN DRIVE
MORONGO VALLEY, CA 92256

NOTES:

1. THIS TRACT MAP CONSISTS 20-2.5 ACRE RESIDENTIAL LOTS AND 20-1 ACRE RESIDENTIAL LOTS FOR A TOTAL OF 40 LOTS.
2. EXISTING ZONING FOR THIS PROJECT IS RL FOR APN 0583-301-01 AND RS-1 FOR 0583-291-01. PROPOSED ZONING: THE SAME.
3. EXISTING LAND USE:
   ON-SITE: VACANT
   NORTH: RL VACANT/SFR
   SOUTH: RL VACANT
   EAST: RL VACANT
   WEST: RL VACANT/SFR
4. BUILDING SETBACK:
   FRONT: 25 FEET
   SIDES: 15 FEET
   REAR: 15 FEET
   SIDE STREET: 25 FEET
5. THIS TENTATIVE MAP DOES INCLUDES THE ENTIRE CONTIGUOUS OWNERSHIP OF THE SUBDIVIDER.
6. THERE ARE 6550 LF NEW STREETS TO BE DEVELOPED.
7. NO GRADING IS PROPOSED AT THIS TIME.
8. NO STRUCTURES, PARKING FACILITIES OR DRIVEWAYS PRESENTLY EXIST.
9. THIS LAND IS NOT SUBJECT TO LIQUEFACTION, OR OTHER GEOLOGIC HAZARDS, NOR IS IT A SPECIAL STUDIES ZONE.
10. ALL SEPTIC SYSTEMS TO BE LOCATED 5' MINIMUM FROM PROPERTY LINE AND 50' FROM DRAINAGE EASEMENTS (SBCDC).
11. THE SITE IS AFFECTED BY AN EXISTING DRAINAGE EASEMENT AS SHOWN ON THIS MAP.
12. THIS SITE IS FOR LOT SALES BY OWNER.
13. THERE ARE NO JOSHUA TREES ON SITE.
14. INDICATES YUCCA TREE

UTILITIES:
TELEPHONE:
VERIZON OPERATIONS
13911 PARK AVE. STE. 300
VICTORVILLE, CA 92392
(760) 241-4003

ELECTRIC:
SOUTHERN CALIFORNIA EDISON
12353 MESPOTH ROAD
VICTORVILLE, CA 92392
(760) 242-3314

CABLE T.V.:
SATELLITE

SEWER:
SEPTIC

GAS:
PROPANE

WATER:
ONSITE PRIVATE WELLS

CURVE TABLE

CURVE	LENGTH	RADIUS	TANGENT	DELTA
C1	20.00	20.00	20.00	90°00'00"
C2	31.42	20.00	20.00	90°00'00"
C3	31.42	20.00	20.00	90°00'00"
C4	31.42	20.00	20.00	90°00'00"
C5	31.42	20.00	20.00	90°00'00"
C6	31.42	20.00	20.00	90°00'00"
C7	31.42	20.00	20.00	90°00'00"
C8	31.42	20.00	20.00	90°00'00"
C9	31.42	20.00	20.00	90°00'00"
C10	31.42	20.00	20.00	90°00'00"
C11	31.42	20.00	20.00	90°00'00"
C12	31.42	20.00	20.00	90°00'00"
C13	31.42	20.00	20.00	90°00'00"
C14	31.42	20.00	20.00	90°00'00"
C15	31.42	20.00	20.00	90°00'00"
C16	31.42	20.00	20.00	90°00'00"
C17	31.42	20.00	20.00	90°00'00"
C18	31.42	20.00	20.00	90°00'00"
C19	31.42	20.00	20.00	90°00'00"
C20	31.42	20.00	20.00	90°00'00"
C21	31.42	20.00	20.00	90°00'00"
C22	31.42	20.00	20.00	90°00'00"
C23	31.42	20.00	20.00	90°00'00"
C24	31.42	20.00	20.00	90°00'00"
C25	31.42	20.00	20.00	90°00'00"
C26	31.42	20.00	20.00	90°00'00"
C27	31.42	20.00	20.00	90°00'00"
C28	31.42	20.00	20.00	90°00'00"
C29	31.42	20.00	20.00	90°00'00"
C30	31.42	20.00	20.00	90°00'00"
C31	31.42	20.00	20.00	90°00'00"
C32	31.42	20.00	20.00	90°00'00"
C33	31.42	20.00	20.00	90°00'00"
C34	31.42	20.00	20.00	90°00'00"
C35	31.42	20.00	20.00	90°00'00"
C36	31.42	20.00	20.00	90°00'00"
C37	31.42	20.00	20.00	90°00'00"
C38	31.42	20.00	20.00	90°00'00"
C39	31.42	20.00	20.00	90°00'00"
C40	31.42	20.00	20.00	90°00'00"

MAP REVISED NOVEMBER 16, 2007

PETRA GROUP, INC.
13940 SOB PALMAS ROAD
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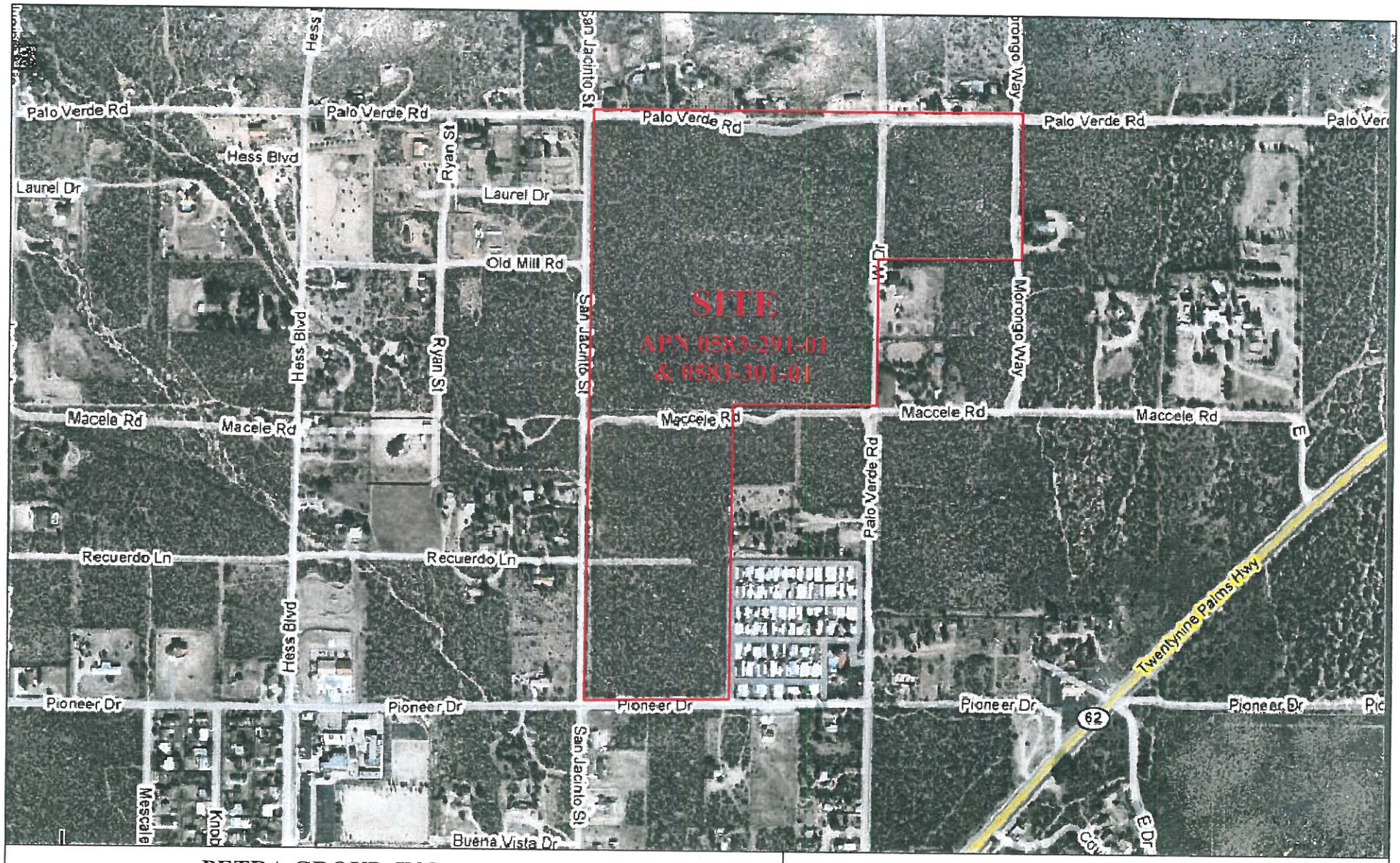
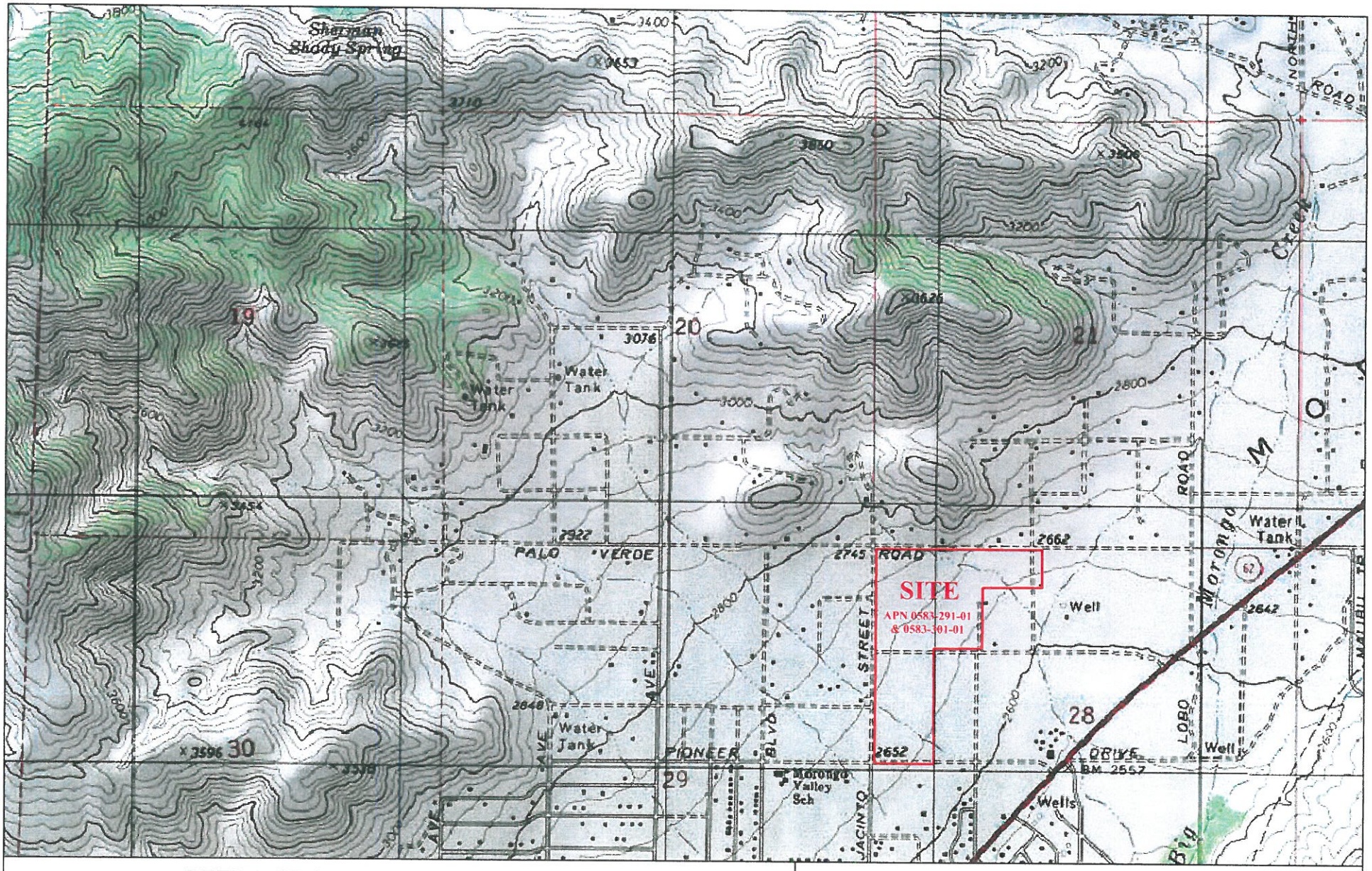
PREPARED BY: 04/28/2006
ROBERT L. MOSHER



PETRA GROUP, INC.	APN 0583-291-01 & 0583-301-01
13840 DOS PALMAS ROAD	
VICTORVILLE, CA 92392	AERIAL MAP
PHONE(760)792-9875 FAX(760)241-9153	



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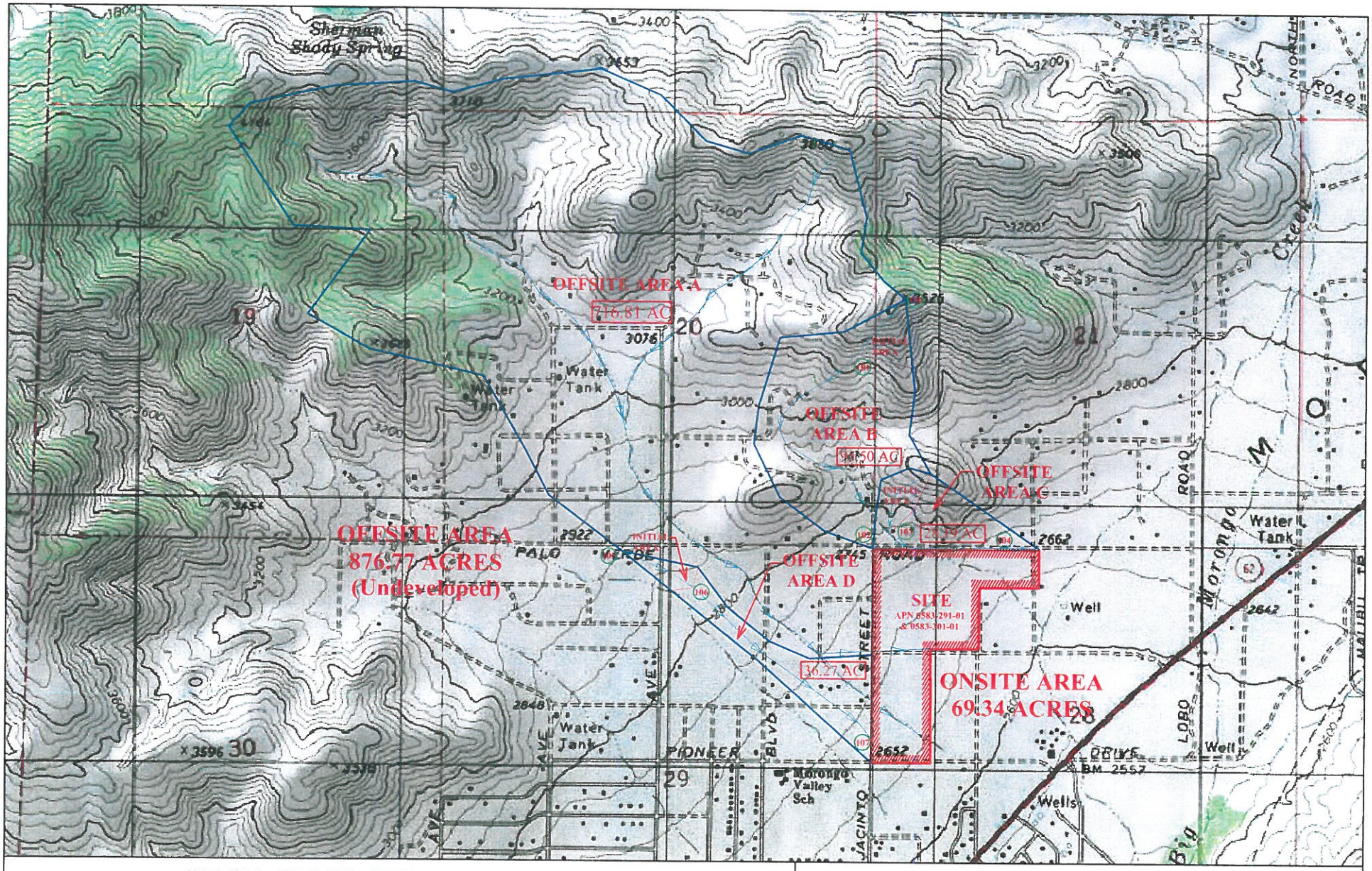
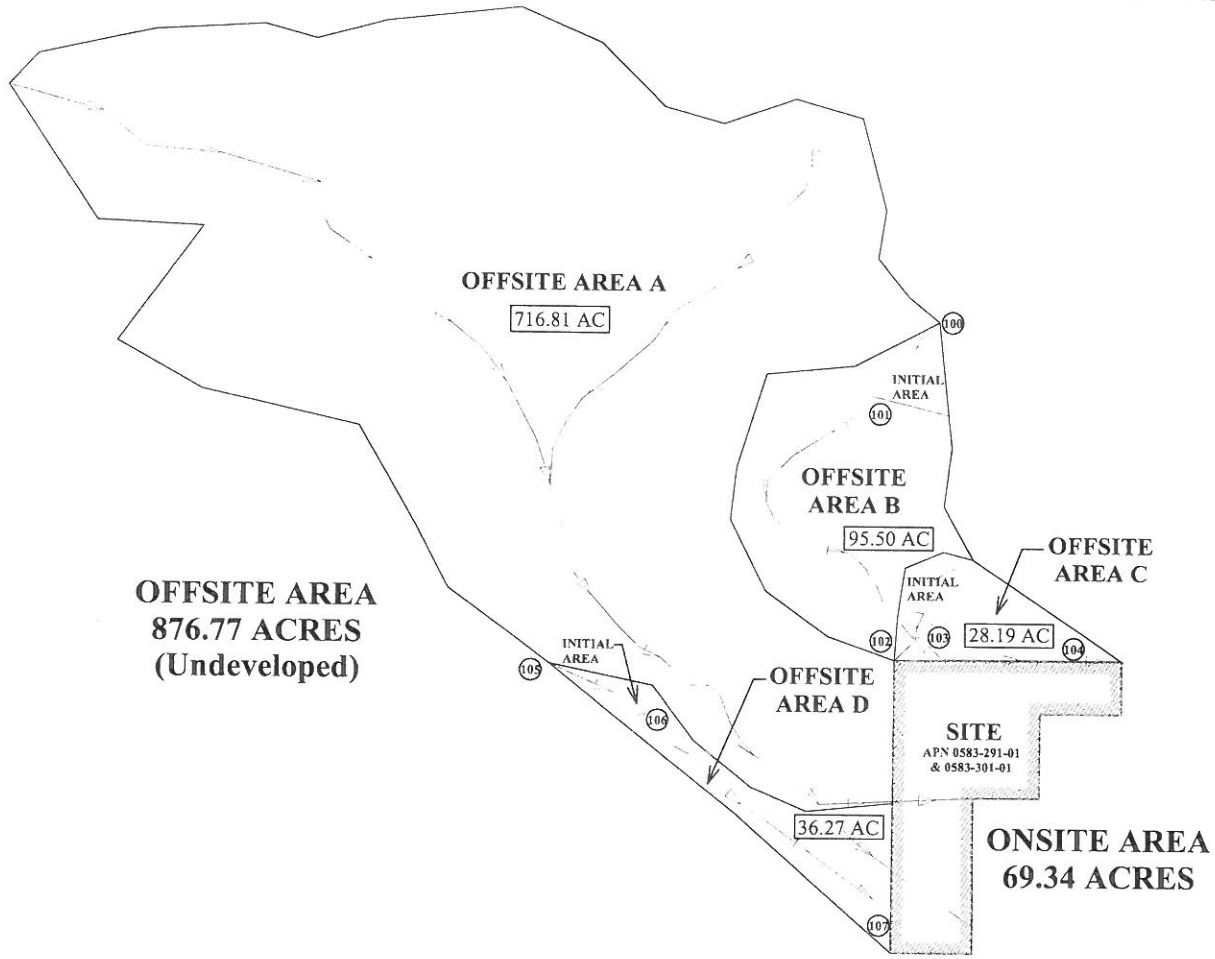
13840 DOS PALMAS ROAD	
VICTORVILLE, CA 92392	USGS TOPO MAP
PHONE(760)792-9875 FAX(760)241-9153	



PETRA GROUP, INC.	APN 0583-291-01 & 0583-301-01
13840 DOS PALMAS ROAD	
VICTORVILLE, CA 92392	USGS HYDROLOGY MAP
PHONE(760)792-9875 FAX(760)241-9153	



SOIL GROUP B, 60 MINUTE RAINFALL=1.20in/hr

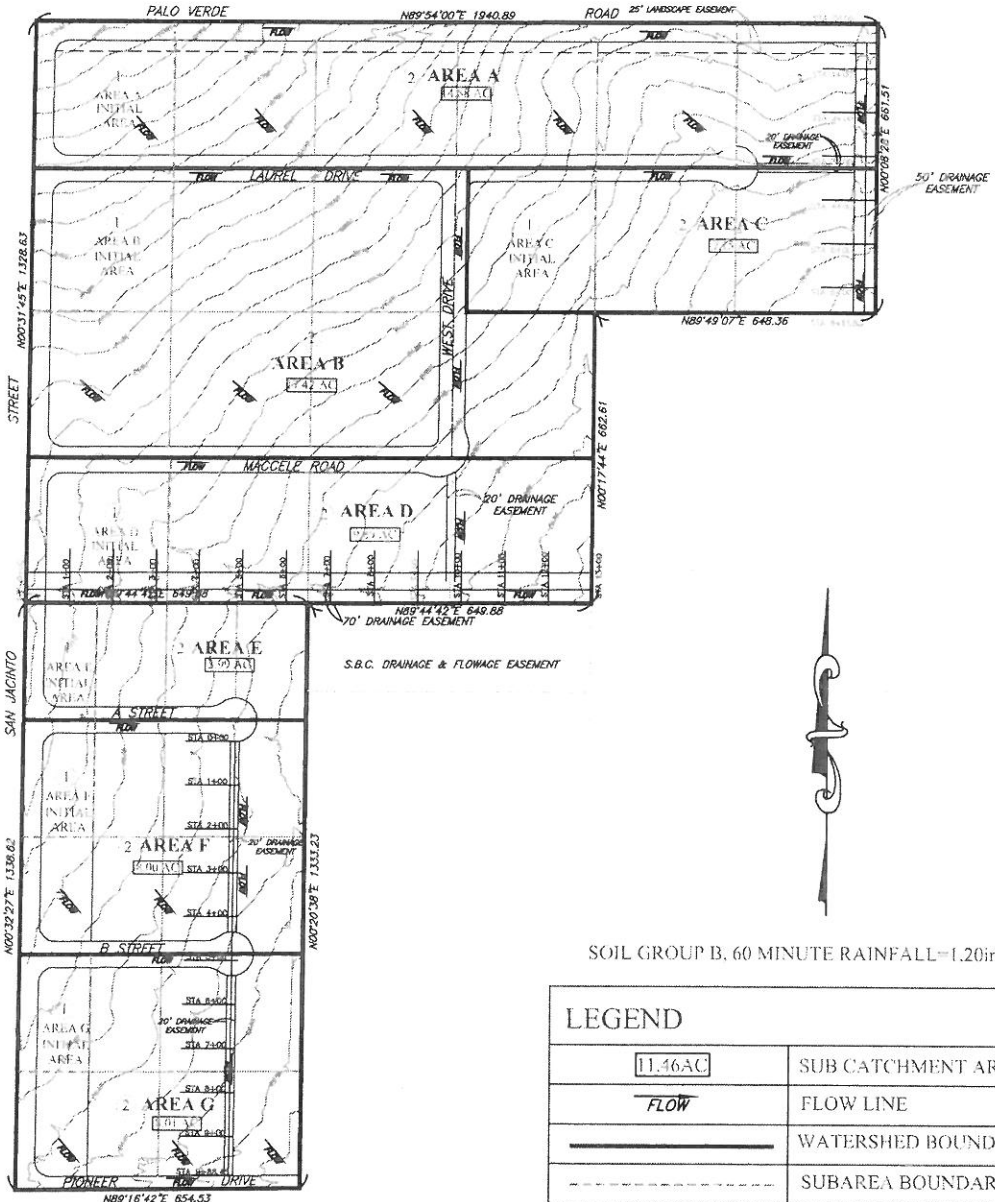
LEGEND	
104	NODE NUMBER
11.46AC	SUB CATCHMENT AREA
	FLOW LINE
	WATERSHED BOUNDARY
	SUBAREA BOUNDARY

PETRA GROUP, INC.

13840 DOS PALMAS ROAD
VICTORVILLE, CA 92392
TEL (760) 792-9875 * FAX (760) 241-9153

PREPARED BY:
NASHAT I. MUWANES RCE NO. C67518

APN 0583-291-01-0000 & 0583-301-01-0000 OFFSITE DRAINAGE AREAS



SOIL GROUP B, 60 MINUTE RAINFALL=1.20in/hr

LEGEND	
11.46AC	SUB CATCHMENT AREA
FLOW	FLOW LINE
———	WATERSHED BOUNDARY
- - - - -	SUBAREA BOUNDARY
2	SUBAREA

PETRA GROUP, INC.

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PREPARED BY:
NASHAT I. MUWANES RCE NO. C67518

APN 0583-291-01-0000 &
0583-301-01-0000
ONSITE DRAINAGE AREAS

U n i t H y d r o g r a p h A n a l y s i s

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Study date 12/27/07

++++++

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
69.0	86.2	716.81	1.000	0.262	1.000	0.262

Area-averaged adjusted loss rate Fm (In/Hr) = 0.262

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
716.81	1.000	69.0	86.2	1.60	0.612

Area-averaged catchment yield fraction, Y = 0.612
Area-averaged low loss fraction, Yb = 0.388
++
Watercourse length = 10235.00(Ft.)
Length from concentration point to centroid = 5112.50(Ft.)
Elevation difference along watercourse = 1300.00(Ft.)
Mannings friction factor along watercourse = 0.030
Watershed area = 716.81(Ac.)
Catchment Lag time = 0.266 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 31.3767
Hydrograph baseflow = 10.00(CFS)
Average maximum watershed loss rate(Fm) = 0.262(In/Hr)
Average low loss rate fraction (Yb) = 0.388 (decimal)
VALLEY UNDEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.444(In)
Computed peak 30-minute rainfall = 0.909(In)
Specified peak 1-hour rainfall = 1.200(In)
Computed peak 3-hour rainfall = 1.641(In)
Specified peak 6-hour rainfall = 2.000(In)
Specified peak 24-hour rainfall = 3.600(In)

Rainfall depth area reduction factors:
Using a total area of 716.81(Ac.) (Ref: fig. E-4)

5-minute factor = 0.966	Adjusted rainfall = 0.429(In)
30-minute factor = 0.966	Adjusted rainfall = 0.879(In)
1-hour factor = 0.966	Adjusted rainfall = 1.160(In)
3-hour factor = 0.996	Adjusted rainfall = 1.634(In)
6-hour factor = 0.998	Adjusted rainfall = 1.996(In)
24-hour factor = 0.999	Adjusted rainfall = 3.597(In)

U n i t H y d r o g r a p h
++

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))

(K = 8668.92 (CFS))

1	3.082	267.175
2	14.620	1000.229
3	34.531	1726.077
4	54.859	1762.225
5	66.907	1044.451
6	73.787	596.385
7	78.412	400.960
8	82.023	313.020
9	84.956	254.232
10	87.325	205.417
11	89.267	168.342
12	90.971	147.656
13	92.345	119.168
14	93.455	96.180
15	94.445	85.862
16	95.390	81.873
17	96.190	69.360
18	96.866	58.633
19	97.448	50.482
20	97.965	44.771
21	98.400	37.723
22	98.746	29.989
23	99.060	27.200
24	99.374	27.200
25	99.687	27.200
26	100.000	27.109

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4292	0.4292
2	0.5663	0.1371
3	0.6661	0.0997
4	0.7473	0.0812
5	0.8171	0.0698
6	0.8789	0.0618
7	0.9348	0.0559
8	0.9861	0.0513
9	1.0336	0.0476
10	1.0781	0.0445
11	1.1200	0.0419
12	1.1597	0.0397
13	1.1890	0.0294
14	1.2169	0.0278
15	1.2434	0.0265
16	1.2687	0.0253
17	1.2930	0.0243
18	1.3162	0.0233
19	1.3387	0.0224
20	1.3603	0.0216
21	1.3812	0.0209
22	1.4014	0.0202
23	1.4210	0.0196
24	1.4400	0.0190
25	1.4585	0.0185
26	1.4764	0.0180
27	1.4939	0.0175

28	1.5110	0.0171
29	1.5277	0.0167
30	1.5439	0.0163
31	1.5598	0.0159
32	1.5754	0.0155
33	1.5906	0.0152
34	1.6055	0.0149
35	1.6201	0.0146
36	1.6344	0.0143
37	1.6473	0.0129
38	1.6600	0.0127
39	1.6725	0.0125
40	1.6847	0.0122
41	1.6968	0.0120
42	1.7086	0.0118
43	1.7202	0.0116
44	1.7316	0.0114
45	1.7429	0.0112
46	1.7539	0.0111
47	1.7648	0.0109
48	1.7756	0.0107
49	1.7862	0.0106
50	1.7966	0.0104
51	1.8069	0.0103
52	1.8170	0.0101
53	1.8270	0.0100
54	1.8368	0.0099
55	1.8466	0.0097
56	1.8562	0.0096
57	1.8657	0.0095
58	1.8750	0.0094
59	1.8843	0.0093
60	1.8934	0.0091
61	1.9025	0.0090
62	1.9114	0.0089
63	1.9202	0.0088
64	1.9290	0.0087
65	1.9376	0.0086
66	1.9461	0.0085
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68	1.9629	0.0084
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73	2.0073	0.0117
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75	2.0304	0.0115
76	2.0419	0.0115
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78	2.0646	0.0113
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134	2.5984	0.0083
135	2.6066	0.0082
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137	2.6229	0.0082
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144	2.6791	0.0079
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154	2.7566	0.0076
155	2.7642	0.0076
156	2.7718	0.0076
157	2.7793	0.0075
158	2.7868	0.0075
159	2.7943	0.0075
160	2.8018	0.0075
161	2.8092	0.0074
162	2.8166	0.0074
163	2.8240	0.0074
164	2.8313	0.0073
165	2.8386	0.0073
166	2.8459	0.0073
167	2.8532	0.0073
168	2.8605	0.0072
169	2.8677	0.0072
170	2.8749	0.0072
171	2.8821	0.0072
172	2.8892	0.0072
173	2.8963	0.0071
174	2.9034	0.0071
175	2.9105	0.0071
176	2.9176	0.0071
177	2.9246	0.0070
178	2.9316	0.0070
179	2.9386	0.0070
180	2.9456	0.0070
181	2.9525	0.0069
182	2.9594	0.0069
183	2.9663	0.0069
184	2.9732	0.0069
185	2.9801	0.0069
186	2.9869	0.0068
187	2.9937	0.0068
188	3.0005	0.0068
189	3.0073	0.0068
190	3.0140	0.0068
191	3.0208	0.0067
192	3.0275	0.0067
193	3.0342	0.0067
194	3.0408	0.0067
195	3.0475	0.0067
196	3.0541	0.0066
197	3.0607	0.0066
198	3.0673	0.0066

199	3.0739	0.0066
200	3.0804	0.0066
201	3.0870	0.0065
202	3.0935	0.0065
203	3.1000	0.0065
204	3.1065	0.0065
205	3.1129	0.0065
206	3.1194	0.0064
207	3.1258	0.0064
208	3.1322	0.0064
209	3.1386	0.0064
210	3.1450	0.0064
211	3.1513	0.0064
212	3.1577	0.0063
213	3.1640	0.0063
214	3.1703	0.0063
215	3.1766	0.0063
216	3.1829	0.0063
217	3.1891	0.0063
218	3.1954	0.0062
219	3.2016	0.0062
220	3.2078	0.0062
221	3.2140	0.0062
222	3.2201	0.0062
223	3.2263	0.0062
224	3.2324	0.0061
225	3.2386	0.0061
226	3.2447	0.0061
227	3.2508	0.0061
228	3.2568	0.0061
229	3.2629	0.0061
230	3.2690	0.0060
231	3.2750	0.0060
232	3.2810	0.0060
233	3.2870	0.0060
234	3.2930	0.0060
235	3.2990	0.0060
236	3.3049	0.0060
237	3.3109	0.0059
238	3.3168	0.0059
239	3.3227	0.0059
240	3.3286	0.0059
241	3.3345	0.0059
242	3.3404	0.0059
243	3.3462	0.0059
244	3.3521	0.0058
245	3.3579	0.0058
246	3.3637	0.0058
247	3.3695	0.0058
248	3.3753	0.0058
249	3.3811	0.0058
250	3.3869	0.0058
251	3.3926	0.0058
252	3.3984	0.0057
253	3.4041	0.0057
254	3.4098	0.0057
255	3.4155	0.0057

256	3.4212	0.0057
257	3.4268	0.0057
258	3.4325	0.0057
259	3.4382	0.0056
260	3.4438	0.0056
261	3.4494	0.0056
262	3.4550	0.0056
263	3.4606	0.0056
264	3.4662	0.0056
265	3.4718	0.0056
266	3.4773	0.0056
267	3.4829	0.0055
268	3.4884	0.0055
269	3.4940	0.0055
270	3.4995	0.0055
271	3.5050	0.0055
272	3.5105	0.0055
273	3.5159	0.0055
274	3.5214	0.0055
275	3.5269	0.0055
276	3.5323	0.0054
277	3.5377	0.0054
278	3.5432	0.0054
279	3.5486	0.0054
280	3.5540	0.0054
281	3.5594	0.0054
282	3.5647	0.0054
283	3.5701	0.0054
284	3.5755	0.0054
285	3.5808	0.0053
286	3.5861	0.0053
287	3.5915	0.0053
288	3.5968	0.0053

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0053	0.0021	0.0033
2	0.0053	0.0021	0.0033
3	0.0053	0.0021	0.0033
4	0.0054	0.0021	0.0033
5	0.0054	0.0021	0.0033
6	0.0054	0.0021	0.0033
7	0.0054	0.0021	0.0033
8	0.0054	0.0021	0.0033
9	0.0054	0.0021	0.0033
10	0.0055	0.0021	0.0033
11	0.0055	0.0021	0.0034
12	0.0055	0.0021	0.0034
13	0.0055	0.0021	0.0034
14	0.0055	0.0021	0.0034
15	0.0055	0.0022	0.0034
16	0.0056	0.0022	0.0034
17	0.0056	0.0022	0.0034
18	0.0056	0.0022	0.0034
19	0.0056	0.0022	0.0034

20	0.0056	0.0022	0.0034
21	0.0057	0.0022	0.0035
22	0.0057	0.0022	0.0035
23	0.0057	0.0022	0.0035
24	0.0057	0.0022	0.0035
25	0.0057	0.0022	0.0035
26	0.0058	0.0022	0.0035
27	0.0058	0.0022	0.0035
28	0.0058	0.0022	0.0035
29	0.0058	0.0023	0.0036
30	0.0058	0.0023	0.0036
31	0.0059	0.0023	0.0036
32	0.0059	0.0023	0.0036
33	0.0059	0.0023	0.0036
34	0.0059	0.0023	0.0036
35	0.0059	0.0023	0.0036
36	0.0060	0.0023	0.0036
37	0.0060	0.0023	0.0037
38	0.0060	0.0023	0.0037
39	0.0060	0.0023	0.0037
40	0.0060	0.0023	0.0037
41	0.0061	0.0024	0.0037
42	0.0061	0.0024	0.0037
43	0.0061	0.0024	0.0037
44	0.0061	0.0024	0.0038
45	0.0062	0.0024	0.0038
46	0.0062	0.0024	0.0038
47	0.0062	0.0024	0.0038
48	0.0062	0.0024	0.0038
49	0.0063	0.0024	0.0038
50	0.0063	0.0024	0.0038
51	0.0063	0.0025	0.0039
52	0.0063	0.0025	0.0039
53	0.0064	0.0025	0.0039
54	0.0064	0.0025	0.0039
55	0.0064	0.0025	0.0039
56	0.0064	0.0025	0.0039
57	0.0065	0.0025	0.0040
58	0.0065	0.0025	0.0040
59	0.0065	0.0025	0.0040
60	0.0066	0.0025	0.0040
61	0.0066	0.0026	0.0040
62	0.0066	0.0026	0.0040
63	0.0067	0.0026	0.0041
64	0.0067	0.0026	0.0041
65	0.0067	0.0026	0.0041
66	0.0067	0.0026	0.0041
67	0.0068	0.0026	0.0041
68	0.0068	0.0026	0.0042
69	0.0068	0.0027	0.0042
70	0.0069	0.0027	0.0042
71	0.0069	0.0027	0.0042
72	0.0069	0.0027	0.0042
73	0.0070	0.0027	0.0043
74	0.0070	0.0027	0.0043
75	0.0070	0.0027	0.0043
76	0.0071	0.0027	0.0043

77	0.0071	0.0028	0.0043
78	0.0071	0.0028	0.0044
79	0.0072	0.0028	0.0044
80	0.0072	0.0028	0.0044
81	0.0072	0.0028	0.0044
82	0.0073	0.0028	0.0045
83	0.0073	0.0028	0.0045
84	0.0073	0.0029	0.0045
85	0.0074	0.0029	0.0045
86	0.0074	0.0029	0.0045
87	0.0075	0.0029	0.0046
88	0.0075	0.0029	0.0046
89	0.0076	0.0029	0.0046
90	0.0076	0.0029	0.0046
91	0.0076	0.0030	0.0047
92	0.0077	0.0030	0.0047
93	0.0077	0.0030	0.0047
94	0.0078	0.0030	0.0048
95	0.0078	0.0030	0.0048
96	0.0079	0.0030	0.0048
97	0.0079	0.0031	0.0049
98	0.0080	0.0031	0.0049
99	0.0080	0.0031	0.0049
100	0.0081	0.0031	0.0049
101	0.0081	0.0031	0.0050
102	0.0082	0.0032	0.0050
103	0.0082	0.0032	0.0050
104	0.0083	0.0032	0.0051
105	0.0083	0.0032	0.0051
106	0.0084	0.0032	0.0051
107	0.0084	0.0033	0.0052
108	0.0085	0.0033	0.0052
109	0.0086	0.0033	0.0052
110	0.0086	0.0033	0.0053
111	0.0087	0.0034	0.0053
112	0.0087	0.0034	0.0053
113	0.0088	0.0034	0.0054
114	0.0088	0.0034	0.0054
115	0.0089	0.0035	0.0055
116	0.0090	0.0035	0.0055
117	0.0091	0.0035	0.0056
118	0.0091	0.0035	0.0056
119	0.0092	0.0036	0.0056
120	0.0093	0.0036	0.0057
121	0.0094	0.0036	0.0057
122	0.0094	0.0036	0.0058
123	0.0095	0.0037	0.0058
124	0.0096	0.0037	0.0059
125	0.0097	0.0037	0.0059
126	0.0097	0.0038	0.0060
127	0.0098	0.0038	0.0060
128	0.0099	0.0038	0.0061
129	0.0100	0.0039	0.0061
130	0.0101	0.0039	0.0062
131	0.0102	0.0040	0.0062
132	0.0103	0.0040	0.0063
133	0.0104	0.0040	0.0064

134	0.0105	0.0041	0.0064
135	0.0106	0.0041	0.0065
136	0.0107	0.0041	0.0065
137	0.0108	0.0042	0.0066
138	0.0109	0.0042	0.0067
139	0.0110	0.0043	0.0068
140	0.0111	0.0043	0.0068
141	0.0113	0.0044	0.0069
142	0.0114	0.0044	0.0070
143	0.0115	0.0045	0.0071
144	0.0116	0.0045	0.0071
145	0.0080	0.0031	0.0049
146	0.0081	0.0031	0.0050
147	0.0083	0.0032	0.0051
148	0.0084	0.0032	0.0051
149	0.0085	0.0033	0.0052
150	0.0086	0.0033	0.0053
151	0.0088	0.0034	0.0054
152	0.0089	0.0035	0.0055
153	0.0091	0.0035	0.0056
154	0.0093	0.0036	0.0057
155	0.0095	0.0037	0.0058
156	0.0096	0.0037	0.0059
157	0.0099	0.0038	0.0060
158	0.0100	0.0039	0.0061
159	0.0103	0.0040	0.0063
160	0.0104	0.0040	0.0064
161	0.0107	0.0042	0.0066
162	0.0109	0.0042	0.0067
163	0.0112	0.0044	0.0069
164	0.0114	0.0044	0.0070
165	0.0118	0.0046	0.0072
166	0.0120	0.0047	0.0074
167	0.0125	0.0048	0.0076
168	0.0127	0.0049	0.0078
169	0.0143	0.0056	0.0088
170	0.0146	0.0057	0.0089
171	0.0152	0.0059	0.0093
172	0.0155	0.0060	0.0095
173	0.0163	0.0063	0.0100
174	0.0167	0.0065	0.0102
175	0.0175	0.0068	0.0107
176	0.0180	0.0070	0.0110
177	0.0190	0.0074	0.0116
178	0.0196	0.0076	0.0120
179	0.0209	0.0081	0.0128
180	0.0216	0.0084	0.0132
181	0.0233	0.0090	0.0143
182	0.0243	0.0094	0.0148
183	0.0265	0.0103	0.0162
184	0.0278	0.0108	0.0170
185	0.0397	0.0154	0.0243
186	0.0419	0.0162	0.0256
187	0.0476	0.0184	0.0291
188	0.0513	0.0199	0.0314
189	0.0618	0.0218	0.0400
190	0.0698	0.0218	0.0480

191	0.0997	0.0218	0.0779
192	0.1371	0.0218	0.1153
193	0.4292	0.0218	0.4074
194	0.0812	0.0218	0.0594
195	0.0559	0.0217	0.0342
196	0.0445	0.0173	0.0272
197	0.0294	0.0114	0.0180
198	0.0253	0.0098	0.0155
199	0.0224	0.0087	0.0137
200	0.0202	0.0078	0.0124
201	0.0185	0.0072	0.0113
202	0.0171	0.0066	0.0104
203	0.0159	0.0062	0.0097
204	0.0149	0.0058	0.0091
205	0.0129	0.0050	0.0079
206	0.0122	0.0047	0.0075
207	0.0116	0.0045	0.0071
208	0.0111	0.0043	0.0068
209	0.0106	0.0041	0.0065
210	0.0101	0.0039	0.0062
211	0.0097	0.0038	0.0060
212	0.0094	0.0036	0.0057
213	0.0090	0.0035	0.0055
214	0.0087	0.0034	0.0053
215	0.0084	0.0033	0.0052
216	0.0082	0.0032	0.0050
217	0.0117	0.0045	0.0072
218	0.0115	0.0044	0.0070
219	0.0112	0.0043	0.0069
220	0.0110	0.0043	0.0067
221	0.0107	0.0042	0.0066
222	0.0105	0.0041	0.0064
223	0.0103	0.0040	0.0063
224	0.0101	0.0039	0.0062
225	0.0100	0.0039	0.0061
226	0.0098	0.0038	0.0060
227	0.0096	0.0037	0.0059
228	0.0095	0.0037	0.0058
229	0.0093	0.0036	0.0057
230	0.0092	0.0036	0.0056
231	0.0090	0.0035	0.0055
232	0.0089	0.0034	0.0054
233	0.0088	0.0034	0.0054
234	0.0086	0.0033	0.0053
235	0.0085	0.0033	0.0052
236	0.0084	0.0033	0.0051
237	0.0083	0.0032	0.0051
238	0.0082	0.0032	0.0050
239	0.0081	0.0031	0.0050
240	0.0080	0.0031	0.0049
241	0.0079	0.0031	0.0048
242	0.0078	0.0030	0.0048
243	0.0077	0.0030	0.0047
244	0.0076	0.0030	0.0047
245	0.0075	0.0029	0.0046
246	0.0075	0.0029	0.0046
247	0.0074	0.0029	0.0045

248	0.0073	0.0028	0.0045
249	0.0072	0.0028	0.0044
250	0.0072	0.0028	0.0044
251	0.0071	0.0027	0.0043
252	0.0070	0.0027	0.0043
253	0.0069	0.0027	0.0043
254	0.0069	0.0027	0.0042
255	0.0068	0.0026	0.0042
256	0.0068	0.0026	0.0041
257	0.0067	0.0026	0.0041
258	0.0066	0.0026	0.0041
259	0.0066	0.0025	0.0040
260	0.0065	0.0025	0.0040
261	0.0065	0.0025	0.0040
262	0.0064	0.0025	0.0039
263	0.0064	0.0025	0.0039
264	0.0063	0.0024	0.0039
265	0.0063	0.0024	0.0038
266	0.0062	0.0024	0.0038
267	0.0062	0.0024	0.0038
268	0.0061	0.0024	0.0037
269	0.0061	0.0024	0.0037
270	0.0060	0.0023	0.0037
271	0.0060	0.0023	0.0037
272	0.0059	0.0023	0.0036
273	0.0059	0.0023	0.0036
274	0.0058	0.0023	0.0036
275	0.0058	0.0023	0.0036
276	0.0058	0.0022	0.0035
277	0.0057	0.0022	0.0035
278	0.0057	0.0022	0.0035
279	0.0056	0.0022	0.0035
280	0.0056	0.0022	0.0034
281	0.0056	0.0022	0.0034
282	0.0055	0.0021	0.0034
283	0.0055	0.0021	0.0034
284	0.0055	0.0021	0.0033
285	0.0054	0.0021	0.0033
286	0.0054	0.0021	0.0033
287	0.0054	0.0021	0.0033
288	0.0053	0.0021	0.0033

Total soil rain loss = 1.18(In)
Total effective rainfall = 2.41(In)
Peak flow rate in flood hydrograph = 1150.31(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

```
Time(h+m) Volume Ac.Ft   Q(CFS)  0       300.0     600.0     900.0    1200.0
-----------------------------------------------------------------------------
  0+ 5       0.0749      10.87  Q         |         |         |         |
```

0+10	0.1721	14.12	Q	|	|	|	|
0+15	0.3081	19.75	Q	|	|	|	|
0+20	0.4838	25.51	Q	|	|	|	|
0+25	0.6832	28.95	Q	|	|	|	|
0+30	0.8963	30.94	VQ	|	|	|	|
0+35	1.1188	32.31	VQ	|	|	|	|
0+40	1.3488	33.40	VQ	|	|	|	|
0+45	1.5850	34.30	VQ	|	|	|	|
0+50	1.8263	35.04	VQ	|	|	|	|
0+55	2.0719	35.66	VQ	|	|	|	|
1+ 0	2.3214	36.22	VQ	|	|	|	|
1+ 5	2.5741	36.69	VQ	|	|	|	|
1+10	2.8295	37.09	VQ	|	|	|	|
1+15	3.0875	37.45	VQ	|	|	|	|
1+20	3.3479	37.81	VQ	|	|	|	|
1+25	3.6104	38.12	VQ	|	|	|	|
1+30	3.8749	38.40	VQ	|	|	|	|
1+35	4.1411	38.66	|Q	|	|	|	|
1+40	4.4090	38.90	|Q	|	|	|	|
1+45	4.6784	39.11	|Q	|	|	|	|
1+50	4.9491	39.31	|Q	|	|	|	|
1+55	5.2211	39.49	|Q	|	|	|	|
2+ 0	5.4943	39.68	|Q	|	|	|	|
2+ 5	5.7689	39.86	|Q	|	|	|	|
2+10	6.0447	40.05	|Q	|	|	|	|
2+15	6.3213	40.15	|Q	|	|	|	|
2+20	6.5985	40.26	|Q	|	|	|	|
2+25	6.8765	40.36	|Q	|	|	|	|
2+30	7.1552	40.46	|Q	|	|	|	|
2+35	7.4346	40.57	|Q	|	|	|	|
2+40	7.7147	40.68	|Q	|	|	|	|
2+45	7.9956	40.78	|Q	|	|	|	|
2+50	8.2772	40.89	|Q	|	|	|	|
2+55	8.5596	41.00	|QV	|	|	|	|
3+ 0	8.8427	41.11	|QV	|	|	|	|
3+ 5	9.1266	41.22	|QV	|	|	|	|
3+10	9.4112	41.33	|QV	|	|	|	|
3+15	9.6967	41.45	|QV	|	|	|	|
3+20	9.9829	41.56	|QV	|	|	|	|
3+25	10.2700	41.68	|QV	|	|	|	|
3+30	10.5578	41.80	|QV	|	|	|	|
3+35	10.8465	41.91	|QV	|	|	|	|
3+40	11.1359	42.03	|QV	|	|	|	|
3+45	11.4263	42.15	|QV	|	|	|	|
3+50	11.7174	42.28	|QV	|	|	|	|
3+55	12.0094	42.40	|QV	|	|	|	|
4+ 0	12.3023	42.52	|QV	|	|	|	|
4+ 5	12.5960	42.65	|Q V	|	|	|	|
4+10	12.8906	42.78	|Q V	|	|	|	|
4+15	13.1861	42.90	|Q V	|	|	|	|
4+20	13.4824	43.03	|Q V	|	|	|	|
4+25	13.7797	43.17	|Q V	|	|	|	|
4+30	14.0779	43.30	|Q V	|	|	|	|
4+35	14.3770	43.43	|Q V	|	|	|	|
4+40	14.6771	43.57	|Q V	|	|	|	|
4+45	14.9781	43.71	|Q V	|	|	|	|
4+50	15.2801	43.84	|Q V	|	|	|	|

4+55	15.5830	43.98	|Q V	|	|	|
5+ 0	15.8869	44.13	|Q V	|	|	|
5+ 5	16.1918	44.27	|Q V	|	|	|
5+10	16.4977	44.42	|Q V	|	|	|
5+15	16.8046	44.56	|Q V	|	|	|
5+20	17.1125	44.71	|Q V	|	|	|
5+25	17.4215	44.86	|Q V	|	|	|
5+30	17.7315	45.01	|Q V	|	|	|
5+35	18.0426	45.17	|Q V	|	|	|
5+40	18.3547	45.32	|Q V	|	|	|
5+45	18.6680	45.48	|Q V	|	|	|
5+50	18.9823	45.64	|Q V	|	|	|
5+55	19.2978	45.80	|Q V	|	|	|
6+ 0	19.6143	45.97	|Q V	|	|	|
6+ 5	19.9321	46.13	|Q V	|	|	|
6+10	20.2510	46.30	|Q V	|	|	|
6+15	20.5710	46.47	|Q V	|	|	|
6+20	20.8923	46.65	|Q V	|	|	|
6+25	21.2147	46.82	|Q V	|	|	|
6+30	21.5384	47.00	|Q V	|	|	|
6+35	21.8633	47.18	|Q V	|	|	|
6+40	22.1894	47.36	|Q V	|	|	|
6+45	22.5168	47.54	|Q V	|	|	|
6+50	22.8456	47.73	|Q V	|	|	|
6+55	23.1756	47.92	|Q V	|	|	|
7+ 0	23.5069	48.11	|Q V	|	|	|
7+ 5	23.8396	48.30	|Q V	|	|	|
7+10	24.1736	48.50	|Q V	|	|	|
7+15	24.5090	48.70	|Q V	|	|	|
7+20	24.8459	48.91	|Q V	|	|	|
7+25	25.1841	49.11	|Q V	|	|	|
7+30	25.5238	49.32	|Q V	|	|	|
7+35	25.8649	49.53	|Q V	|	|	|
7+40	26.2075	49.75	|Q V	|	|	|
7+45	26.5516	49.97	|Q V	|	|	|
7+50	26.8973	50.19	|Q V	|	|	|
7+55	27.2445	50.41	|Q V	|	|	|
8+ 0	27.5933	50.64	|Q V	|	|	|
8+ 5	27.9436	50.87	|Q V	|	|	|
8+10	28.2956	51.11	|Q V	|	|	|
8+15	28.6493	51.35	|Q V	|	|	|
8+20	29.0046	51.60	|Q V	|	|	|
8+25	29.3617	51.84	|Q V	|	|	|
8+30	29.7205	52.09	|Q V	|	|	|
8+35	30.0810	52.35	|Q V	|	|	|
8+40	30.4433	52.61	|Q V	|	|	|
8+45	30.8075	52.87	|Q V	|	|	|
8+50	31.1735	53.15	|Q V	|	|	|
8+55	31.5414	53.42	|Q V	|	|	|
9+ 0	31.9112	53.70	|Q V	|	|	|
9+ 5	32.2830	53.98	|Q V	|	|	|
9+10	32.6568	54.27	|Q V	|	|	|
9+15	33.0325	54.56	|Q V	|	|	|
9+20	33.4104	54.87	|Q V	|	|	|
9+25	33.7904	55.17	|Q V	|	|	|
9+30	34.1725	55.48	|Q V	|	|	|
9+35	34.5567	55.80	|Q V	|	|	|

9+40	34.9433	56.12	|Q	V |	|	|	|
9+45	35.3320	56.45	|Q	V |	|	|	|
9+50	35.7231	56.79	|Q	V |	|	|	|
9+55	36.1166	57.13	|Q	V |	|	|	|
10+ 0	36.5124	57.48	|Q	V |	|	|	|
10+ 5	36.9108	57.84	|Q	V |	|	|	|
10+10	37.3116	58.20	|Q	V|	|	|	|
10+15	37.7150	58.57	|Q	V|	|	|	|
10+20	38.1210	58.95	|Q	V|	|	|	|
10+25	38.5297	59.34	|Q	V|	|	|	|
10+30	38.9411	59.74	|Q	V|	|	|	|
10+35	39.3553	60.14	| Q	V|	|	|	|
10+40	39.7724	60.56	| Q	V|	|	|	|
10+45	40.1924	60.98	| Q	V|	|	|	|
10+50	40.6154	61.42	| Q	V|	|	|	|
10+55	41.0415	61.86	| Q	V|	|	|	|
11+ 0	41.4707	62.32	| Q	V	|	|	|
11+ 5	41.9031	62.79	| Q	V	|	|	|
11+10	42.3388	63.27	| Q	V	|	|	|
11+15	42.7779	63.76	| Q	V	|	|	|
11+20	43.2205	64.26	| Q	V	|	|	|
11+25	43.6666	64.78	| Q	V	|	|	|
11+30	44.1164	65.31	| Q	V	|	|	|
11+35	44.5699	65.85	| Q	V	|	|	|
11+40	45.0273	66.41	| Q	V	|	|	|
11+45	45.4886	66.99	| Q	V	|	|	|
11+50	45.9540	67.58	| Q	|V	|	|	|
11+55	46.4236	68.19	| Q	|V	|	|	|
12+ 0	46.8976	68.82	| Q	|V	|	|	|
12+ 5	47.3717	68.84	| Q	|V	|	|	|
12+10	47.8343	67.18	| Q	|V	|	|	|
12+15	48.2739	63.83	| Q	|V	|	|	|
12+20	48.6898	60.40	| Q	|V	|	|	|
12+25	49.0936	58.63	|Q	|V	|	|	|
12+30	49.4925	57.92	|Q	|V	|	|	|
12+35	49.8897	57.67	|Q	| V	|	|	|
12+40	50.2868	57.66	|Q	| V	|	|	|
12+45	50.6848	57.79	|Q	| V	|	|	|
12+50	51.0848	58.08	|Q	| V	|	|	|
12+55	51.4874	58.47	|Q	| V	|	|	|
13+ 0	51.8933	58.94	|Q	| V	|	|	|
13+ 5	52.3031	59.51	|Q	| V	|	|	|
13+10	52.7175	60.17	| Q	| V	|	|	|
13+15	53.1369	60.89	| Q	| V	|	|	|
13+20	53.5616	61.66	| Q	| V	|	|	|
13+25	53.9920	62.51	| Q	| V	|	|	|
13+30	54.4289	63.43	| Q	| V	|	|	|
13+35	54.8725	64.42	| Q	| V	|	|	|
13+40	55.3235	65.48	| Q	| V	|	|	|
13+45	55.7823	66.62	| Q	| V	|	|	|
13+50	56.2496	67.85	| Q	| V	|	|	|
13+55	56.7259	69.15	| Q	| V	|	|	|
14+ 0	57.2118	70.55	| Q	| V	|	|	|
14+ 5	57.7090	72.20	| Q	| V	|	|	|
14+10	58.2219	74.47	| Q	| V	|	|	|
14+15	58.7550	77.40	| Q	| V	|	|	|
14+20	59.3095	80.51	| Q	| V	|	|	|

14+25	59.8830	83.28	Q	V			
14+30	60.4749	85.93	Q	V			
14+35	61.0852	88.62	Q	V			
14+40	61.7151	91.47	Q	V			
14+45	62.3659	94.50	Q	V			
14+50	63.0394	97.78	Q	V			
14+55	63.7372	101.33	Q	V			
15+ 0	64.4620	105.25	Q	V			
15+ 5	65.2165	109.55	Q	V			
15+10	66.0043	114.38	Q	V			
15+15	66.8293	119.79	Q	V			
15+20	67.6970	126.00	Q	V			
15+25	68.6235	134.52	Q	V			
15+30	69.6442	148.21	Q	V			
15+35	70.7976	167.47	Q	V			
15+40	72.1034	189.59	Q	V			
15+45	73.5648	212.20	Q	V			
15+50	75.2200	240.35	Q	V			
15+55	77.1750	283.86	Q	V			
16+ 0	79.6619	361.10	Q	V			
16+ 5	83.4994	557.21	Q	V			
16+10	89.6413	891.81	V	Q			
16+15	97.5636	1150.31	V	Q			
16+20	105.1617	1103.25	V	Q			
16+25	110.5591	783.70	Q				
16+30	114.4046	558.37	Q	V			
16+35	117.3980	434.64	Q	V			
16+40	119.8868	361.37	Q	V			
16+45	122.0217	310.00	Q	V			
16+50	123.8791	269.69	Q	V			
16+55	125.5190	238.12	Q	V			
17+ 0	126.9979	214.74	Q	V			
17+ 5	128.3149	191.22	Q	V			
17+10	129.4961	171.52	Q	V			
17+15	130.5800	157.38	Q	V			
17+20	131.5870	146.22	Q	V			
17+25	132.5073	133.63	Q	V			
17+30	133.3528	122.76	Q	V			
17+35	134.1344	113.50	Q	V			
17+40	134.8619	105.62	Q	V			
17+45	135.5362	97.91	Q	V			
17+50	136.1617	90.81	Q	V			
17+55	136.7533	85.90	Q	V			
18+ 0	137.3198	82.26	Q	V			
18+ 5	137.8625	78.81	Q	V			
18+10	138.3879	76.29	Q	V			
18+15	138.8544	67.73	Q	V			
18+20	139.3280	68.78	Q	V			
18+25	139.8028	68.93	Q	V			
18+30	140.2733	68.32	Q	V			
18+35	140.7388	67.59	Q	V			
18+40	141.1988	66.79	Q	V			
18+45	141.6533	65.98	Q	V			
18+50	142.1020	65.15	Q	V			
18+55	142.5449	64.32	Q	V			
19+ 0	142.9824	63.52	Q	V			
19+ 5	143.4142	62.71	Q	V			

19+10	143.8406	61.90	| Q	|	|	| V	|
19+15	144.2617	61.15	| Q	|	|	| V	|
19+20	144.6779	60.43	| Q	|	|	| V	|
19+25	145.0892	59.72	|Q	|	|	| V	|
19+30	145.4957	59.03	|Q	|	|	| V	|
19+35	145.8976	58.36	|Q	|	|	| V	|
19+40	146.2950	57.70	|Q	|	|	| V	|
19+45	146.6881	57.07	|Q	|	|	| V	|
19+50	147.0768	56.44	|Q	|	|	| V	|
19+55	147.4613	55.84	|Q	|	|	| V	|
20+ 0	147.8418	55.26	|Q	|	|	| V	|
20+ 5	148.2186	54.70	|Q	|	|	| V	|
20+10	148.5916	54.17	|Q	|	|	| V	|
20+15	148.9607	53.59	|Q	|	|	| V	|
20+20	149.3259	53.04	|Q	|	|	| V	|
20+25	149.6875	52.50	|Q	|	|	| V	|
20+30	150.0455	51.98	|Q	|	|	| V	|
20+35	150.4001	51.48	|Q	|	|	| V	|
20+40	150.7513	51.00	|Q	|	|	| V	|
20+45	151.0993	50.53	|Q	|	|	| V	|
20+50	151.4442	50.08	|Q	|	|	| V	|
20+55	151.7860	49.64	|Q	|	|	| V	|
21+ 0	152.1249	49.21	|Q	|	|	| V	|
21+ 5	152.4610	48.79	|Q	|	|	| V	|
21+10	152.7942	48.39	|Q	|	|	| V	|
21+15	153.1248	48.00	|Q	|	|	| V	|
21+20	153.4528	47.62	|Q	|	|	| V	|
21+25	153.7782	47.25	|Q	|	|	| V	|
21+30	154.1011	46.89	|Q	|	|	| V	|
21+35	154.4216	46.54	|Q	|	|	| V	|
21+40	154.7398	46.20	|Q	|	|	| V	|
21+45	155.0556	45.86	|Q	|	|	| V	|
21+50	155.3693	45.54	|Q	|	|	| V	|
21+55	155.6807	45.22	|Q	|	|	| V	|
22+ 0	155.9900	44.91	|Q	|	|	| V	|
22+ 5	156.2973	44.61	|Q	|	|	| V	|
22+10	156.6025	44.32	|Q	|	|	| V	|
22+15	156.9057	44.03	|Q	|	|	| V	|
22+20	157.2070	43.75	|Q	|	|	| V	|
22+25	157.5064	43.47	|Q	|	|	| V	|
22+30	157.8040	43.20	|Q	|	|	| V	|
22+35	158.0997	42.94	|Q	|	|	| V	|
22+40	158.3937	42.68	|Q	|	|	| V	|
22+45	158.6859	42.43	|Q	|	|	| V	|
22+50	158.9765	42.19	|Q	|	|	| V	|
22+55	159.2653	41.94	|Q	|	|	| V	|
23+ 0	159.5526	41.71	|Q	|	|	| V	|
23+ 5	159.8382	41.48	|Q	|	|	| V	|
23+10	160.1223	41.25	|Q	|	|	| V	|
23+15	160.4049	41.03	|Q	|	|	| V	|
23+20	160.6859	40.81	|Q	|	|	| V	|
23+25	160.9655	40.59	|Q	|	|	| V	|
23+30	161.2436	40.38	|Q	|	|	| V	|
23+35	161.5203	40.18	|Q	|	|	| V	|
23+40	161.7956	39.97	|Q	|	|	| V	|
23+45	162.0696	39.78	|Q	|	|	| V	|
23+50	162.3422	39.58	|Q	|	|	| V	|

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23+55     162.6134     39.39  |Q        |         |         |         V|
24+ 0     162.8834     39.20  |Q        |         |         |         V|
24+ 5     163.1462     38.15  |Q        |         |         |         V|
24+10     163.3853     34.73  |Q        |         |         |         V|
24+15     163.5848     28.97  Q         |         |         |         V|
24+20     163.7441     23.13  Q         |         |         |         V|
24+25     163.8795     19.66  Q         |         |         |         V|
24+30     164.0011     17.66  Q         |         |         |         V|
24+35     164.1134     16.31  Q         |         |         |         V|
24+40     164.2185     15.25  Q         |         |         |         V|
24+45     164.3176     14.39  Q         |         |         |         V|
24+50     164.4119     13.70  Q         |         |         |         V|
24+55     164.5024     13.13  Q         |         |         |         V|
25+ 0     164.5893     12.63  Q         |         |         |         V|
25+ 5     164.6736     12.23  Q         |         |         |         V|
25+10     164.7555     11.90  Q         |         |         |         V|
25+15     164.8355     11.61  Q         |         |         |         V|
25+20     164.9135     11.33  Q         |         |         |         V|
25+25     164.9900     11.10  Q         |         |         |         V|
25+30     165.0651     10.90  Q         |         |         |         V|
25+35     165.1390     10.73  Q         |         |         |         V|
25+40     165.2119     10.58  Q         |         |         |         V|
25+45     165.2839     10.46  Q         |         |         |         V|
25+50     165.3553     10.36  Q         |         |         |         V|
25+55     165.4260     10.27  Q         |         |         |         V|
26+ 0     165.4961     10.18  Q         |         |         |         V|
26+ 5     165.5656     10.09  Q         |         |         |         V|
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San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2000 Version 6.3
Rational Hydrology Study Date: 12/27/07

TTM 18516
MORONGO VALLEY
OFF-SITE AREA B
APN 0583-291-01 & 0583-301-01

PETRA GROUP, INC
PROGRAM LICENSE SERIAL NUMBER 6042

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.200 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.262(In/Hr)
Initial subarea data:
Initial area flow distance = 4085.000(Ft.)
Top (of initial area) elevation = 3500.000(Ft.)
Bottom (of initial area) elevation = 2800.000(Ft.)
Difference in elevation = 700.000(Ft.)
Slope = 0.17136 s(%)= 17.14
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 27.958 min.
Rainfall intensity = 1.897(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.776
Subarea runoff = 14.046(CFS)
Total initial stream area = 9.540(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.262(In/Hr)

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.262(In/Hr)
Time of concentration =    27.96 min.
Rainfall intensity =      1.897(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.776
Subarea runoff =    126.563(CFS) for   85.960(Ac.)
Total runoff =    140.609(CFS)
Effective area this stream =       95.50(Ac.)
Total Study Area (Main Stream No. 1) =       95.50(Ac.)
Area averaged Fm value =    0.262(In/Hr)
End of computations, Total Study Area =           95.50 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number =  69.0
```

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2000 Version 6.3
Rational Hydrology Study Date: 12/27/07

TTM 18516
MORONGO VALLEY
OFF-SITE AREA C
APN 0583-291-01 & 0583-301-01

PETRA GROUP,INC
PROGRAM LICENSE SERIAL NUMBER 6042

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.200 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 102.000 to Point/Station 103.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.262(In/Hr)
Initial subarea data:
Initial area flow distance = 2020.000(Ft.)
Top (of initial area) elevation = 3000.000(Ft.)
Bottom (of initial area) elevation = 2720.000(Ft.)
Difference in elevation = 280.000(Ft.)
Slope = 0.13861 s(%)= 13.86
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 22.008 min.
Rainfall intensity = 2.190(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.793
Subarea runoff = 13.888(CFS)
Total initial stream area = 8.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.262(In/Hr)

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.262(In/Hr)
Time of concentration =    22.01 min.
Rainfall intensity =      2.190(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.793
Subarea runoff =     35.050(CFS) for   20.190(Ac.)
Total runoff =     48.937(CFS)
Effective area this stream =       28.19(Ac.)
Total Study Area (Main Stream No. 1) =       28.19(Ac.)
Area averaged Fm value =    0.262(In/Hr)
End of computations, Total Study Area =           28.19 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number =  69.0
```

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2000 Version 6.3
Rational Hydrology Study Date: 12/27/07

TTM 18516
MORONGO VALLEY
OFF-SITE AREA D
APN 0583-291-01 & 0583-301-01

PETRA GROUP.INC
PROGRAM LICENSE SERIAL NUMBER 6042

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.200 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 105.000 to Point/Station 106.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.262(In/Hr)
Initial subarea data:
Initial area flow distance = 3857.000(Ft.)
Top (of initial area) elevation = 2960.000(Ft.)
Bottom (of initial area) elevation = 2680.000(Ft.)
Difference in elevation = 280.000(Ft.)
Slope = 0.07260 s(%)= 7.26
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 32.443 min.
Rainfall intensity = 1.735(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.764
Subarea runoff = 6.128(CFS)
Total initial stream area = 4.620(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.262(In/Hr)

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.262(In/Hr)
Time of concentration =    32.44 min.
Rainfall intensity =      1.735(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.764
Subarea runoff =     41.970(CFS) for   31.640(Ac.)
Total runoff =     48.099(CFS)
Effective area this stream =       36.26(Ac.)
Total Study Area (Main Stream No. 1) =       36.26(Ac.)
Area averaged Fm value =    0.262(In/Hr)
End of computations, Total Study Area =           36.26 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number =  69.0
```

RATIONAL METHOD Q100 ONSITE CALCULATION FORM

SAN BERNARDINO COUNTY HYDROLOGY MANUAL	STUDY NAME: APN 0583-291-01-00, 0583-301-01-00 & 0583-281-01-00 100 - Year Storm; I-Hour Rainfall = 1.20 in/hr Onsite area= 69.34 Ac	Calculated by: M.M.A. Checked by: NASHAT MUWANES Page 1 of 2

Concentration Point	Area (Acres) Subarea	Area (Acres) Total	Soil Type	Dev. Type	T_t min	T_c min	I in/hr	F_m in/hr	F_m avg.	Q cfs	Flow Path Length ft.	Slope ft/ft	V ft/s	Hydraulics and Notes
ONSITE CALCULATIONS(Post Development)														
Area A-1	0.21	0.21	B	Dev		13.80	2.85	0.60	0.60	0.43	462.10	0.075		Initial SubArea
					4.00									
2	0.84	1.05	B	Dev		17.80	2.48	0.60	0.60	1.78	1295.34	0.05	5.4013	Cover Type=Imp(1DU/AC)
					0.88									
3	0.21	1.26	B	Dev		18.68	2.38	0.60	0.60	**2.02**	331.04	0.06	6.2386	Cover Type=Imp(1DU/AC)
Area B-1	0.21	0.21	B	Dev		13.50	2.95	0.60	0.60	0.44	456.50	0.054		Initial SubArea
					2.72									
2	1.26	1.47	B	Dev		16.22	2.67	0.60	0.60	**2.74**	973.00	0.066	5.9714	Cover Type=Imp(1DU/AC)
Area C-1	0.21	0.21	B	Dev		13.40	2.98	0.60	0.60	0.45	440.10	0.068		Initial SubArea
					2.03									
2	0.42	0.63	B	Dev		15.43	2.72	0.60	0.60	**1.20**	726.04	0.055	5.973	Cover Type=Imp(1DU/AC)
Area D-1	0.21	0.21	B	Dev		13.80	2.85	0.60	0.60	0.43	462.19	0.043		Initial SubArea
					2.56									
2	0.63	0.84	B	Dev		16.36	2.65	0.60	0.60	**1.55**	975.12	0.051	6.3442	Cover Type=Imp(1DU/AC)
Area E-1	0.21	0.21	B	Dev		10.15	3.50	0.60	0.60	0.55	310.68	0.041		Initial SubArea
					1.55									
2	0.63	0.84	B	Dev		11.70	3.20	0.60	0.60	**1.97**	487.34	0.051	5.2491	Cover Type=Imp(1DU/AC)
Area F-1	0.21	0.21	B	Dev		10.20	3.40	0.60	0.60	0.53	311.56	0.031		Initial SubArea
					2.01									
2	1.47	1.68	B	Dev		12.21	3.08	0.60	0.60	**3.75**	652.28	0.054	5.4013	Cover Type=Imp(1DU/AC)
Area G-1	0.21	0.21	B	Dev		10.20	3.45	0.60	0.60	0.54	311.10	0.042		Initial SubArea
					2.27									
2	1.47	1.68	B	Dev		12.47	3.05	0.60	0.60	**3.70**	647.44	0.042	4.7635	Cover Type=Imp(1DU/AC)

RATIONAL METHOD Q100 ONSITE CALCULATION FORM

SAN BERNARDINO COUNTY HYDROLOGY MANUAL	STUDY NAME: APN 0583-291-01-00, 0583-301-01-00 & 0583-281-01-00 100 - Year Storm; I-Hour Rainfall = 1.20 in/hr Onsite area= 69.34 Ac	Calculated by: M.M.A. Checked by: NASHAT MUWANES Page 2 of 2

Concentration Point	Area (Acres) Subarea	Area (Acres) Total	Soil Type	Dev. Type	T_t min	T_c min	I in/hr	F_m in/hr	F_m avg.	Q cfs	Flow Path Length ft.	Slope ft/ft	V ft/s	Hydraulics and Notes
ONSITE CALCULATIONS(Post Development)														
Area A-1	2.28	2.28	B	Und		13.80	2.85	0.27	0.27	5.29	462.10	0.075		Initial SubArea
					4.00									
2	9.09	11.37	B	Und		17.80	2.48	0.27	0.27	22.61	1295.34	0.05	5.4013	Cover Type=Barren
					0.88									
3	2.25	13.62	B	Und		18.68	2.38	0.27	0.27	**25.86**	331.04	0.06	6.2386	Cover Type=Barren
Area B-1	2.21	2.21	B	Und		13.50	2.95	0.27	0.27	5.33	456.50	0.054		Initial SubArea
					2.72									
2	13.74	15.95	B	Und		16.22	2.67	0.27	0.27	**34.45**	973.00	0.066	5.9714	Cover Type=Barren
Area C-1	2.02	2.02	B	Und		13.40	2.98	0.27	0.27	4.93	440.10	0.068		Initial SubArea
					2.03									
2	4.50	6.52	B	Und		15.43	2.72	0.27	0.27	**14.38**	726.04	0.055	5.973	Cover Type=Barren
Area D-1	2.28	2.28	B	Und		13.80	2.85	0.27	0.27	5.29	462.19	0.043		Initial SubArea
					2.56									
2	6.77	9.05	B	Und		16.36	2.65	0.27	0.27	**19.39**	975.12	0.051	6.3442	Cover Type=Barren
Area E-1	0.79	0.79	B	Und		10.15	3.50	0.27	0.27	2.30	310.68	0.041		Initial SubArea
					1.55									
2	2.36	3.15	B	Und		11.70	3.20	0.27	0.27	**8.31**	487.34	0.051	5.2491	Cover Type=Barren
Area F-1	0.80	0.80	B	Und		10.20	3.40	0.27	0.27	2.25	311.56	0.031		Initial SubArea
					2.01									
2	5.52	6.32	B	Und		12.21	3.08	0.27	0.27	**15.98**	652.28	0.054	5.4013	Cover Type=Barren
Area G-1	0.79	0.79	B	Und		10.20	3.45	0.27	0.27	2.26	311.10	0.042		Initial SubArea
					2.27									
2	5.54	6.33	B	Und		12.47	3.05	0.27	0.27	**15.84**	647.44	0.042	4.7635	Cover Type=Barren

ONSITE DISCHARGE=	**151.13 Cfs**
TOTAL DISCHARGE =	**151.13**
Discharge Bulk factor =	**2.00**
Bulk Q100 Discharge =	**302.27 Cfs**

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1.0 DESIGN

1.1 General Criteria
1.2 Design Criteria
1.3 Conclusion

2.0 CHANNEL CAPACITY CALCULATIONS

1.0 DESIGN

1.1 General Criteria

The Channel Capacity calculation is carried out to find out the feasibility of 70' wide Drainage channel to carry out the Q100 Offsite storm runoff and discharge across the San jacinto street, leading the flow to the S.B.C Drainage and flowage easement.

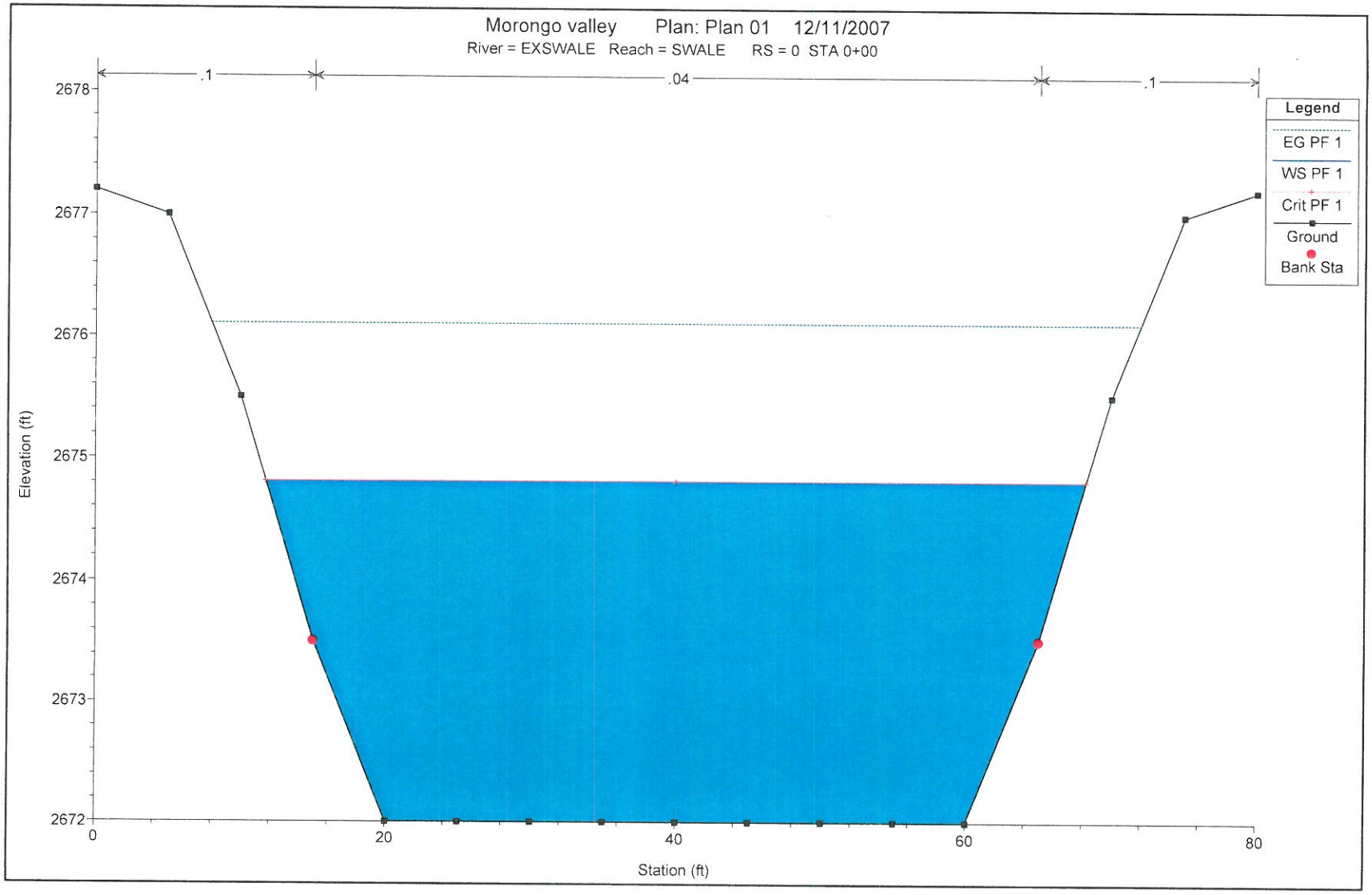
1.2 Design Criteria

1. HEC-RAS is used for routing and sizing the channel.
2. Q100 Offsite Discharge = 1150.31 Cfs (As per San Bernardino county Unit Hydrograph method Calculation).
3. Q100 Onsite Discharge = 74.38 Cfs (With a bulk factor of 2 as per San Bernardino County Rational method Calculation).

1.3 Conclusion

The HEC-RAS output shows a max flow width of 56.52'along all the section, which flows clearly within 70'wide easement with a free borad of 2' above flow level. It is recommended to grade the sides of channel with slopes of 2H: 1V on both sides. This increases the flow capacity of Channel and keep the neighboring sites safely away from flow limits.

Following pages give the details of the channel capacity calculations.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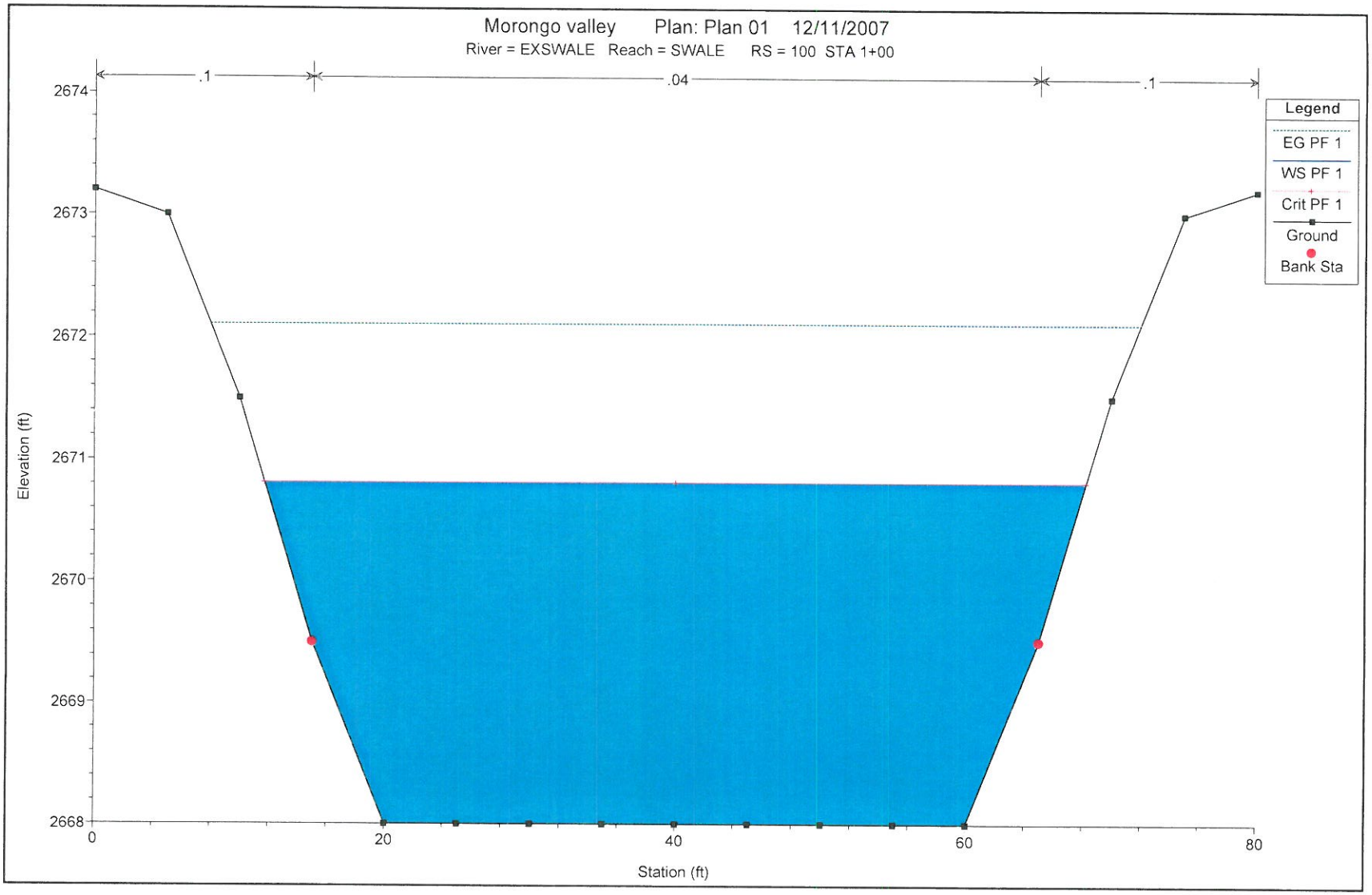
.1
.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2678
2677
2676
2675
2674
2673
2672
0
20
40
60
80
Station (ft)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.04
.1
Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
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2669
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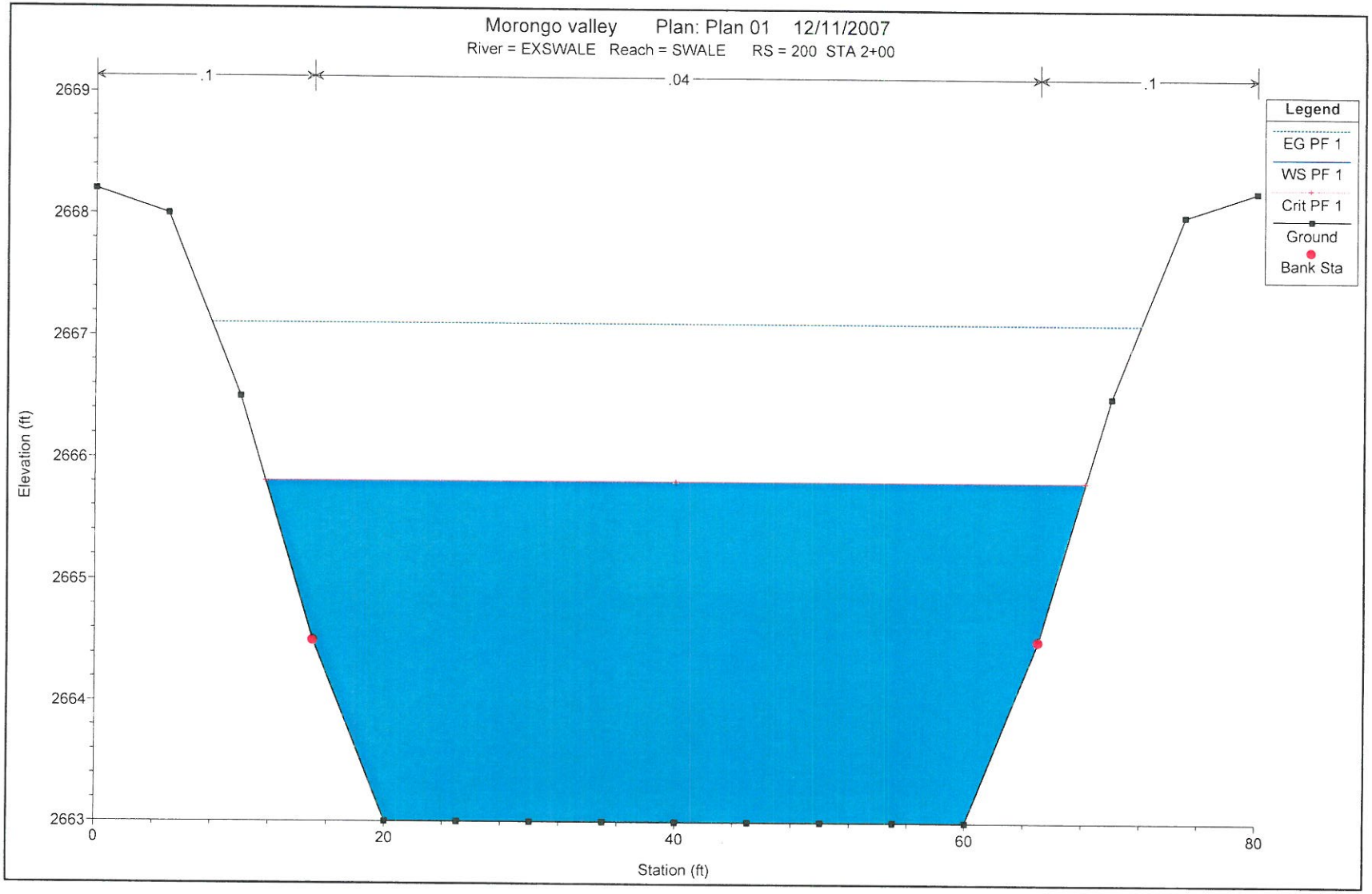
20
40
60
80
Station (ft)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.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
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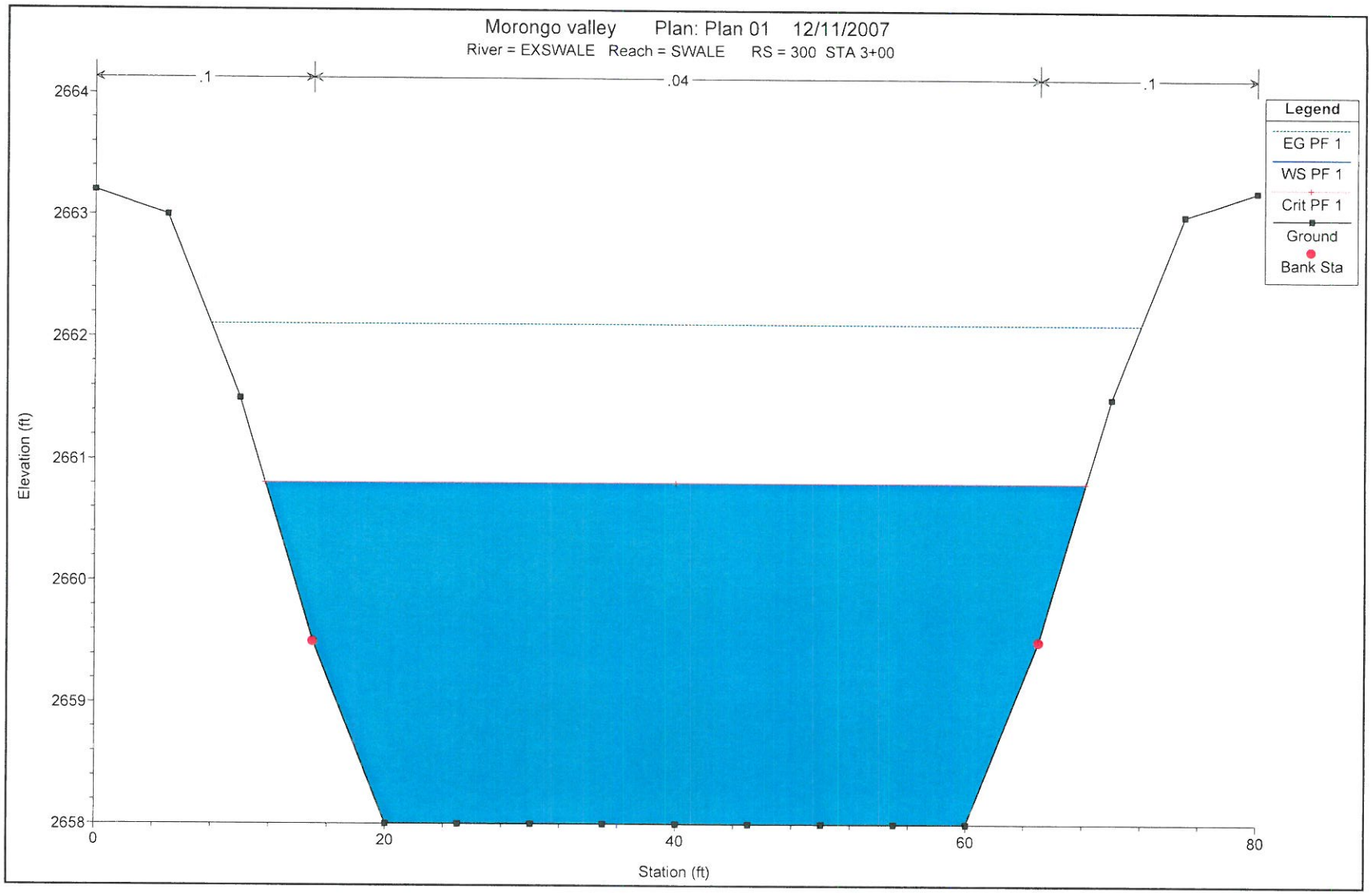
2668
2667
2666
2665
2664
2663
0
20
40
60
80
Station (ft)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.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
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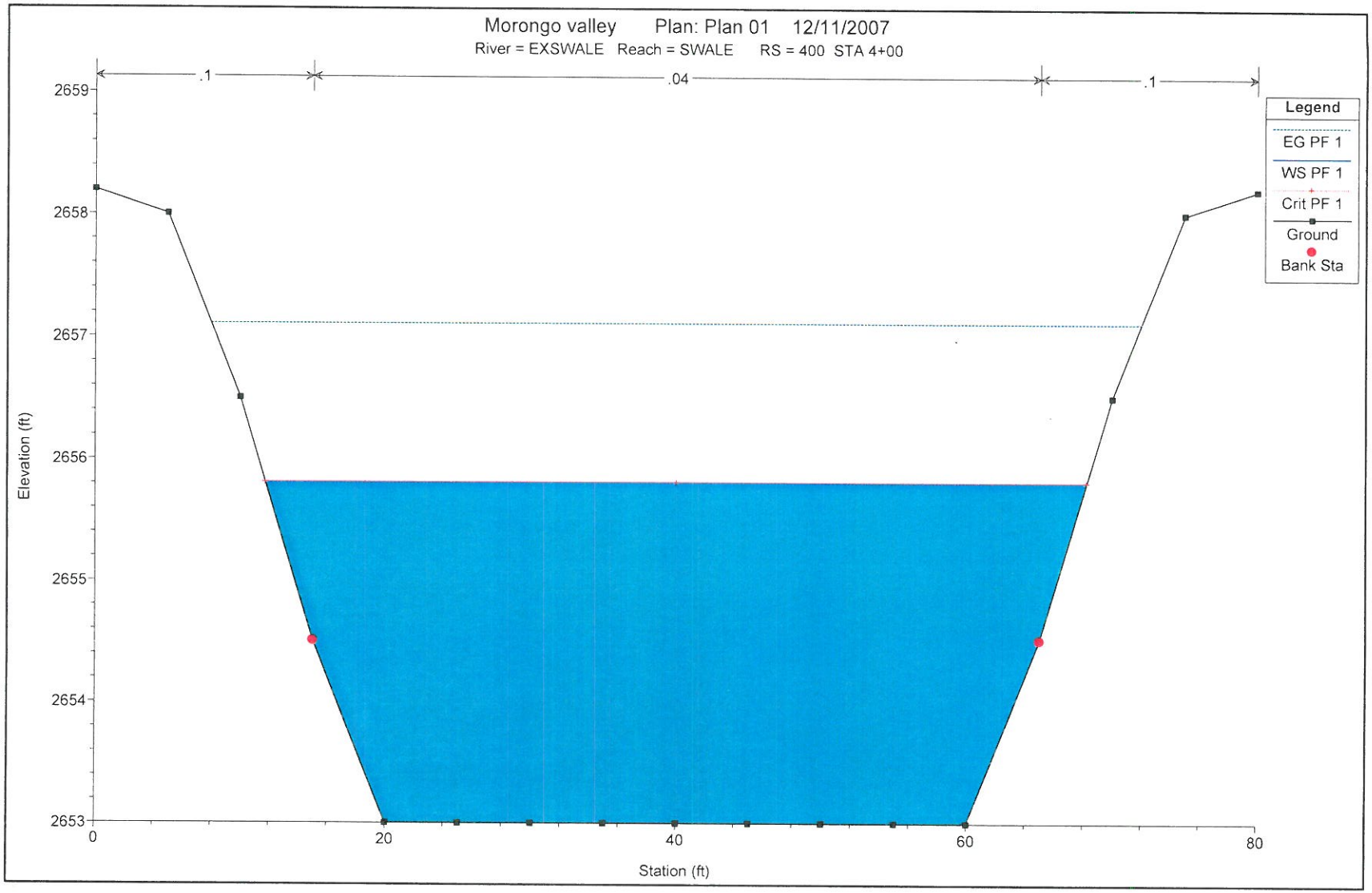
2663
2662
2661
2660
2659
2658
0
20
40
60
80
Station (ft)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.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
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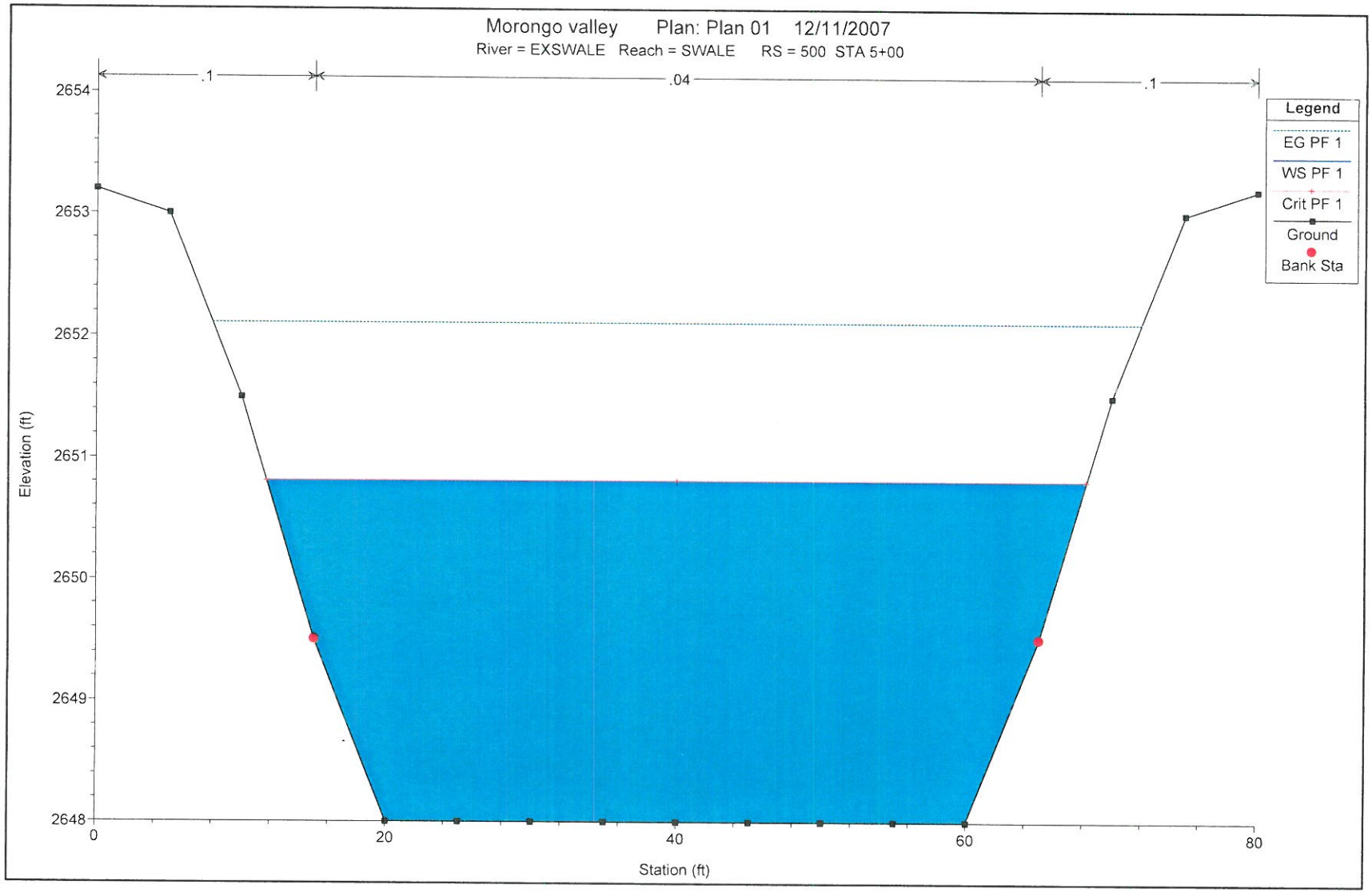
2658
2657
2656
2655
2654
2653
0
20
40
60
80
Station (ft)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.1
.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
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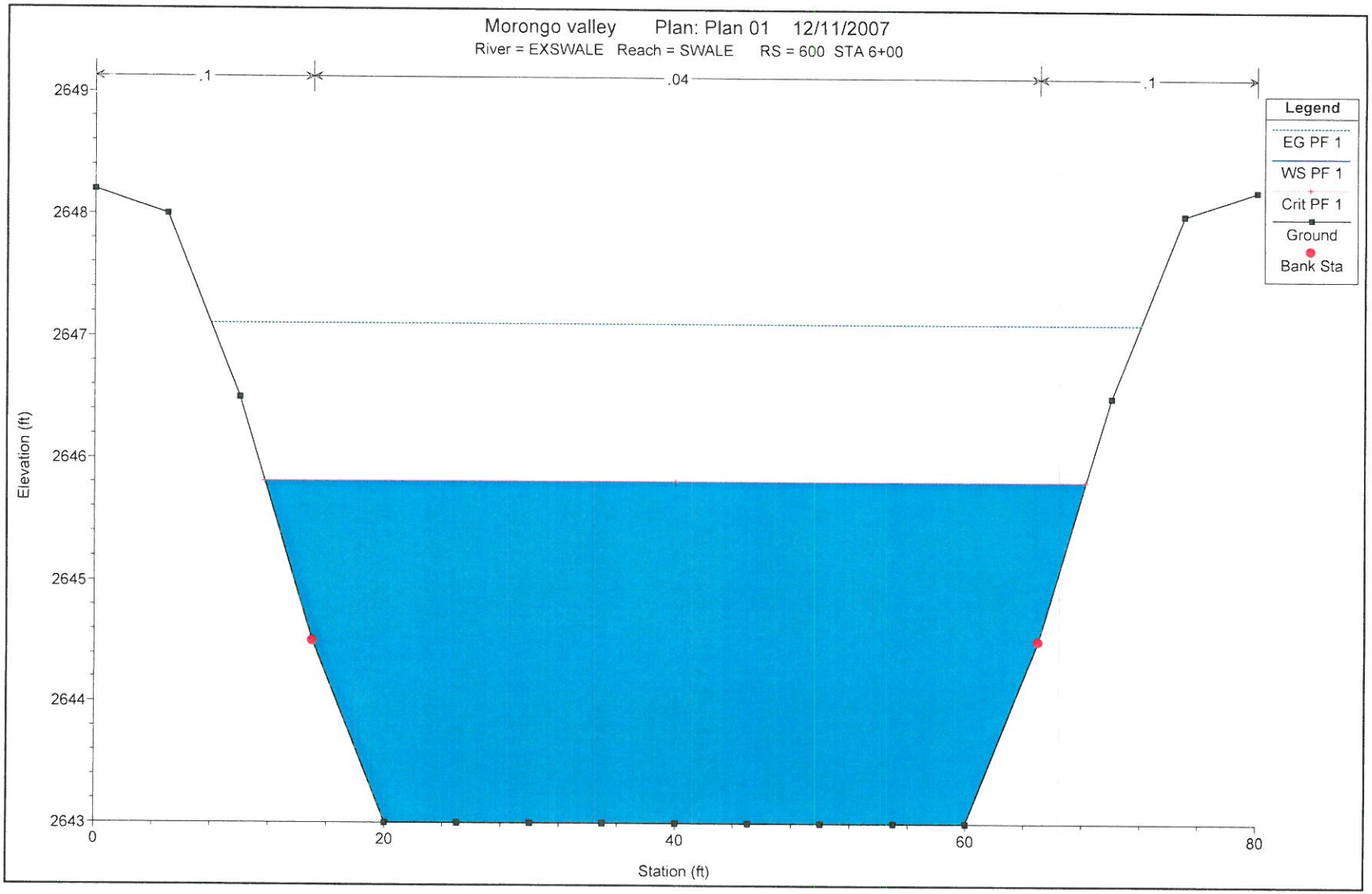
2653
2652
2651
2650
2649
2648
0
20
40
60
80
Station (ft)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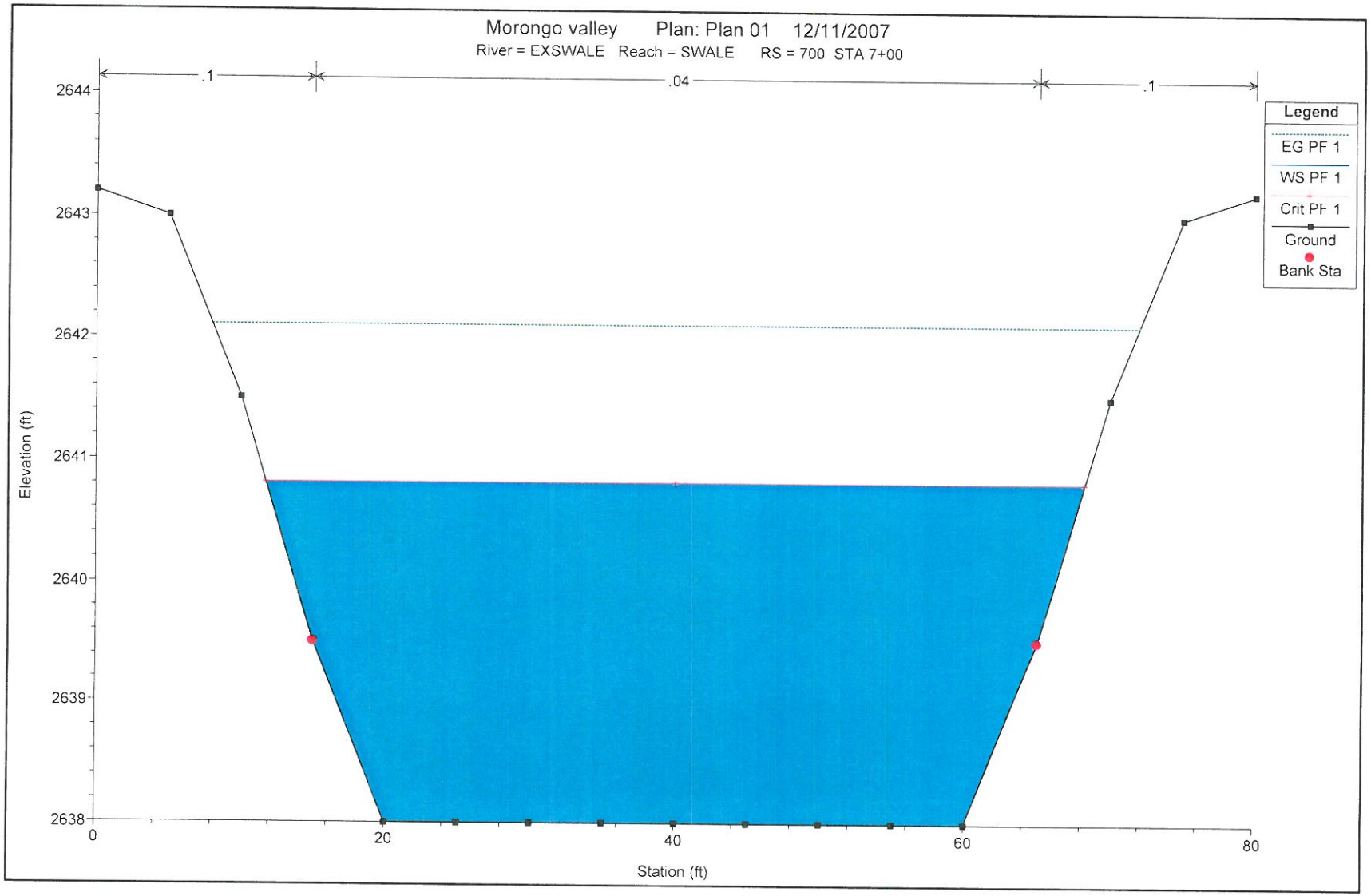
.1
.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2649
2648
2647
2646
2645
2644
2643
0
20
40
60
80
Station (ft)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.1
.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
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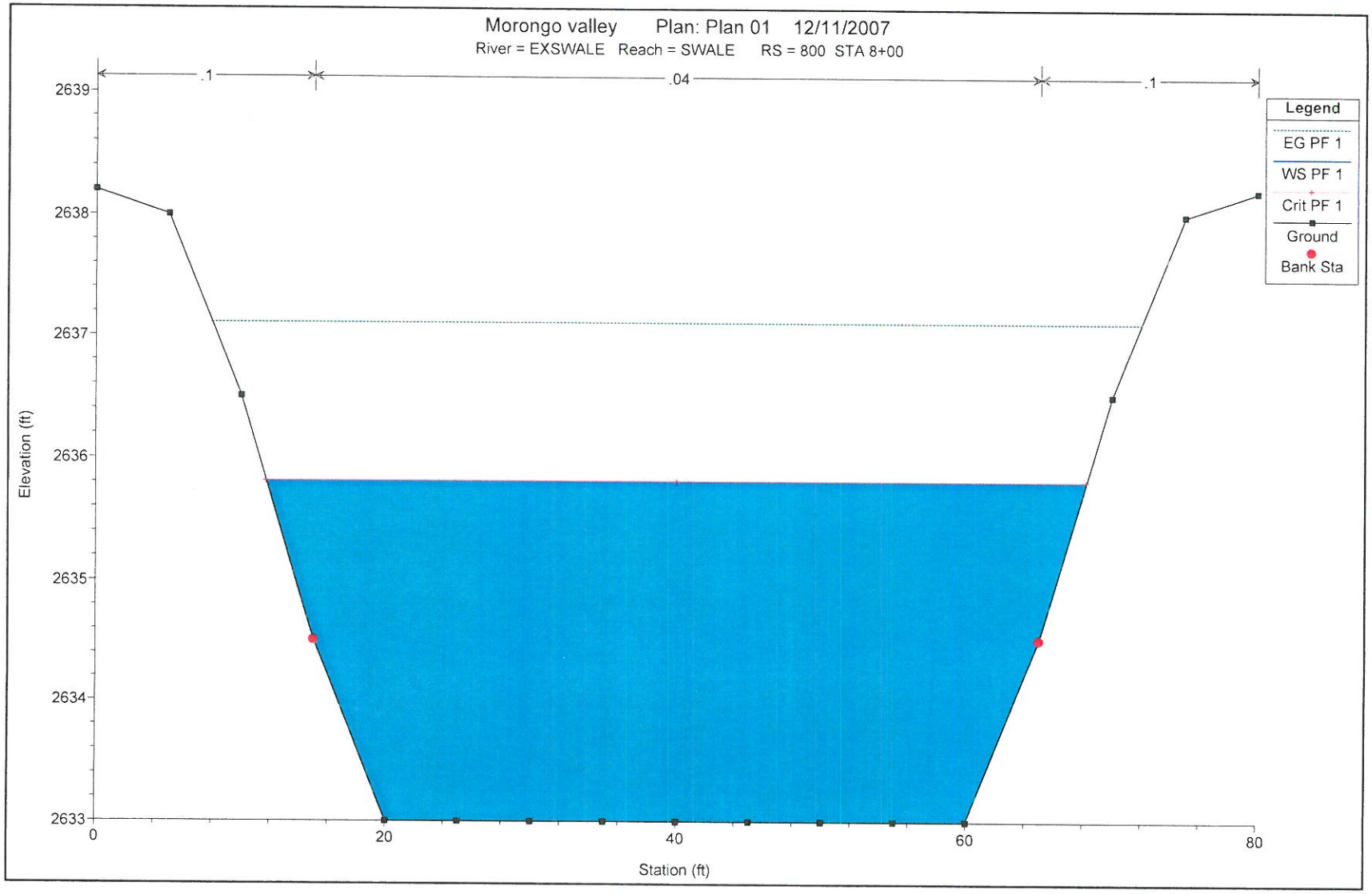
2644
2643
2642
2641
2640
2639
2638
0
20
40
60
80
Station (ft)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.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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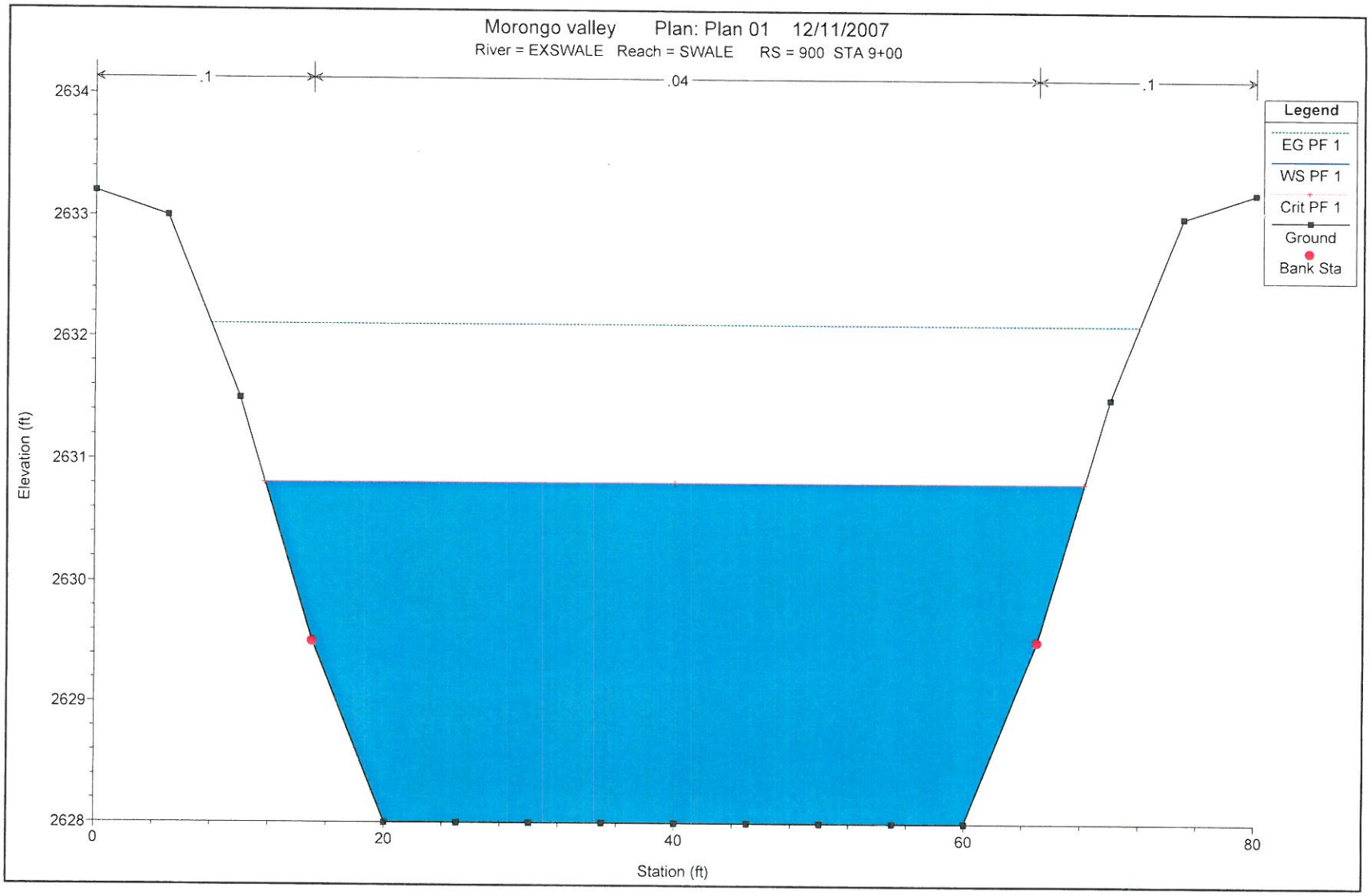
2638
2637
2636
2635
2634
2633
0
20
40
60
80
Station (ft)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.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
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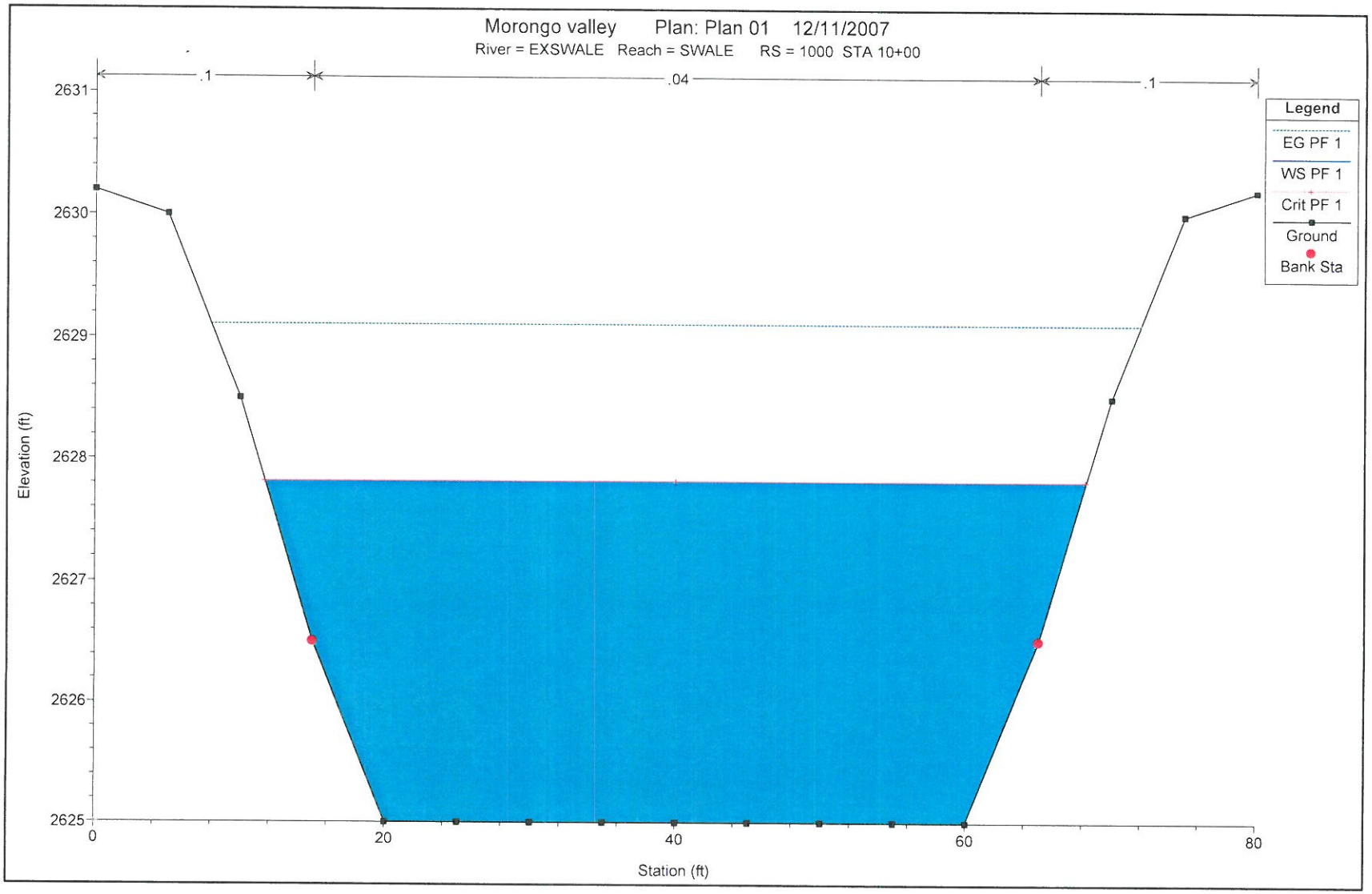
2633
2632
2631
2630
2629
2628
0
20
40
60
80
Station (ft)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.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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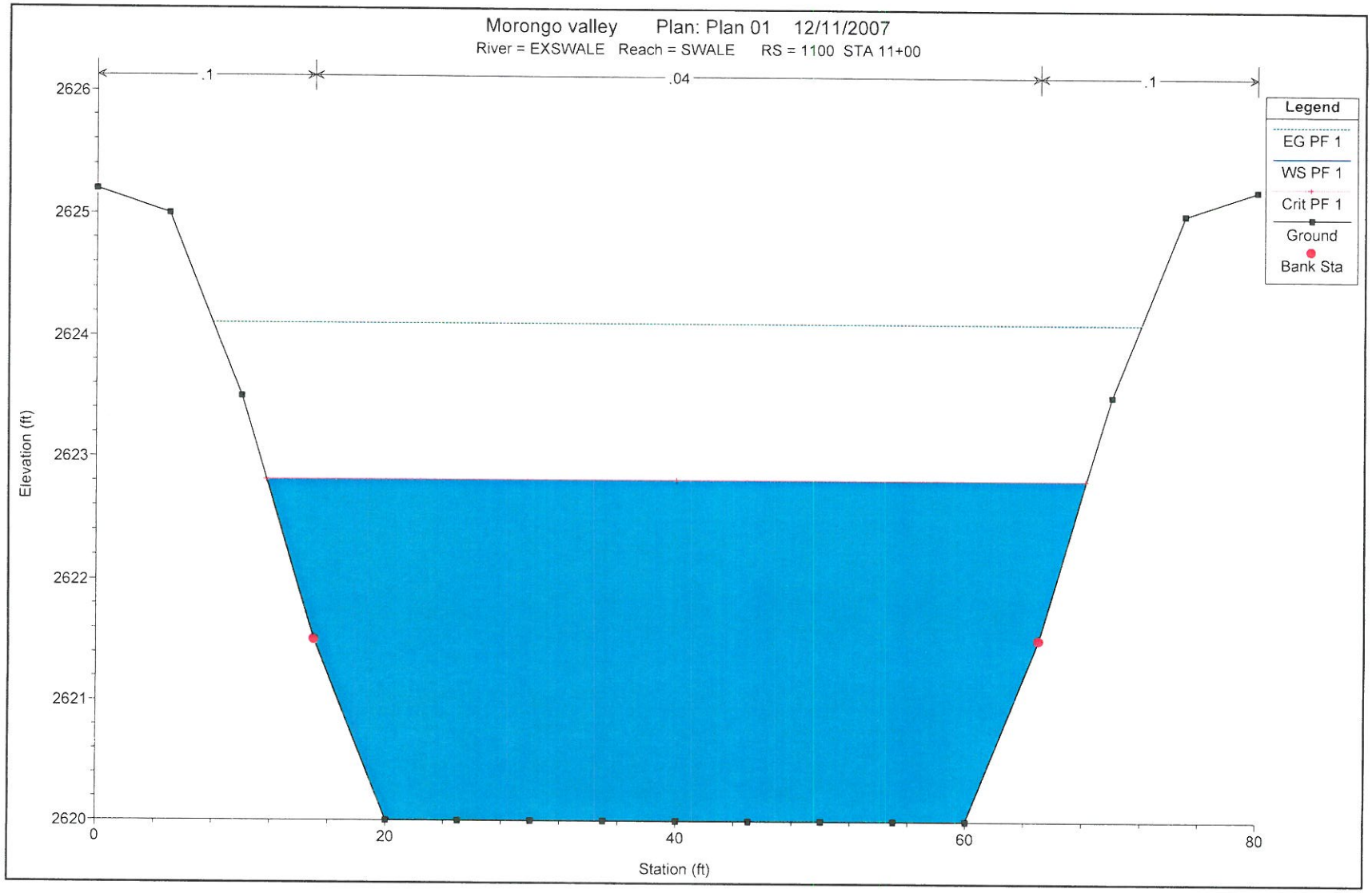
2630
2629
2628
2627
2626
2625
0
20
40
60
80
Station (ft)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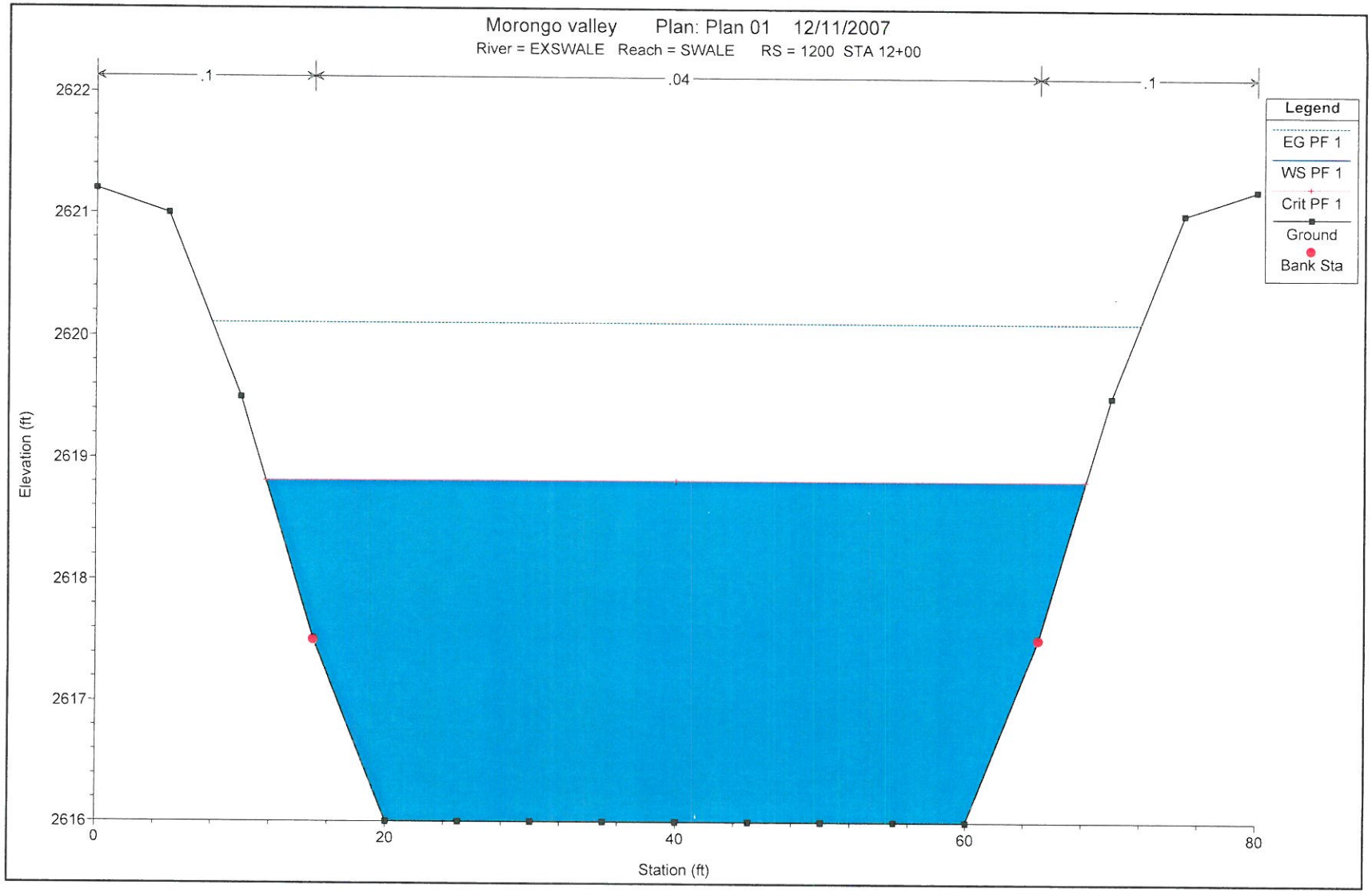
.1
.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2626
2625
2624
2623
2622
2621
2620
0
20
40
60
80
Station (ft)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.1
.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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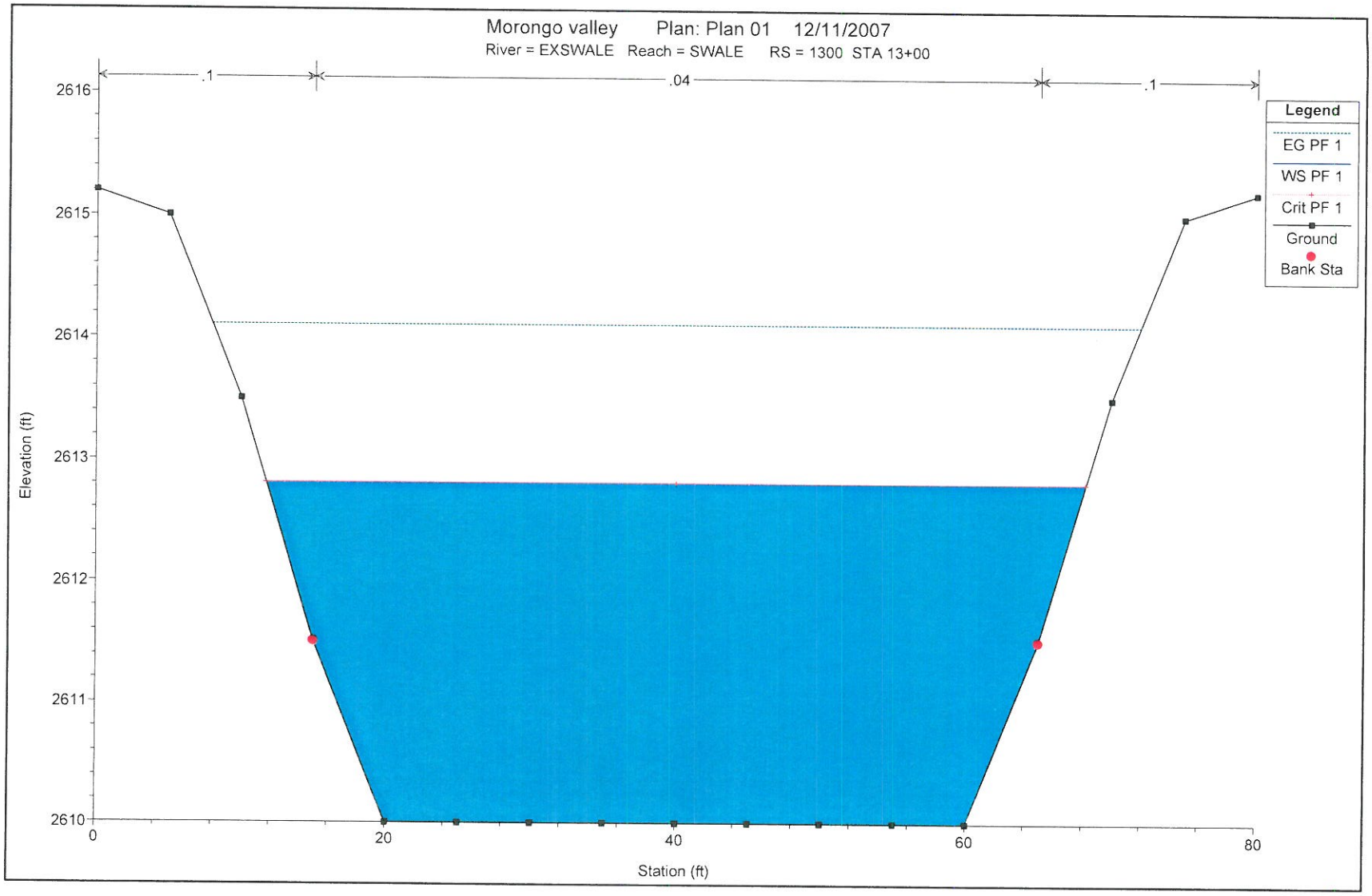
2621
2620
2619
2618
2617
2616
0
20
40
60
80
Station (ft)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.1
.04
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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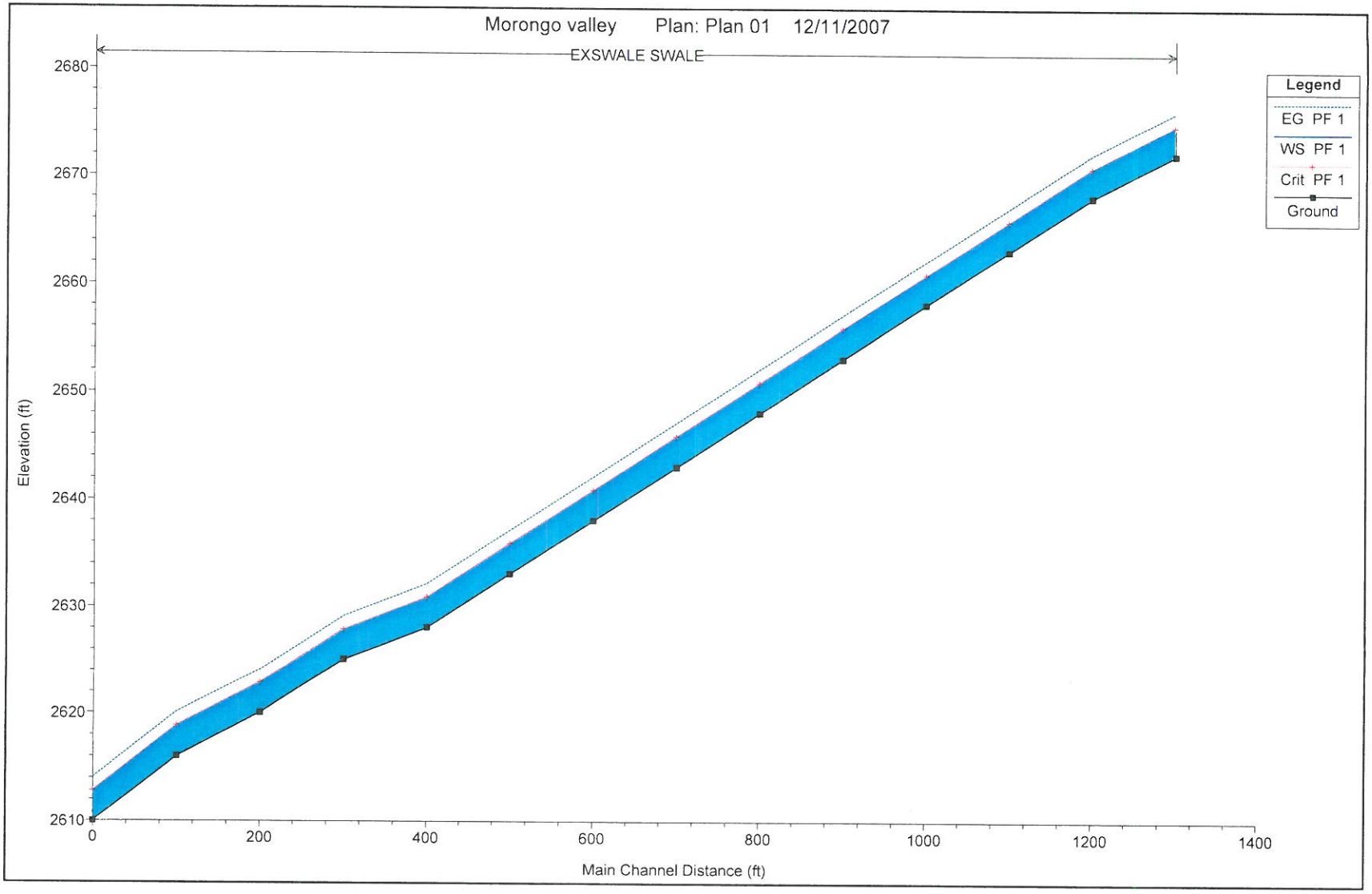
0
20
40
60
80
Station (ft)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EXSWALE SWALE
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2680
2670
2660
2650
2640
2630
2620
2610
0
200
400
600
800
1000
1200
1400
Main Channel Distance (ft)

Plan: Plan 01 EXSWALE SWALE RS: 0 Profile: PF 1

E.G. Elev (ft)	2676.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2674.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2674.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2672.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.06	3.96	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.10	1.49	0.10

Plan: Plan 01 EXSWALE SWALE RS: 100 Profile: PF 1

E.G. Elev (ft)	2672.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2670.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2670.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2668.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.06	3.65	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.09	1.38	0.09

Plan: Plan 01 EXSWALE SWALE RS: 200 Profile: PF 1

E.G. Elev (ft)	2667.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2665.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2665.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2663.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.05	3.35	0.05
C & E Loss (ft)	0.00	Cum SA (acres)	0.08	1.26	0.08

Plan: Plan 01 EXSWALE SWALE RS: 300 Profile: PF 1

E.G. Elev (ft)	2662.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2660.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2660.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93

Plan: Plan 01 EXSWALE SWALE RS: 300 Profile: PF 1 (Continued)

Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2658.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.05	3.05	0.05
C & E Loss (ft)	0.00	Cum SA (acres)	0.07	1.15	0.07

Plan: Plan 01 EXSWALE SWALE RS: 400 Profile: PF 1

E.G. Elev (ft)	2657.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2655.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2655.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2653.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.04	2.74	0.04
C & E Loss (ft)	0.00	Cum SA (acres)	0.07	1.03	0.07

Plan: Plan 01 EXSWALE SWALE RS: 500 Profile: PF 1

E.G. Elev (ft)	2652.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2650.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2650.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2648.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.04	2.44	0.04
C & E Loss (ft)	0.00	Cum SA (acres)	0.06	0.92	0.06

Plan: Plan 01 EXSWALE SWALE RS: 600 Profile: PF 1

E.G. Elev (ft)	2647.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2645.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2645.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2643.00	Shear (lb/sq ft)	0.64	2.77	0.64

Plan: Plan 01 EXSWALE SWALE RS: 600 Profile: PF 1 (Continued)

Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.03	2.13	0.03
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	0.80	0.05

Plan: Plan 01 EXSWALE SWALE RS: 700 Profile: PF 1

E.G. Elev (ft)	2642.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2640.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2640.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2638.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.03	1.83	0.03
C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.69	0.04

Plan: Plan 01 EXSWALE SWALE RS: 800 Profile: PF 1

E.G. Elev (ft)	2637.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2635.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2635.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2633.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.02	1.52	0.02
C & E Loss (ft)	0.00	Cum SA (acres)	0.04	0.57	0.04

Plan: Plan 01 EXSWALE SWALE RS: 900 Profile: PF 1

E.G. Elev (ft)	2632.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2630.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2630.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2628.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.02	1.22	0.02
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	0.46	0.03

Plan: Plan 01 EXSWALE SWALE RS: 1000 Profile: PF 1

E.G. Elev (ft)	2629.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2627.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2627.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2625.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.01	0.91	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.02	0.34	0.02

Plan: Plan 01 EXSWALE SWALE RS: 1100 Profile: PF 1

E.G. Elev (ft)	2624.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2622.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2622.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2620.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	0.01	0.61	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.01	0.23	0.01

Plan: Plan 01 EXSWALE SWALE RS: 1200 Profile: PF 1

E.G. Elev (ft)	2620.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2618.80	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2618.80	Flow Area (sq ft)	2.12	132.69	2.12
E.G. Slope (ft/ft)	0.016839	Area (sq ft)	2.12	132.69	2.12
Q Total (cfs)	1224.69	Flow (cfs)	2.93	1218.83	2.93
Top Width (ft)	56.52	Top Width (ft)	3.26	50.00	3.26
Vel Total (ft/s)	8.94	Avg. Vel. (ft/s)	1.38	9.19	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9437.9	Conv. (cfs)	22.6	9392.7	22.6
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.51	50.44	3.51
Min Ch El (ft)	2616.00	Shear (lb/sq ft)	0.64	2.77	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.40	0.88
Frctn Loss (ft)	1.69	Cum Volume (acre-ft)	0.00	0.30	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.01	0.11	0.01

Plan: Plan 01 EXSWALE SWALE RS: 1300 Profile: PF 1

E.G. Elev (ft)	2614.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.31	Wt. n-Val.	0.100	0.040	0.100
W.S. Elev (ft)	2612.80	Reach Len. (ft)			
Crit W.S. (ft)	2612.80	Flow Area (sq ft)	2.11	132.45	2.11
E.G. Slope (ft/ft)	0.016938	Area (sq ft)	2.11	132.45	2.11
Q Total (cfs)	1224.69	Flow (cfs)	2.91	1218.87	2.91

Plan: Plan 01 EXSWALE SWALE RS: 1300 Profile: PF 1 (Continued)

Top Width (ft)	56.50	Top Width (ft)	3.25	50.00	3.25
Vel Total (ft/s)	8.96	Avg. Vel. (ft/s)	1.38	9.20	1.38
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	0.65	2.65	0.65
Conv. Total (cfs)	9410.1	Conv. (cfs)	22.4	9365.3	22.4
Length Wtd. (ft)		Wetted Per. (ft)	3.50	50.44	3.50
Min Ch El (ft)	2610.00	Shear (lb/sq ft)	0.64	2.78	0.64
Alpha	1.05	Stream Power (lb/ft s)	0.88	25.55	0.88
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

50' WIDE CHANNEL CAPACITY CALCULATION

TTM 18516
APN# 0583-291-01-0000
& 0583-301-01-0000

LOCATED AT
PIONEER DRIVE &
PALO VERDE ROAD

Prepared by

Petra Group Inc.

13840 Dos Palmas Road
Victorville, CA 92392
Phone: (760) 792-9875

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2.0 CHANNEL CAPACITY CALCULATION

1.0 DESIGN

1.1 General Criteria

The Channel Capacity calculation is carried out to find out the feasibility of 50' wide Drainage channel flowing North to South to carry out the Q100 Offsite storm runoff and discharge the flow to the South.

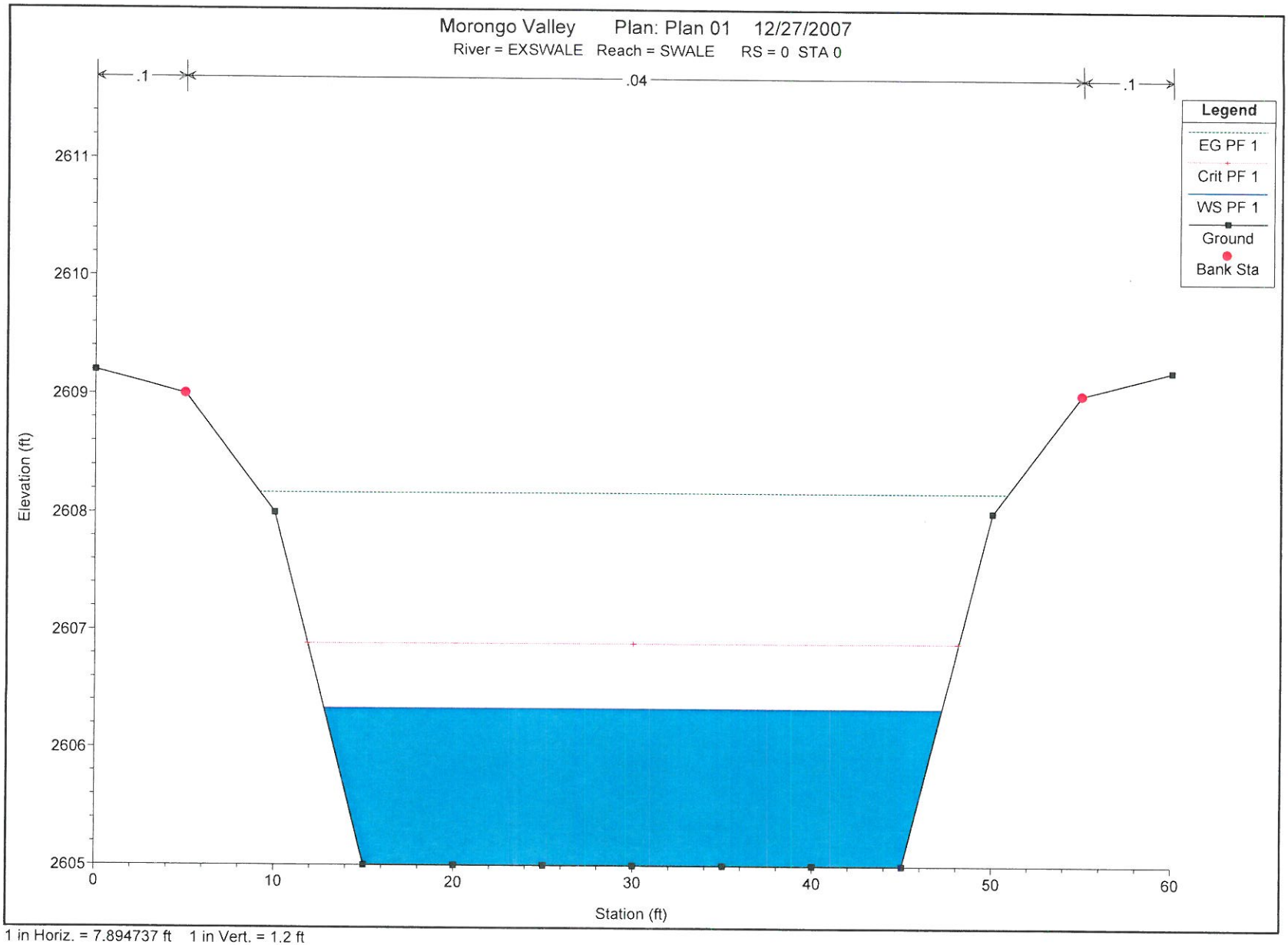
1.2 Design Criteria

1. HEC-RAS is used for routing and sizing the channel.
2. Q100 Offsite Discharge = 379.09 Cfs (With a bulk factor of 2 as per San Bernardino County Rational method Calculation).
3. Q100 Onsite Discharge = 6.44 Cfs (With a bulk factor of 2 as per San Bernardino County Rational method Calculation).

1.3 Conclusion

The HEC-RAS output shows a max flow width of 35.74' along all the sections, which flows clearly within 50'wide easement with a free board of 2.5' above flowlevel. It is recommended to grade the sides of channel with slopes of 2H: 1V on both sides. This increases the flow capacity of Channel and keep the neighboring sites safely away from flow limits.

Following pages give the details of the channel capacity calculations.



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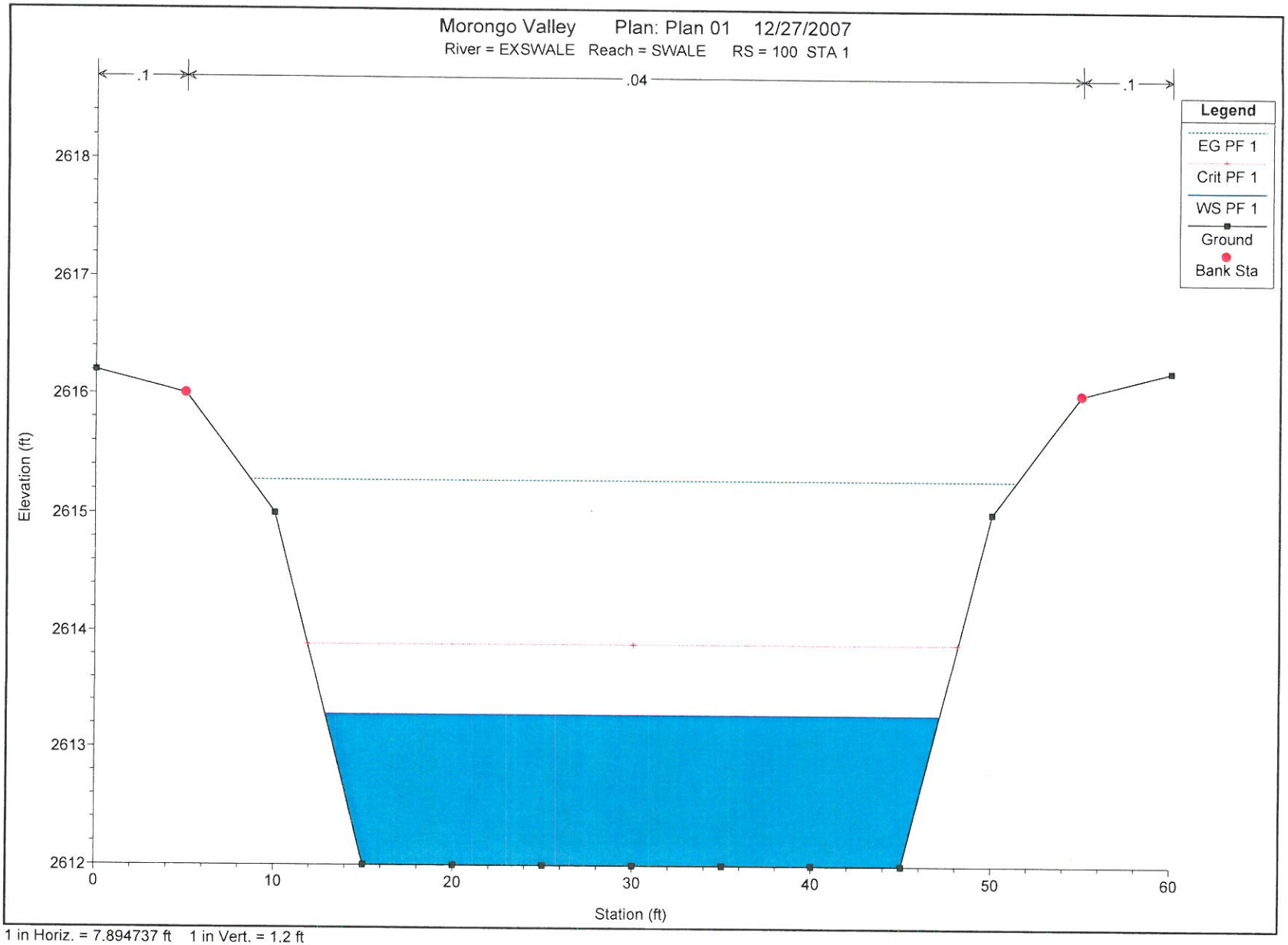

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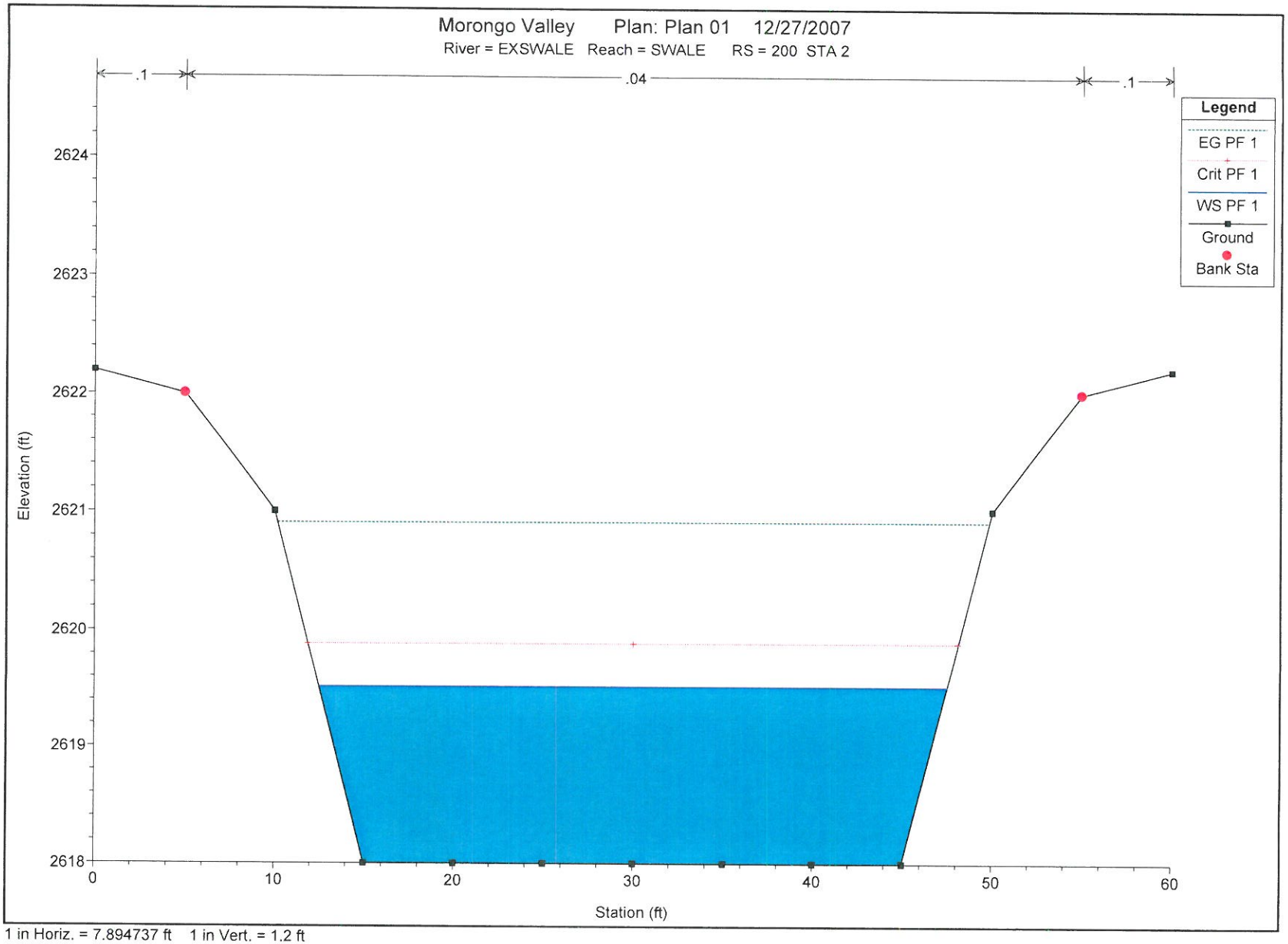

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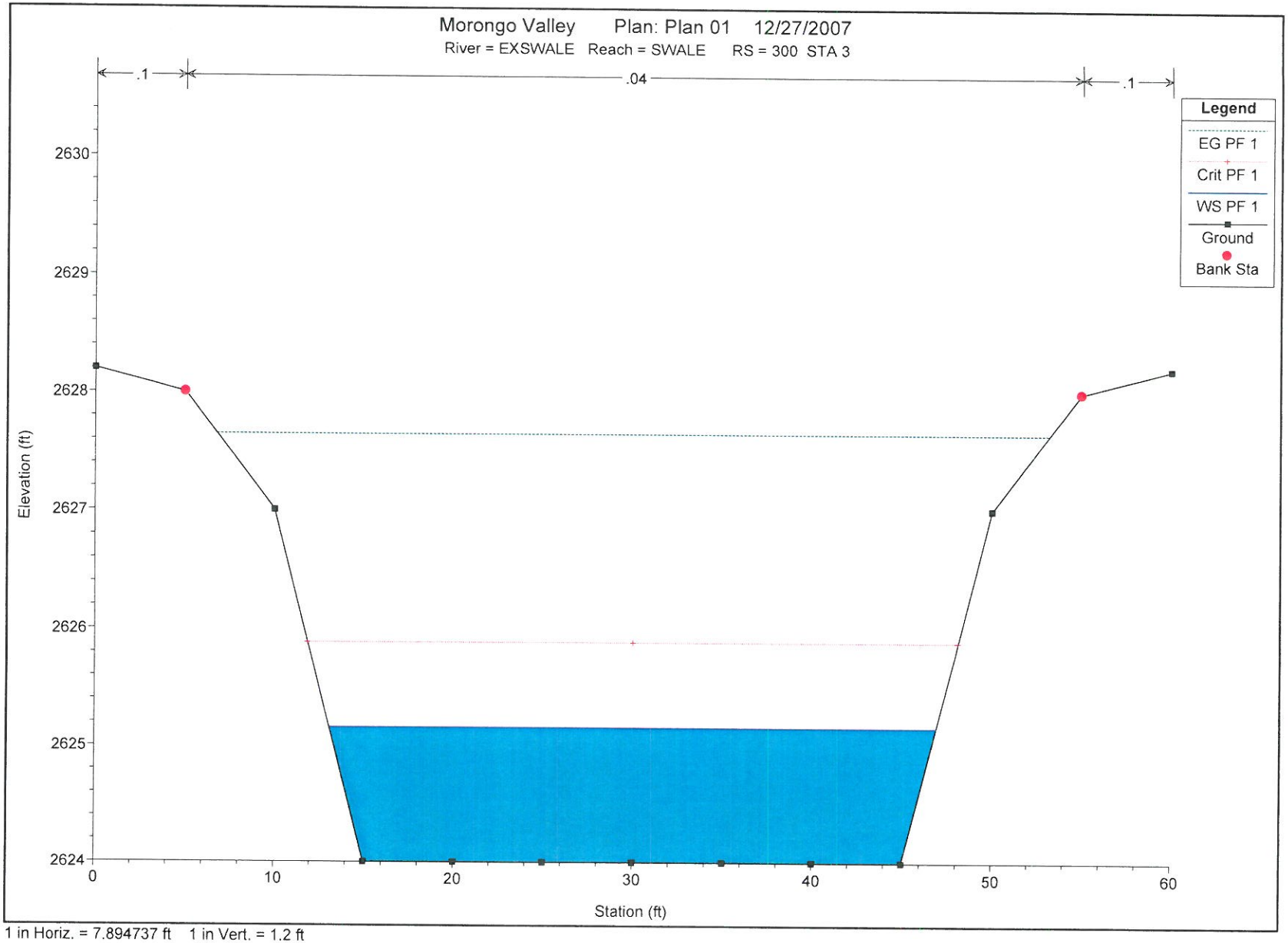

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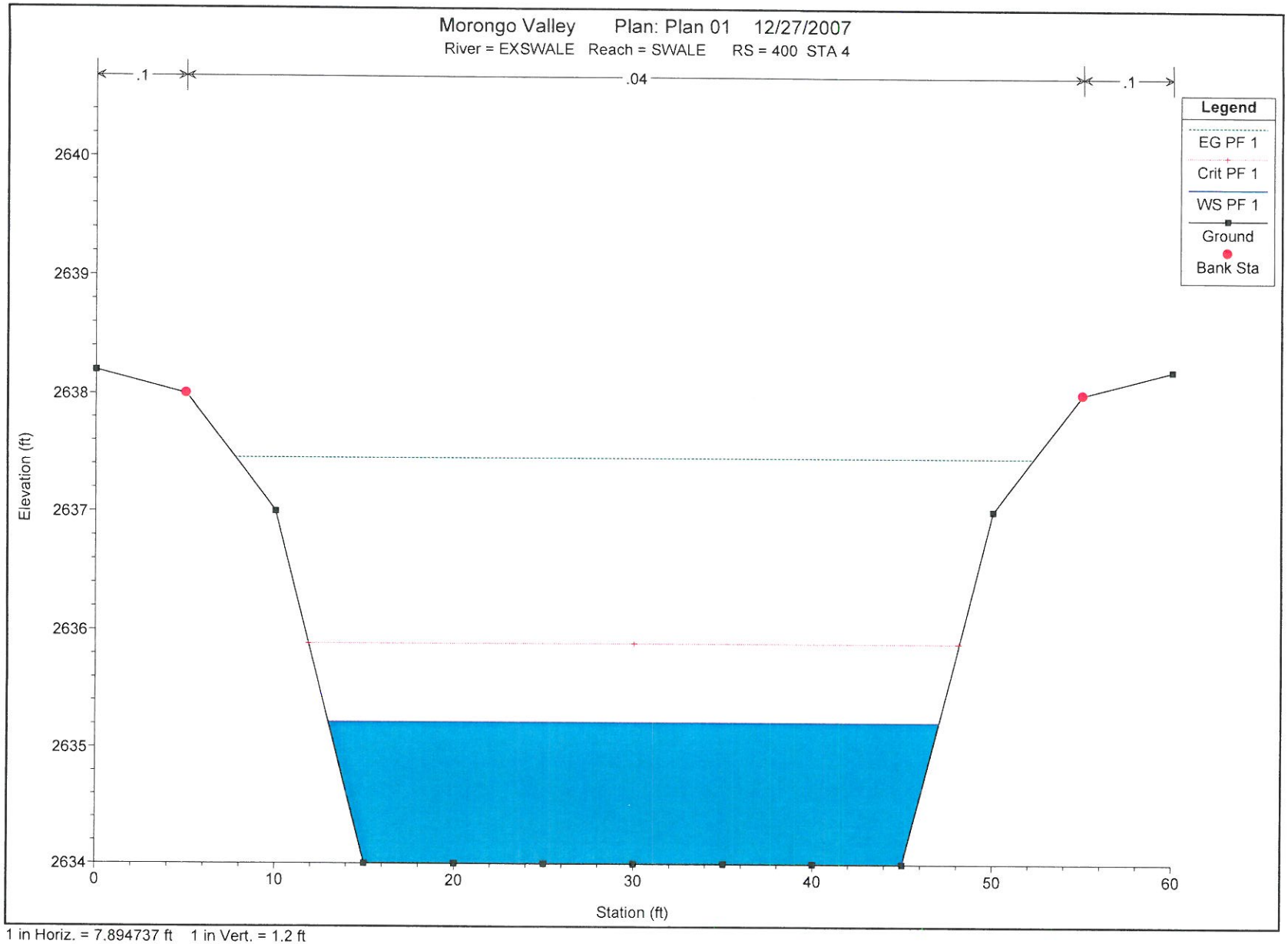
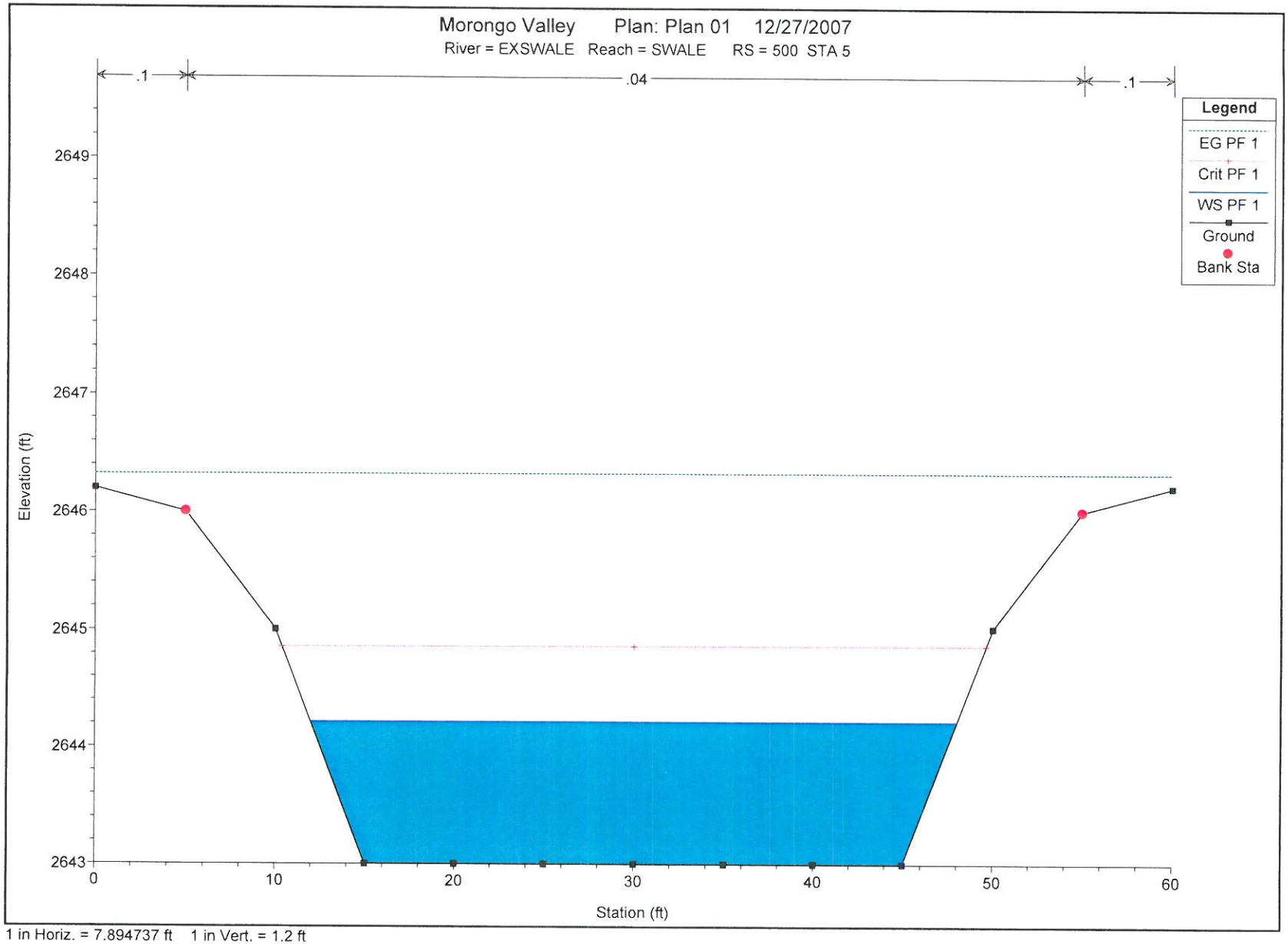
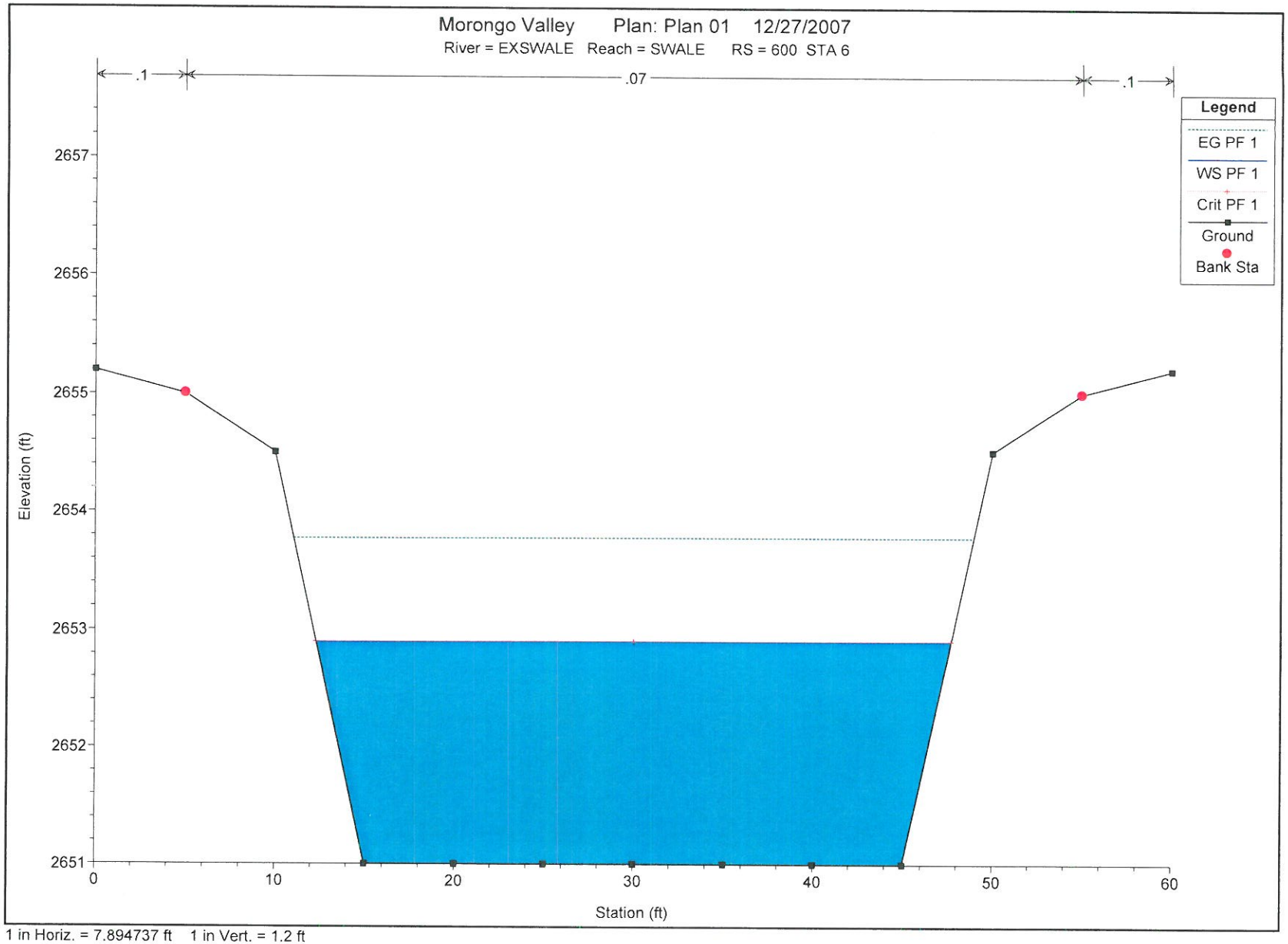


1 in Horiz. = 7.894737 ft 1 in Vert. = 1.2 ft



1 in Horiz. = 7.894737 ft 1 in Vert. = 1.2 ft



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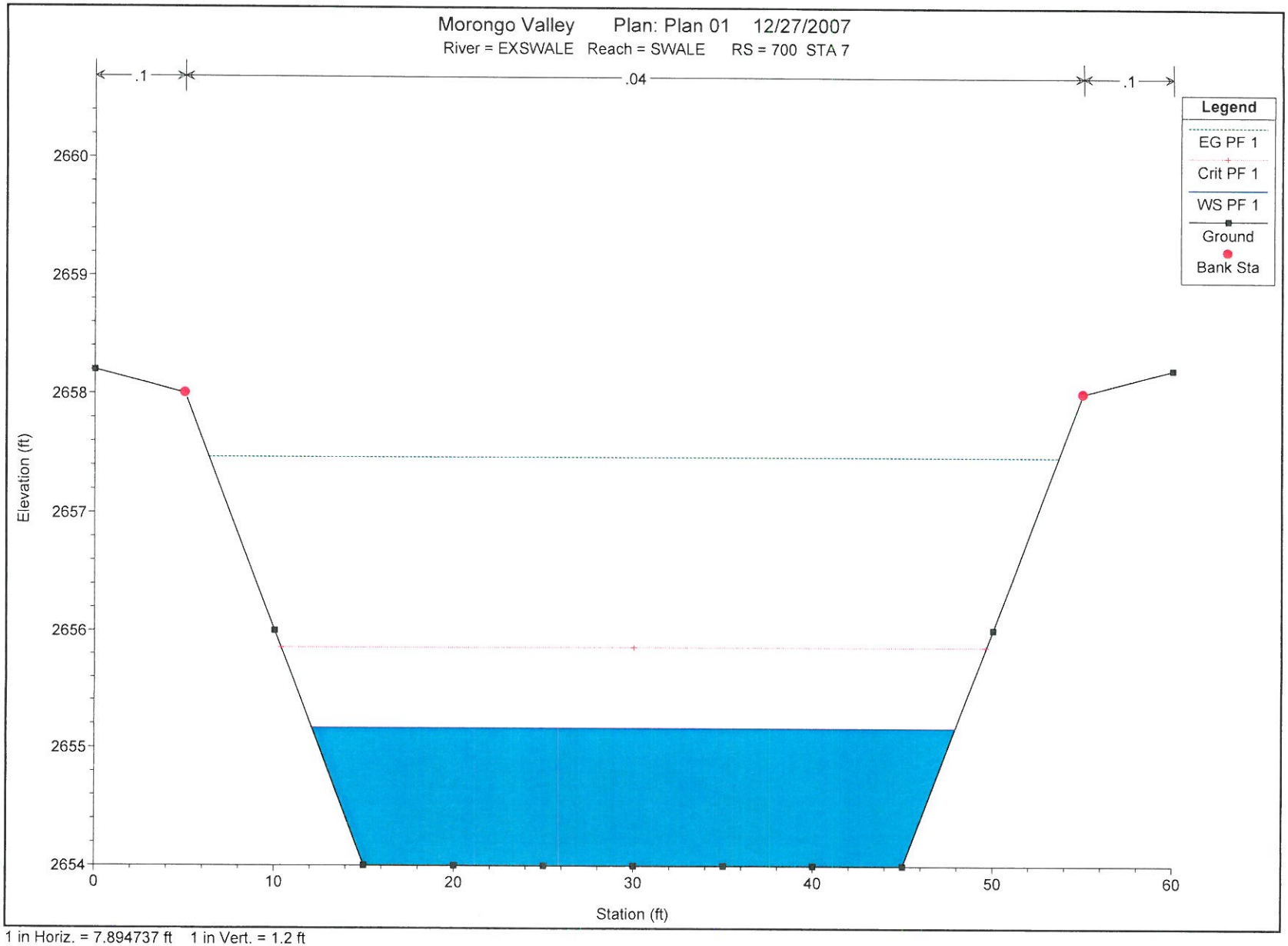
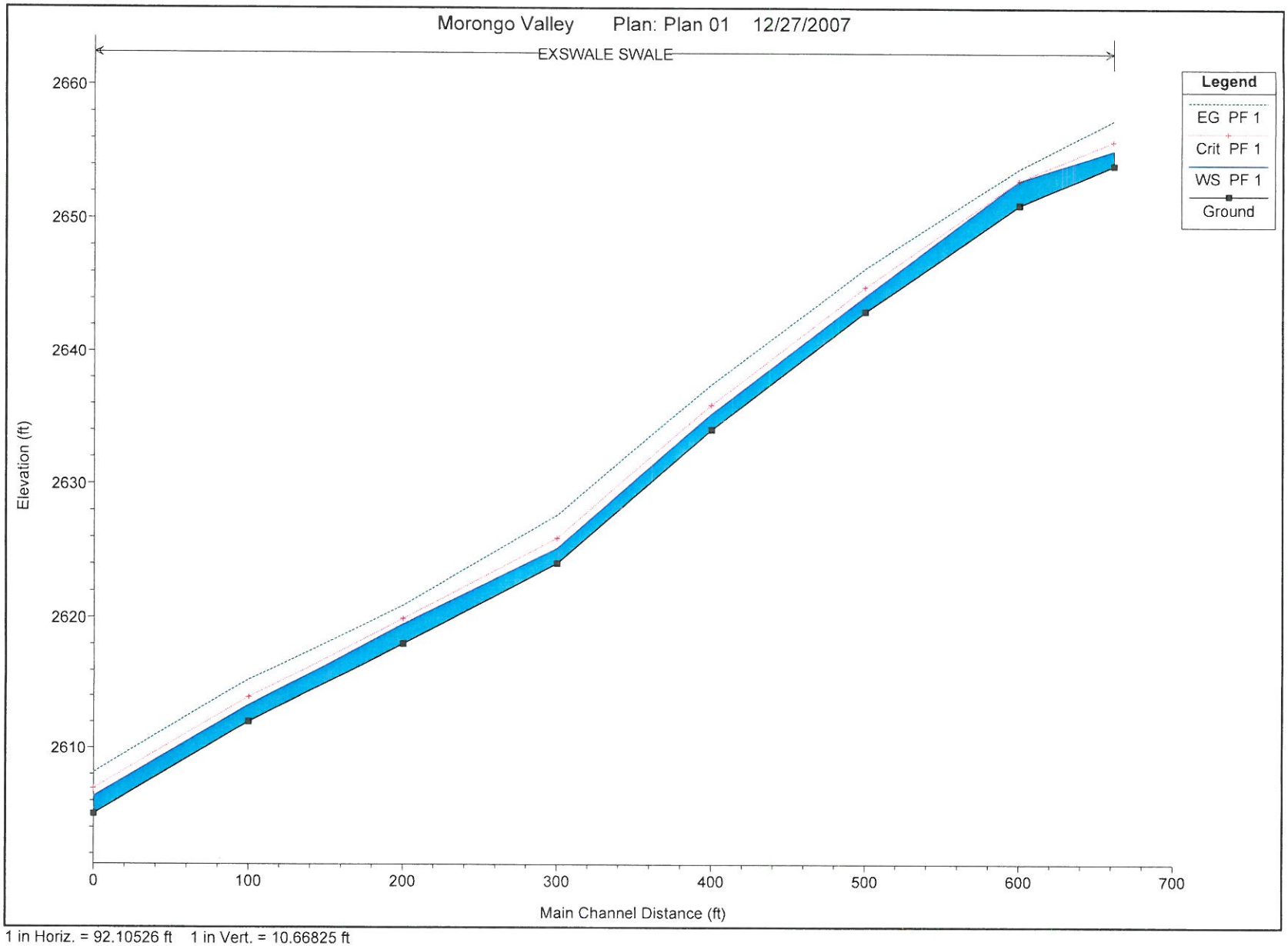


1 in Horiz. = 7.894737 ft 1 in Vert. = 1.2 ft



1 in Horiz. = 92.10526 ft 1 in Vert. = 10.66825 ft

Plan: Plan 01 EXSWALE SWALE RS: 700 Profile: PF 1

E.G. Elev (ft)	2657.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.30	Wt. n-Val.		0.040	
W.S. Elev (ft)	2655.16	Reach Len. (ft)	61.50	61.50	61.50
Crit W.S. (ft)	2655.85	Flow Area (sq ft)		38.27	
E.G. Slope (ft/ft)	0.100040	Area (sq ft)		38.27	
Q Total (cfs)	466.02	Flow (cfs)		466.02	
Top Width (ft)	35.81	Top Width (ft)		35.81	
Vel Total (ft/s)	12.18	Avg. Vel. (ft/s)		12.18	
Max Chl Dpth (ft)	1.16	Hydr. Depth (ft)		1.07	
Conv. Total (cfs)	1473.4	Conv. (cfs)		1473.4	
Length Wtd. (ft)	61.50	Wetted Per. (ft)		36.26	
Min Ch El (ft)	2654.00	Shear (lb/sq ft)		6.59	
Alpha	1.00	Stream Power (lb/ft s)		80.26	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.66	
C & E Loss (ft)		Cum SA (acres)		0.53	

Plan: Plan 01 EXSWALE SWALE RS: 600 Profile: PF 1

E.G. Elev (ft)	2653.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.88	Wt. n-Val.		0.070	
W.S. Elev (ft)	2652.89	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2652.89	Flow Area (sq ft)		61.92	
E.G. Slope (ft/ft)	0.062363	Area (sq ft)		61.92	
Q Total (cfs)	466.02	Flow (cfs)		466.02	
Top Width (ft)	35.41	Top Width (ft)		35.41	
Vel Total (ft/s)	7.53	Avg. Vel. (ft/s)		7.53	
Max Chl Dpth (ft)	1.89	Hydr. Depth (ft)		1.75	
Conv. Total (cfs)	1866.1	Conv. (cfs)		1866.1	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		36.60	
Min Ch El (ft)	2651.00	Shear (lb/sq ft)		6.59	
Alpha	1.00	Stream Power (lb/ft s)		49.57	
Frctn Loss (ft)	3.30	Cum Volume (acre-ft)		0.59	
C & E Loss (ft)	0.02	Cum SA (acres)		0.48	

Plan: Plan 01 EXSWALE SWALE RS: 500 Profile: PF 1

E.G. Elev (ft)	2646.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.11	Wt. n-Val.		0.040	
W.S. Elev (ft)	2644.21	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2644.85	Flow Area (sq ft)		39.98	
E.G. Slope (ft/ft)	0.087285	Area (sq ft)		39.98	
Q Total (cfs)	466.02	Flow (cfs)		466.02	
Top Width (ft)	36.05	Top Width (ft)		36.05	
Vel Total (ft/s)	11.66	Avg. Vel. (ft/s)		11.66	
Max Chl Dpth (ft)	1.21	Hydr. Depth (ft)		1.11	
Conv. Total (cfs)	1577.4	Conv. (cfs)		1577.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		36.52	
Min Ch El (ft)	2643.00	Shear (lb/sq ft)		5.97	
Alpha	1.00	Stream Power (lb/ft s)		69.54	
Frctn Loss (ft)	7.33	Cum Volume (acre-ft)		0.48	
C & E Loss (ft)	0.12	Cum SA (acres)		0.40	

Plan: Plan 01 EXSWALE SWALE RS: 400 Profile: PF 1

E.G. Elev (ft)	2637.45	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.24	Wt. n-Val.		0.040	
W.S. Elev (ft)	2635.21	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2635.88	Flow Area (sq ft)		38.81	
E.G. Slope (ft/ft)	0.090011	Area (sq ft)		38.81	
Q Total (cfs)	466.02	Flow (cfs)		466.02	
Top Width (ft)	34.04	Top Width (ft)		34.04	
Vel Total (ft/s)	12.01	Avg. Vel. (ft/s)		12.01	
Max Chl Dpth (ft)	1.21	Hydr. Depth (ft)		1.14	
Conv. Total (cfs)	1553.3	Conv. (cfs)		1553.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		34.71	
Min Ch El (ft)	2634.00	Shear (lb/sq ft)		6.28	
Alpha	1.00	Stream Power (lb/ft s)		75.44	
Frctn Loss (ft)	8.86	Cum Volume (acre-ft)		0.39	
C & E Loss (ft)	0.01	Cum SA (acres)		0.32	

Plan: Plan 01 EXSWALE SWALE RS: 300 Profile: PF 1

E.G. Elev (ft)	2627.65	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.49	Wt. n-Val.		0.040	
W.S. Elev (ft)	2625.15	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2625.88	Flow Area (sq ft)		36.78	
E.G. Slope (ft/ft)	0.106703	Area (sq ft)		36.78	
Q Total (cfs)	466.02	Flow (cfs)		466.02	
Top Width (ft)	33.84	Top Width (ft)		33.84	
Vel Total (ft/s)	12.67	Avg. Vel. (ft/s)		12.67	
Max Chl Dpth (ft)	1.15	Hydr. Depth (ft)		1.09	
Conv. Total (cfs)	1426.6	Conv. (cfs)		1426.6	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		34.48	
Min Ch El (ft)	2624.00	Shear (lb/sq ft)		7.11	
Alpha	1.00	Stream Power (lb/ft s)		90.04	
Frctn Loss (ft)	9.78	Cum Volume (acre-ft)		0.30	
C & E Loss (ft)	0.03	Cum SA (acres)		0.24	

Plan: Plan 01 EXSWALE SWALE RS: 200 Profile: PF 1

E.G. Elev (ft)	2620.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.40	Wt. n-Val.		0.040	
W.S. Elev (ft)	2619.51	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2619.88	Flow Area (sq ft)		49.15	
E.G. Slope (ft/ft)	0.042809	Area (sq ft)		49.15	
Q Total (cfs)	466.02	Flow (cfs)		466.02	
Top Width (ft)	35.04	Top Width (ft)		35.04	
Vel Total (ft/s)	9.48	Avg. Vel. (ft/s)		9.48	
Max Chl Dpth (ft)	1.51	Hydr. Depth (ft)		1.40	
Conv. Total (cfs)	2252.3	Conv. (cfs)		2252.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		35.88	
Min Ch El (ft)	2618.00	Shear (lb/sq ft)		3.66	
Alpha	1.00	Stream Power (lb/ft s)		34.72	
Frctn Loss (ft)	6.42	Cum Volume (acre-ft)		0.20	
C & E Loss (ft)	0.33	Cum SA (acres)		0.16	

Plan: Plan 01 EXSWALE SWALE RS: 100 Profile: PF 1

E.G. Elev (ft)	2615.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.00	Wt. n-Val.		0.040	
W.S. Elev (ft)	2613.28	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	2613.88	Flow Area (sq ft)		41.06	
E.G. Slope (ft/ft)	0.075374	Area (sq ft)		41.06	
Q Total (cfs)	466.02	Flow (cfs)		466.02	
Top Width (ft)	34.26	Top Width (ft)		34.26	
Vel Total (ft/s)	11.35	Avg. Vel. (ft/s)		11.35	
Max Chl Dpth (ft)	1.28	Hydr. Depth (ft)		1.20	
Conv. Total (cfs)	1697.4	Conv. (cfs)		1697.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		34.97	
Min Ch El (ft)	2612.00	Shear (lb/sq ft)		5.52	
Alpha	1.00	Stream Power (lb/ft s)		62.71	
Frctn Loss (ft)	5.57	Cum Volume (acre-ft)		0.10	
C & E Loss (ft)	0.06	Cum SA (acres)		0.08	

Plan: Plan 01 EXSWALE SWALE RS: 0 Profile: PF 1

E.G. Elev (ft)	2608.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.84	Wt. n-Val.		0.040	
W.S. Elev (ft)	2606.33	Reach Len. (ft)			
Crit W.S. (ft)	2606.88	Flow Area (sq ft)		42.77	
E.G. Slope (ft/ft)	0.066272	Area (sq ft)		42.77	
Q Total (cfs)	466.02	Flow (cfs)		466.02	
Top Width (ft)	34.43	Top Width (ft)		34.43	
Vel Total (ft/s)	10.90	Avg. Vel. (ft/s)		10.90	
Max Chl Dpth (ft)	1.33	Hydr. Depth (ft)		1.24	
Conv. Total (cfs)	1810.3	Conv. (cfs)		1810.3	
Length Wtd. (ft)		Wetted Per. (ft)		35.16	
Min Ch El (ft)	2605.00	Shear (lb/sq ft)		5.03	
Alpha	1.00	Stream Power (lb/ft s)		54.84	
Frctn Loss (ft)	7.06	Cum Volume (acre-ft)			
C & E Loss (ft)	0.05	Cum SA (acres)			