CAMPUS PARK WEST PROJECT

APPENDIX O

SAN LUIS REY FLOODPLAIN STUDY

SPA05-001, GPA05-003, REZ05-005,
TM 5424, LOG NO. 05-02-009

for the

DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT

August 2013

SAN LUIS REY RIVER

FLOODPLAIN STUDY

FOR

CAMPUS PARK WEST

(TENTATIVE MAP NO. 5424, GPA05-003; SPA05-001; REZ05-005; ER05-02-009)

July 30, 2013

Wayne W. Chang, MS, PE 46548

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MAP POCKET

INTRODUCTION

Campus Park West (Tentative Map No. 5424) is a proposed mixed-use development (light industrial, commercial, multi-family, and open space uses) located near the intersection of State Route 76 (aka Pala Road) and Pankey Road in the County of San Diego (see Vicinity Map). Project Design Consultants (PDC) is preparing a tentative map for the project. The majority of the development will be north of State Route 76, while two commercial pads will be constructed south of State Route 76 on either side of Pankey Road. Pankey Road and Shearer Crossing will be realigned adjacent to the two commercial pads. The main channel of the San Luis Rey River is approximately 500 feet south of the southerly pads and conveys flow in a westerly direction. In addition, Horse Ranch Creek is just west of the southerly pads and conveys flow south to a confluence with the San Luis Rey River.

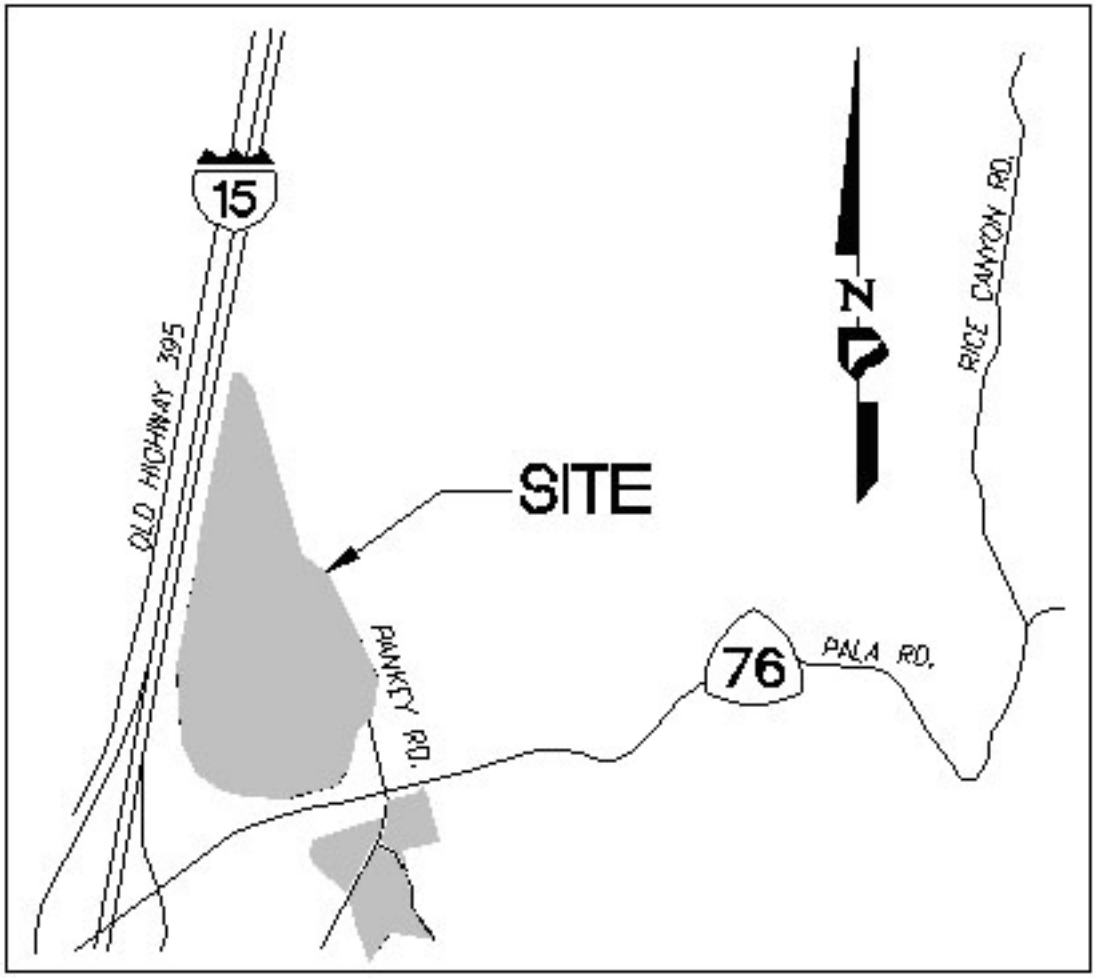


Figure 1. Vicinity Map

The County of San Diego studied the San Luis Rey River's 100-year floodplain and floodway near the project site in the 1970's and 1980's. Although detailed floodplain analyses were performed, the *Flood Insurance Rate Map* defines the floodplain along the project site as a Zone A (approximate study). The County has indicated that their floodway delineation will apply to development projects. In an August 26, 2011 report titled, *FEMA Letter of Map Revision*

(LOMR) – Follow up to CLOMR #05-09-1045R State Route 76 Widening And Realignment from Interstate 15 to 3.9 KM East, San Diego County, URS Corporation performed hydraulic analyses for the San Luis Rey River floodplain (not floodway) based on 2004 surveyed cross-sections, supplemented with the County of San Diego's orthotopographic mapping, and the proposed State Route 76 widening and realignment project. The results from this Letter of Map Revision for the San Luis Rey River floodplain were effective as of December 3, 2012.

The recent floodplain mapping by URS shows that the San Luis Rey River's 100-year floodplain extends north of the main channel within a portion of the Campus Park West development footprint south of Highway 76. The proposed development will occur within the current floodplain fringe, but outside of the County delineated floodway. Fill within the floodplain fringe is allowed by regulation. This report contains existing and proposed condition hydraulic analyses of the San Luis Rey River in support of the project's tentative map. A separate hydraulic analysis will be prepared for Horse Ranch Creek by PDC.

HYDRAULIC ANALYSES

Existing (pre-project) and proposed (post-project) condition HEC-RAS analyses for the San Luis Rey River were performed along the project reach. The following describes the input data. The HEC-RAS analyses were based on the 100-year flow rate (33,000 cfs) established by the County of San Diego and the US Army Corps of Engineers in 1978. This flow rate was used in the earlier County studies and URS' recent LOMR. The 100-year flow rate does not change at the confluence with Horse Ranch Creek.

The HEC-RAS cross-sections are on NGVD 29 vertical datum, were created from multiple data sources, and generally labeled in accordance with URS' stationing (see HEC-RAS Work Map in the map pocket at the back of this report). The cross-sections were primarily generated from May 3, 2008, 2-foot contour interval topographic mapping prepared for the project by PDC. This mapping is on NGVD 29 vertical datum and covers the project site as well as the majority of the upstream and downstream study areas. State Route 76 has been realigned along and near the site. The PDC mapping was flown prior to the realignment. As a result, the State Route 76 design plans were used to model the realigned roadway (see the map pocket for the as-builts). The plans were converted from metric units and NAVD 88 vertical datum to English units and NGVD 29 datum. The PDC mapping did not contain enough coverage for cross-sections 676.7 to 677.8. Topographic mapping was obtained for this area from Nolte Associates, Inc. The mapping was prepared circa 2005, is at a 1-foot contour interval, and was converted from NAVD 88 to NGVD 29 datum (NGVD 29 = NAVD 88 – 2.23'). The conversion was provided by the registered Senior Land Surveyor at PDC and is included after this report text. The upstream-most cross-section (680) was copied from the effective FEMA model in order to allow a tie-in with the FEMA floodplain. Finally, the Shearer Crossing bridge was modeled based on a March 25, 2010 field survey (NGVD 29) by PDC (see Field Survey Data exhibit in the map pocket).

Analyses were performed for low and high roughness conditions. The low roughness analyses were used to assess the potential for erosive flow velocities, while the high roughness analyses were used to establish the pad elevations. The low roughness analyses were based on channel

and overbank Manning's coefficients of 0.030 and 0.035, respectively (a roughness of 0.020 was assumed for streets and 0.040 for landscape areas). These analyses assume critical depth for the starting water surface elevation. The high roughness analyses were based on channel and overbank Manning's coefficients of 0.10 and 0.06, respectively. These analyses use URS' 100-year "post-condition" results at cross-section 662 for the starting water surface elevation (257.77 feet NGVD 29). Results from the HEC-RAS performed for URS' August 26, 2011, *FEMA Letter of Map Revision (LOMR) – Follow up to CLOMR #05-09-1045R State Route 76 Widening And Realignment from Interstate 15 to 3.9 KM East, San Diego County*, containing this water surface elevation are included after this report text. The URS LOMR was effective as of December 3, 2012.

The 100-year existing and proposed condition, low and high roughness HEC-RAS results are included in Appendix A and summarized in Table 1. The 100-year existing and proposed condition high roughness floodplain is plotted on the HEC-RAS Work Map at the back of this report. Table 1 indicates that the post-project generally maintains the pre-project average channel velocities and water surface elevations. The sole exception is a 0.1 foot per second increase in the average main channel flow velocity at cross-section 676.7 and 677.2. This is minimal change that will not affect the project or the existing protection at Shearer Crossing. The existing and proposed condition high roughness water surface elevations match at the upstream end of the study reach to the precision in the FEMA *Flood Insurance Study*, which is published to a tenth of a foot.

The above-described analyses were used to check velocity and water surface elevations. An additional existing and proposed condition analysis was performed in order to allow a comparison with the FEMA effective results. The existing and proposed condition models were similar to the high and low roughness models, but the roughness coefficients were changed to mimic the roughness coefficients from the effective model. A comparison of the results is provided in the last three columns of Table 1. The same starting water surface elevations were used and the model results tie-in exactly to the hundredth place at cross-section 680. Review of the results indicates that the proposed condition water surface elevations either match or are lower than the effective results everywhere except at cross-section 663, where the proposed water surface is 0.03 feet higher than the effective (and existing) water surface. This cross-section is downstream of the project area. Variations are attributed to differences in the base topographic mapping used to create the cross-sections. The effective model was primarily based on 2-foot contour interval topographic mapping from 2004. The cross-sections used for this report were primarily based on more recent topographic mapping from 2008. Some of the upper cross-sections were based on more detailed 1-foot contour interval topographic mapping circa 2005. Naturally, since more recent and/or detailed mapping was available in comparison to the LOMR mapping, the better mapping was used and can lead to different results. The river is a natural system, so its physical shape can change over time, which would be reflected in the newer mapping. Furthermore, the URS cross-sections are spaced further apart than those used for this report. The closer spacing will lead to slightly more accurate results. The URS work map is included in the map pocket for comparison with the work map for this report. A side-by-side comparison of the URS topographic mapping from their attached work map with the work map for this report reveals that their mapping is not nearly the quality or accuracy of the more recent mapping.

Cross-Section	Existing Condition, Low Roughness, 100-Year Velocity, fps	Proposed Condition, Low Roughness, 100-Year Velocity, fps	Existing Condition, High Roughness, 100-Year Water Surface Elevation, ft	Proposed Condition, High Roughness, 100-Year Water Surface Elevation, ft	Existing Condition, FEMA Roughness, 100-Year Water Surface Elevation, ft	Proposed Condition, FEMA Roughness, 100-Year Water Surface Elevation, ft	[2]FEMA Effective 100-Year Water Surface Elevation, ft
662[1]	13.8	13.8	257.77	257.77	257.77	257.77	257.77
663	11.7	11.7	258.78	258.78	257.85	257.88	257.85
664	10.1	10.1	259.59	259.59	257.89	257.94	257.94
665	7.8	7.8	260.76	260.76	258.28	258.34	259.47
666	10.3	10.3	261.25	261.25	258.18	258.27	260.02
668	12.4	12.4	262.05	262.03	262.46	262.48	262.87
669	Shearer Crossing Bridge		Shearer Crossing Bridge		Shearer Crossing Bridge		
670	9.0	8.8	266.88	266.80	265.21	265.15	265.97
673	4.2	4.2	267.28	267.27	266.03	265.96	266.94
674	3.7	3.7	267.48	267.50	266.14	266.07	267.00
676	4.3	4.3	267.64	267.66	266.16	266.08	267.03
676.7	5.5	5.6	267.86	267.88	266.13	266.06	267.11
677.2	5.2	5.3	268.22	268.24	266.27	266.20	267.17
677.8	8.4	8.4	268.79	268.80	266.19	266.11	266.97
680	15.1	15.1	269.18	269.18	266.55	266.55	266.55

[1]The low roughness HEC-RAS analyses use critical depth as the downstream starting water surface elevation at cross-section 662. The high roughness analyses use the URS "post-condition" (effective model) 100-year water surface elevation (257.77') as the downstream starting water surface elevation at cross-section 662.

[2]The FEMA effective results are from the URS LOMR. Some of the effective water surface elevations are based on interpolation where the FEMA cross-section is not at the same location as the existing condition cross-section. The existing and proposed condition analyses using the FEMA roughness coefficients ties into the FEMA effective model on the upstream (cross-section 680) and downstream (cross-section 662) as shown in the table. Cross-section 680 in the proposed condition model was copied from the FEMA effective model.

Table 1. Summary of HEC-RAS Results

For design purposes, the pads shall be set above the adjacent 100-year proposed condition high roughness water surface elevations with the required freeboard. The flow velocities in the HEC-RAS output reflect the average 100-year flow velocities in the main channel, which is over 400 feet from the proposed pads and realigned roads. In order to assess the flow velocities at the pads and realigned roads, the velocity distribution was plotted within the proposed condition, low roughness cross-sections (see Appendix A). The distribution shows that the velocities near the development are at (along Shearer Crossing) or below the erosive threshold of 6 feet per second.

CONCLUSION

Hydraulic analyses for the San Luis Rey River have been prepared for the Campus Park West Tentative Map by Project Design Consultants. The 100-year analyses have been performed for the pre- and post-project conditions based on the most recent available topographic mapping and the State Route 76 realignment. Analyses were performed based on a low channel and overbank roughness condition and showed that the flow velocities along the site are at or below 6 feet per second. The velocities closer to 6 feet per second are near Shearer Crossing, which will be paved. The road embankment may require some protection, such as a geosynthetic mat or vegetation, to protect against erosion. The proposed pads shall be set above the high roughness water surface elevations to protect against inundation. The current FIRM delineated with the proposed 100-year floodplain from this report is included in the map pocket.

On August 26, 2011, FEMA prepared a Letter of Map Revision for the San Luis Rey River by URS, which is reflected in the attached FIRM. The LOMR covers the segment of the river addressed in this report and also extends further upstream and downstream. The LOMR was titled *FEMA Letter of Map Revision (LOMR) – Follow up to CLOMR #05-09-1045R State Route 76 Widening And Realignment from Interstate 15 to 3.9 KM East, San Diego County.* The post-condition effective HEC-RAS model from the LOMR was obtained and the starting water surface elevation was used as discussed above.

The remainder of the effective URS HEC-RAS model was not used for the following reasons. The effective model was primarily based on 2-foot contour interval topographic mapping from 2004. The cross-sections used for this report were primarily based on more recent topographic mapping from 2008. Some of the upper cross-sections were based on more detailed 1-foot contour interval topographic mapping circa 2005. Naturally, since more recent and/or detailed mapping was available in comparison to the LOMR mapping, the better mapping was used and can lead to different results. The river is a natural system, so its physical shape can change over time, which would be reflected in the newer mapping. Furthermore, the URS cross-sections are spaced further apart than those used for this report. The closer spacing will lead to slightly more accurate results. The URS work map is included in the map pocket for comparison with the work map for this report.

The County of San Diego is requiring a Conditional Letter of Map Revision and Letter of Map Revision for the project. The CLOMR and LOMR will result in an update to the URS LOMR,

which will address the discrepancies discussed in the prior paragraph. The floodplain is mapped as an approximate Zone A floodplain, so the discrepancies would not be of issue to FEMA.

Wayne W. Chang

From: Wayne W. Chang <wayne@changconsultants.com>
Sent: Tuesday, April 09, 2013 4:31 PM
To: Wayne@ChangConsultants.com
Subject: VERTCON shift over Shearer Crossing
Attachments: 20130408124702311.pdf

From: Scott Edkins [mailto:scotte@projectdesign.com]
Sent: Monday, April 08, 2013 12:54 PM
To: wayne@changconsultants.com
Cc: 'Chelisa Pack'
Subject: RE: VERTCON shift over Shearer Crossing

Wayne;
I ran the VERTCON program from the N.G.S. website as well as the Corpscon6 program and have included both in the attachment above. They both are in agreement with a 2.234' shift. (You didn't provide an elevation for the point in question so I had to assume one for the purpose of determining the difference between datums.) I will call you shortly to discuss.

B. Scott Edkins P.L.S.
Senior Land Surveyor
Project Design Consultants
701 B Street, Suite 800
San Diego, Ca 92101
www.projectdesign.com
619-881-3389 direct
619-234-0349 fax
scotte@projectdesign.com

Questions concerning the VERTCON process may be mailed to NGS

Latitude: 33 20 03.6058

Longitude: 117 08 41.544

NGVD 29 height:

Datum shift (NAVD 88 minus NGVD 29): 0.681 meter = 2.234' ft

Office

Project

8 April 2013

INPUT	OUTPUT
Geographic, NAD83 Vertical - NAVD88, U.S. Feet	State Plane, NAD83 0406 - California 6, U.S. Feet Vertical - NGVD29 (Vertcon94), U.S. Feet

---

100 1/2

Latitude: 33 20 03.6058
Longitude: 117 08 41.544
Elevation/Z:

Northing/Y:
Easting/X:
Elevation/Z:
Convergence:
Scale Factor:
Combined Factor:

Elevation/Z input field could not be parsed (-114).

---

100 2/2

Latitude: 33 20 03.6058
Longitude: 117 08 41.544
Elevation/Z: 100

ASSUMED

Northing/Y: 2066448.970
Easting/X: 6288349.921
Elevation/Z: 97.766 — DIFF = 2.234'
Convergence: -0 29 30.29505
Scale Factor: 0.999954143
Combined Factor: 0.999954641

Remark:

EFFECTIVE "POST-CONDITION" HEC-RAS FROM URS

HEC-RAS Plan: Rev River: San Luis Reach: 1 Profile: 100-year

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	654	100-year	33000.00	236.30	252.35	246.45	252.58	0.000308	4.7	10989.78	2497.56	0.23
1	656	100-year	33000.00	236.60	252.40	248.41	252.76	0.000569	6.4	9564.28	2256.26	0.32
1	658	100-year	33000.00	237.60	252.64	247.83	252.98	0.000457	5.8	10256.75	2584.82	0.28
1	660	100-year	33000.00	243.10	252.30	252.30	256.61	0.009257	17.6	2199.54	538.01	1.16
1	662	100-year	33000.00	245.80	257.77	256.38	259.12	0.001867	10.7	4195.30	661.14	0.56
1	664	100-year	33000.00	246.70	257.94	257.74	259.98	0.002880	12.8	3594.67	768.90	0.69
1	666	100-year	33000.00	247.22	260.57		261.06	0.000507	5.8	6336.07	1006.72	0.30
1	668	100-year	33000.00	247.80	262.87	262.87	265.38	0.002624	13.4	3339.34	829.42	0.66
1	669		Bridge									
1	670	100-year	33000.00	248.00	265.97	263.18	266.84	0.000850	8.8	6344.42	1385.48	0.39
1	672	100-year	33000.00	249.25	266.91		267.08	0.000127	3.6	11887.26	1532.33	0.16
1	674	100-year	33000.00	250.45	267.02	259.50	267.15	0.000162	3.3	13779.33	2235.78	0.17
1	676	100-year	33000.00	250.95	267.03		267.22	0.000385	4.1	10571.49	2040.40	0.24
1	677	100-year	33000.00	253.12	267.19		267.40	0.000282	4.0	10411.94	1794.09	0.22
1	678.2	100-year	33000.00	254.02	266.97		267.82	0.001155	7.8	5675.79	1571.29	0.43
1	680	100-year	33000.00	256.58	266.55	266.55	270.09	0.006894	15.1	2185.51	466.43	1.00
1	689	100-year	33000.00	256.31	269.90	264.24	270.56	0.000764	6.8	5504.36	1008.23	0.36
1	692	100-year	33000.00	257.49	269.97	264.61	270.73	0.000924	7.2	4997.62	803.83	0.39
1	694	100-year	33000.00	259.78	270.81	266.54	271.60	0.001069	7.1	4620.51	634.45	0.41
1	695	100-year	33000.00	261.45	271.16		272.26	0.001947	8.4	3913.39	510.61	0.54
1	696	100-year	33000.00	261.77	271.80		272.75	0.001734	7.9	4250.81	587.66	0.51
1	696.5	100-year	33000.00	261.87	272.02		272.98	0.001785	7.9	4220.08	590.24	0.51
1	697	100-year	33000.00	261.82	272.76		273.43	0.001122	6.6	5062.74	657.68	0.41
1	698	100-year	33000.00	263.07	272.86		273.92	0.002226	8.5	4267.09	778.85	0.57
1	700	100-year	33000.00	267.40	275.61	275.61	278.92	0.007053	14.6	2260.82	341.99	1.00
1	702	100-year	33000.00	272.80	285.29	285.29	287.34	0.003811	13.0	3701.43	839.22	0.77
1	704	100-year	33000.00	276.10	287.38	285.79	288.44	0.001944	8.9	4639.88	846.43	0.54
1	706	100-year	33000.00	280.80	289.86	286.90	290.07	0.000919	5.6	9150.42	1665.38	0.36

Note: Starting 100-Year Water Surface Elevation is Highlighted.

APPENDIX A

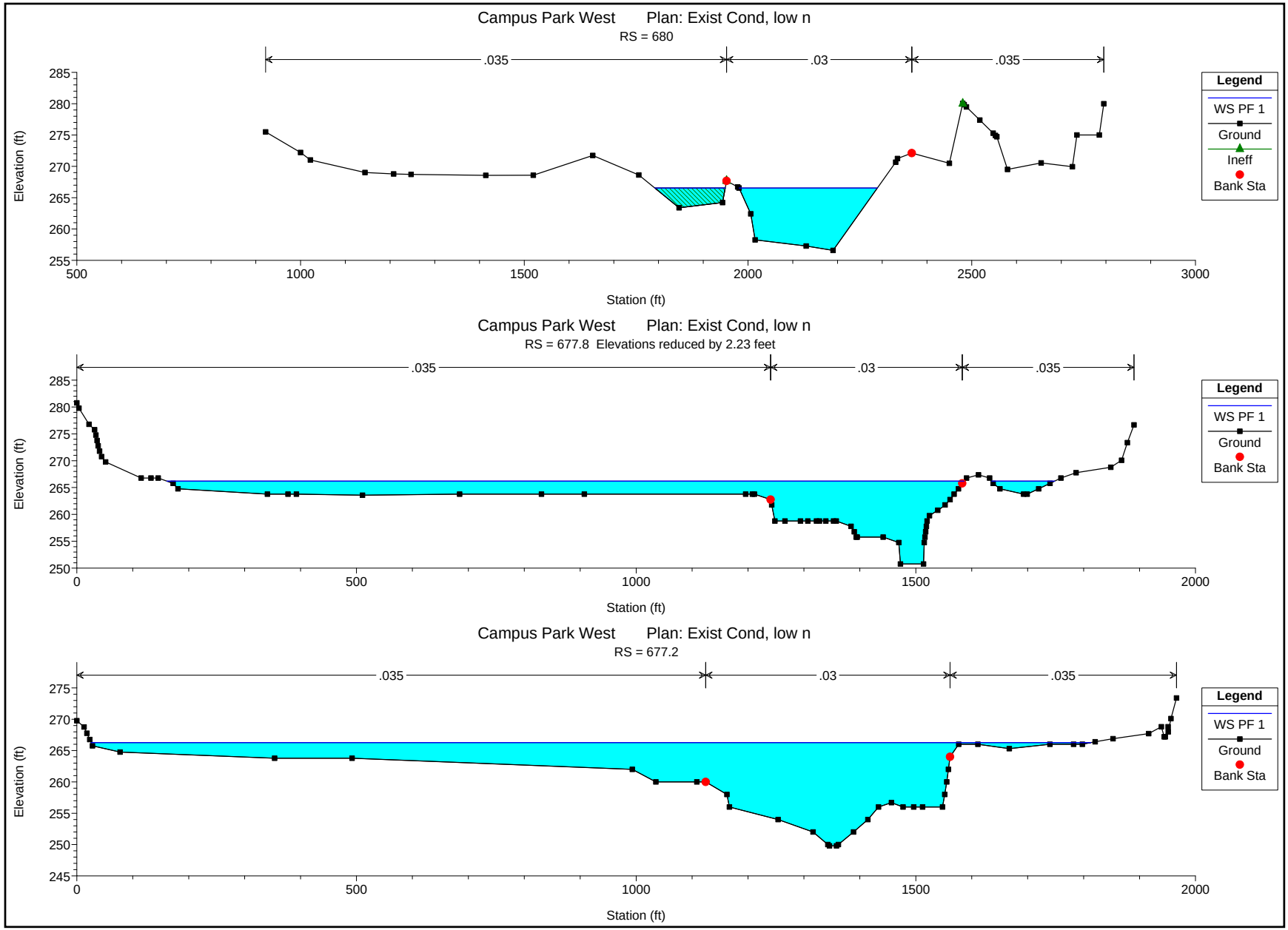
100-YEAR HEC RAS ANALYSES

EXISTING CONDITION ANALYSES

EXISTING CONDITION LOW ROUGHNESS

HEC-RAS Plan: Ex Cond, lo n River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	662	PF 1	33000.00	244.30	251.60	251.60	254.56	0.007413	13.8	2392.57	409.91	1.01
Reach-1	663	PF 1	33000.00	245.00	253.60	252.68	255.72	0.004731	11.7	2826.78	444.17	0.82
Reach-1	664	PF 1	33000.00	245.40	254.87		256.46	0.002500	10.1	3286.21	446.29	0.62
Reach-1	665	PF 1	33000.00	246.20	256.24		257.19	0.001863	7.8	4221.23	612.82	0.52
Reach-1	666	PF 1	33000.00	247.20	256.10		257.75	0.003611	10.3	3200.45	494.80	0.71
Reach-1	668	PF 1	33000.00	245.92	262.48	262.48	264.37	0.002422	12.4	4102.10	1125.78	0.63
Reach-1	669		Bridge									
Reach-1	670	PF 1	33000.00	247.30	265.21	263.18	266.12	0.000945	9.0	6405.18	1582.81	0.41
Reach-1	673	PF 1	33000.00	247.50	266.03		266.26	0.000206	4.2	10454.31	1610.46	0.19
Reach-1	674	PF 1	33000.00	247.70	266.14		266.30	0.000175	3.7	12848.15	2137.60	0.18
Reach-1	676	PF 1	33000.00	248.70	266.16		266.37	0.000228	4.3	11576.64	2056.69	0.20
Reach-1	676.7	PF 1	33000.00	249.20	266.13		266.50	0.000461	5.5	8550.21	1696.81	0.28
Reach-1	677.2	PF 1	33000.00	249.80	266.27		266.62	0.000432	5.2	8600.85	1787.51	0.27
Reach-1	677.8	PF 1	33000.00	250.77	266.19		267.05	0.001672	8.4	5665.27	1537.85	0.50
Reach-1	680	PF 1	33000.00	256.58	266.55	266.55	270.09	0.006894	15.1	2185.51	466.43	1.00


Campus Park West Plan: Exist Cond, low n
RS = 680
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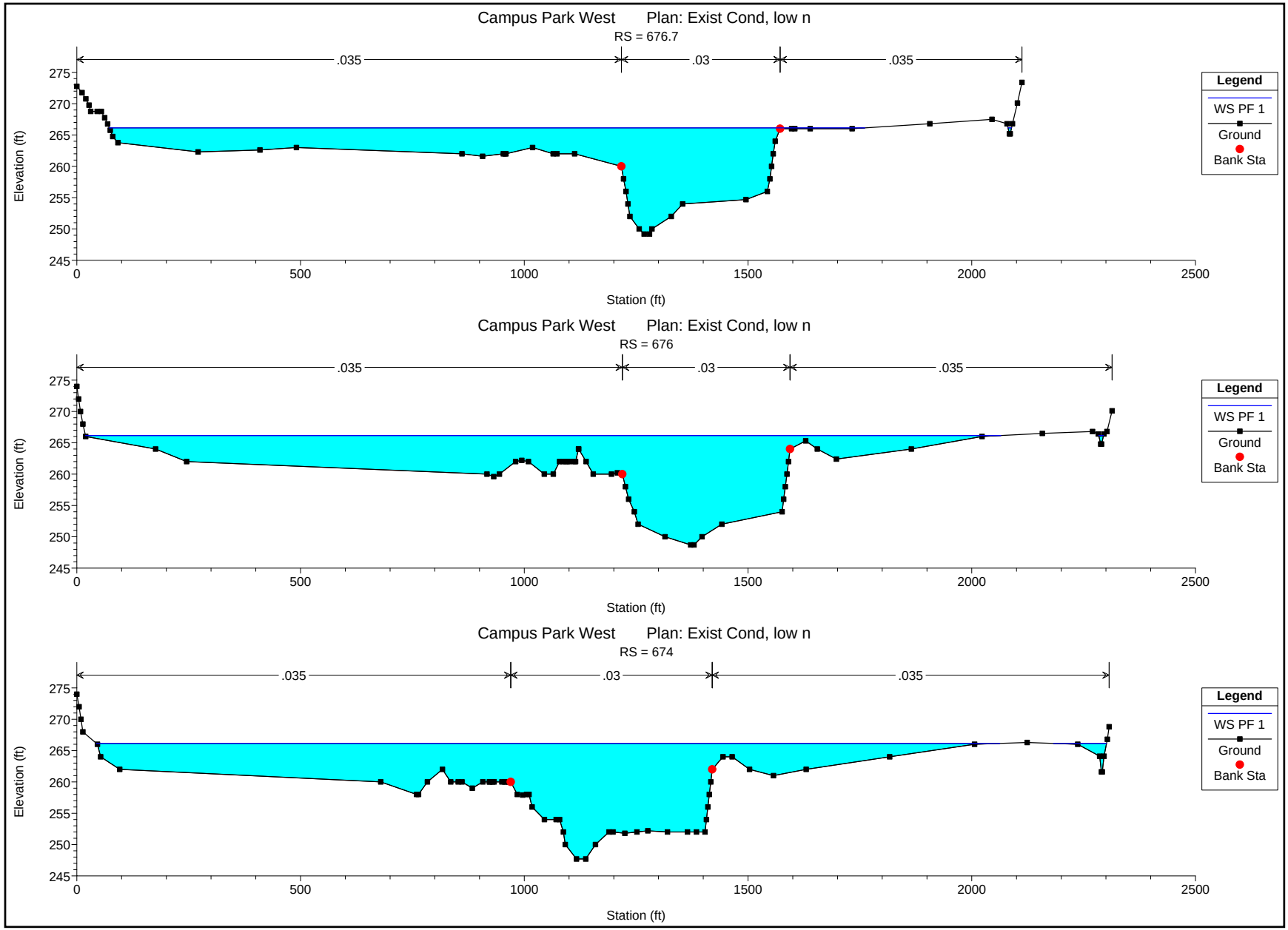
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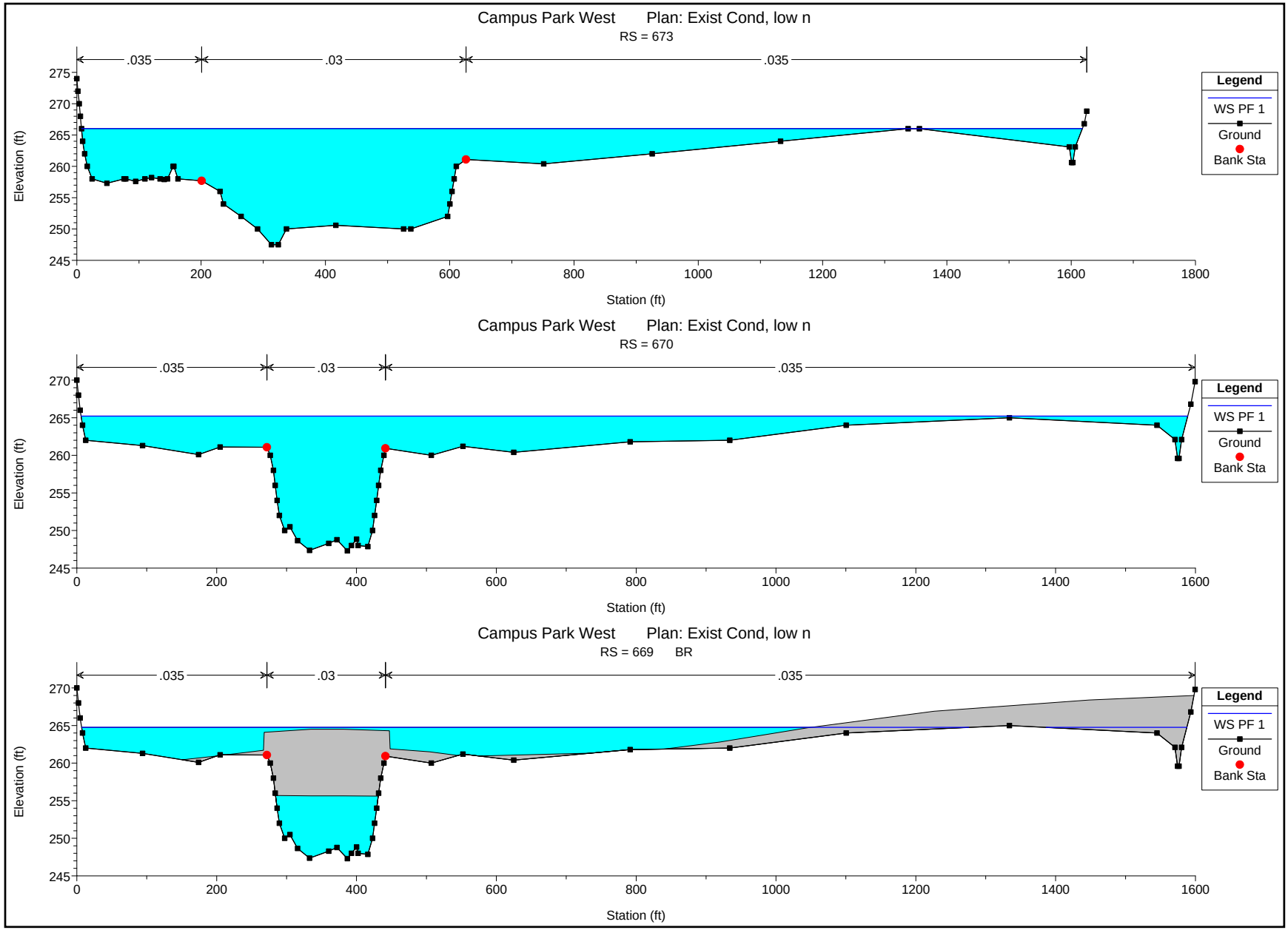
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Station (ft)
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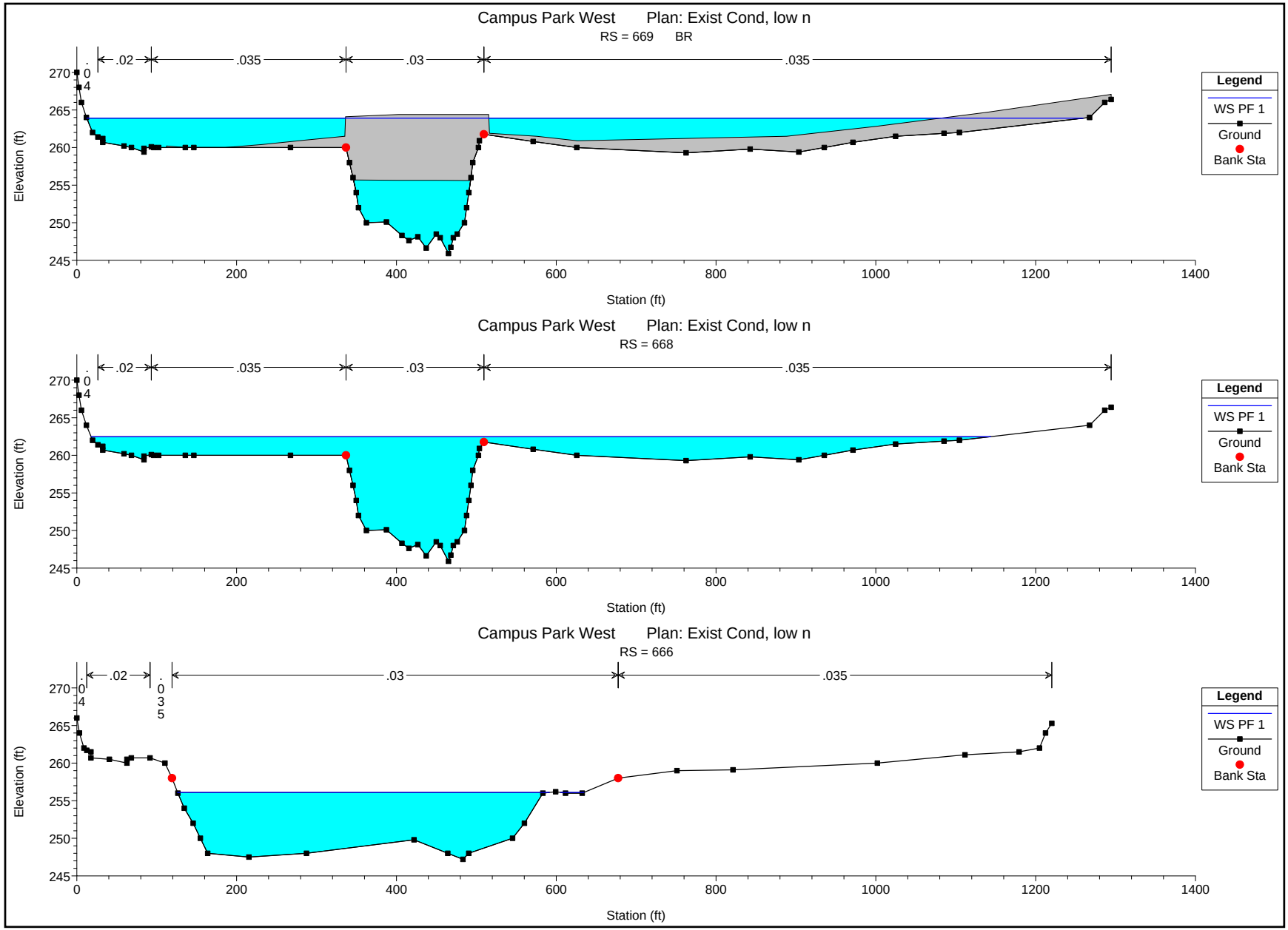
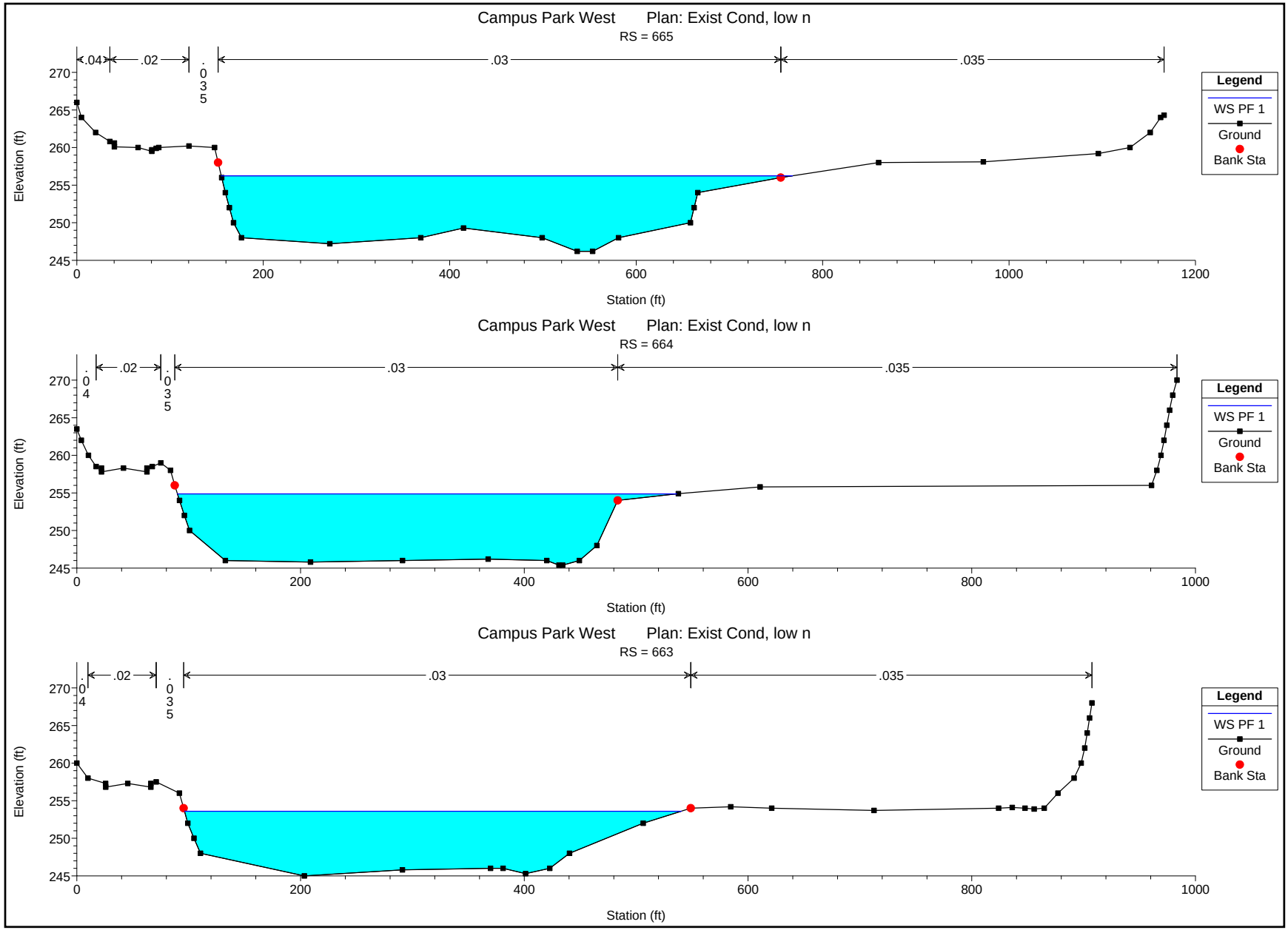
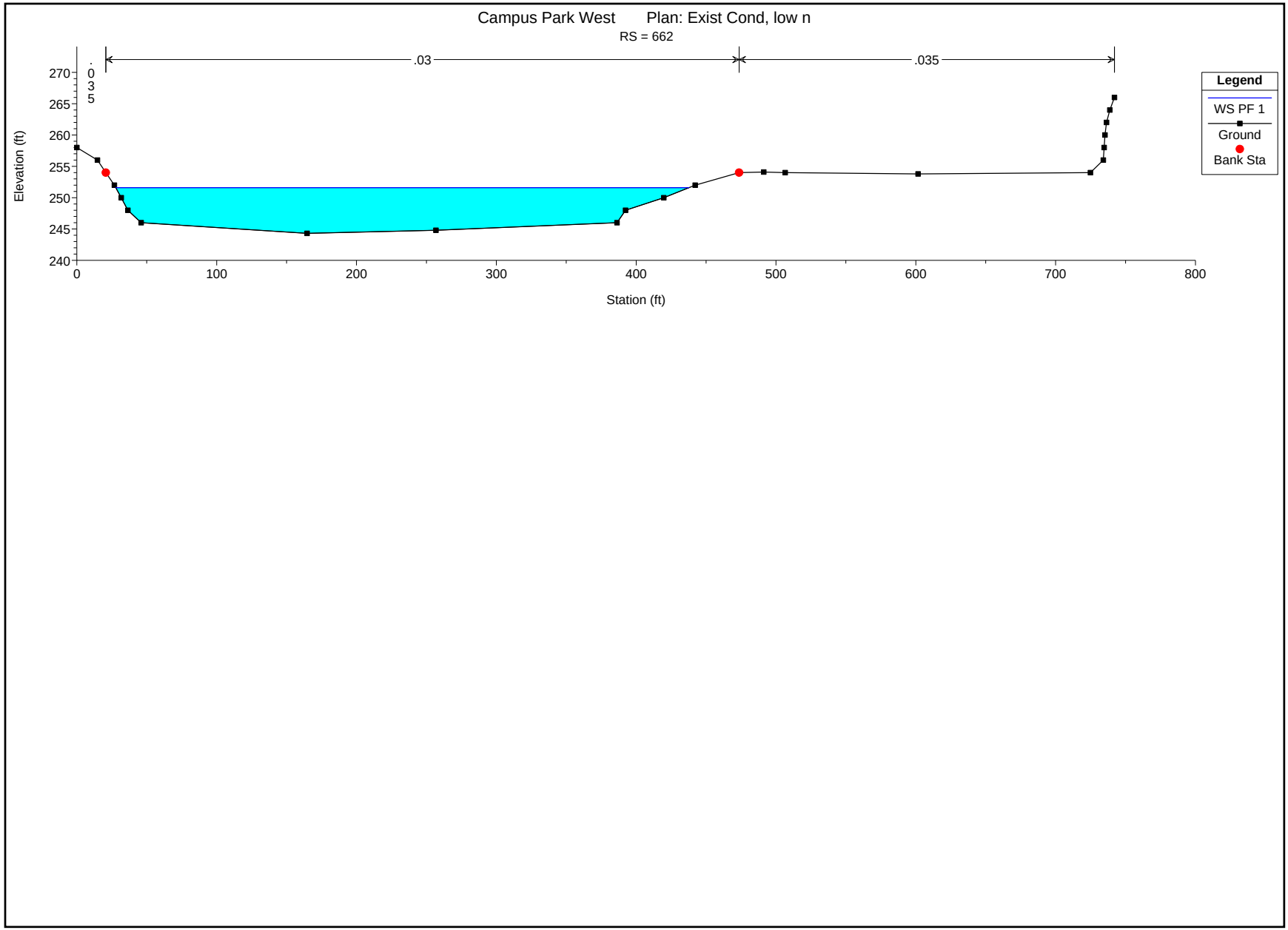
Ground
Bank Sta
Campus Park West Plan: Exist Cond, low n
RS = 669 BR
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Exist Cond, low n
RS = 669 BR
.04
.02
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
1400
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, low n
RS = 668
.04
.02
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, low n
RS = 666
.04
.02
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta

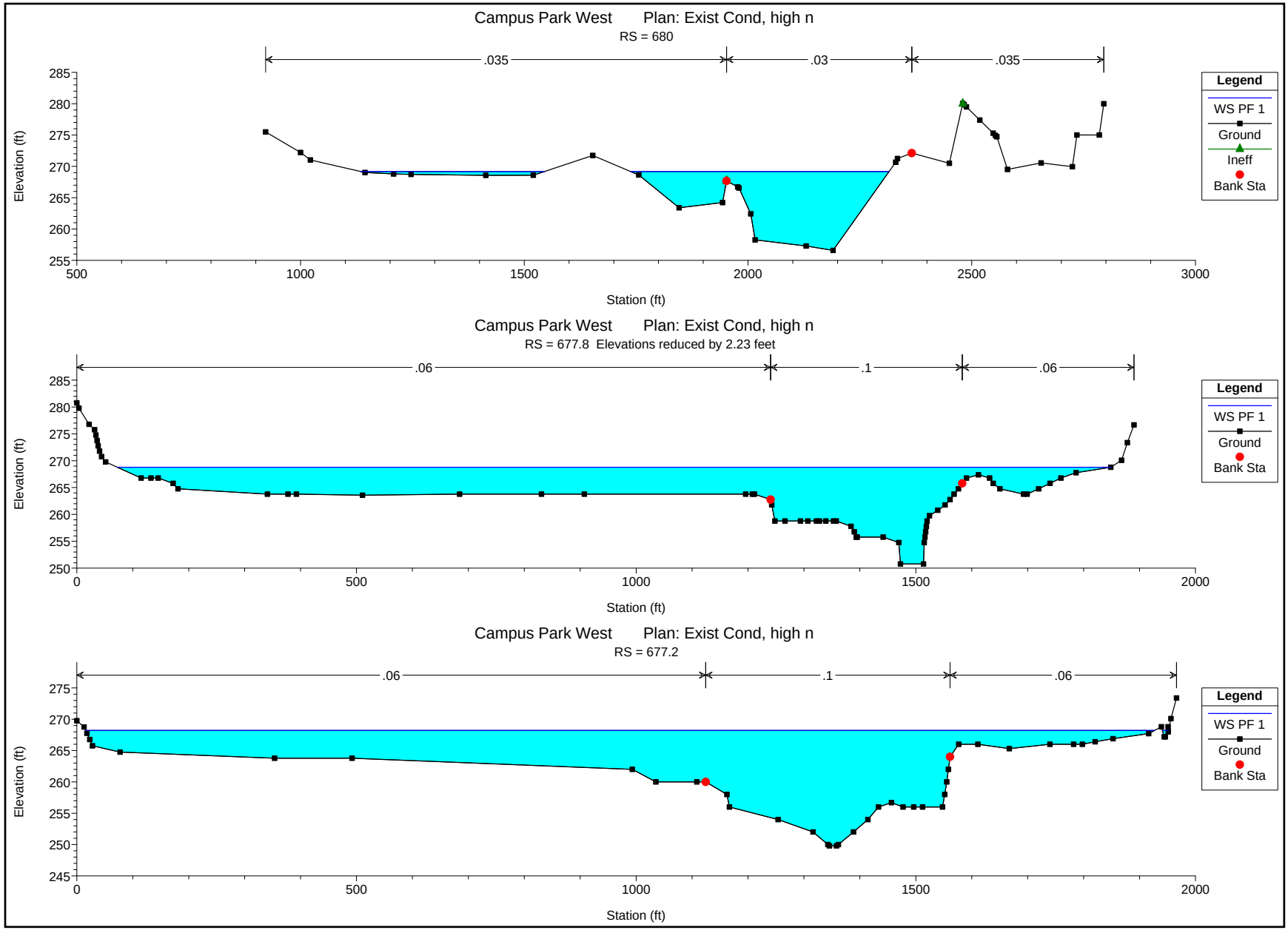

Campus Park West Plan: Exist Cond, low n
RS = 665
.04
.02
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, low n
RS = 664
.04
.02
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, low n
RS = 663
.04
.02
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta

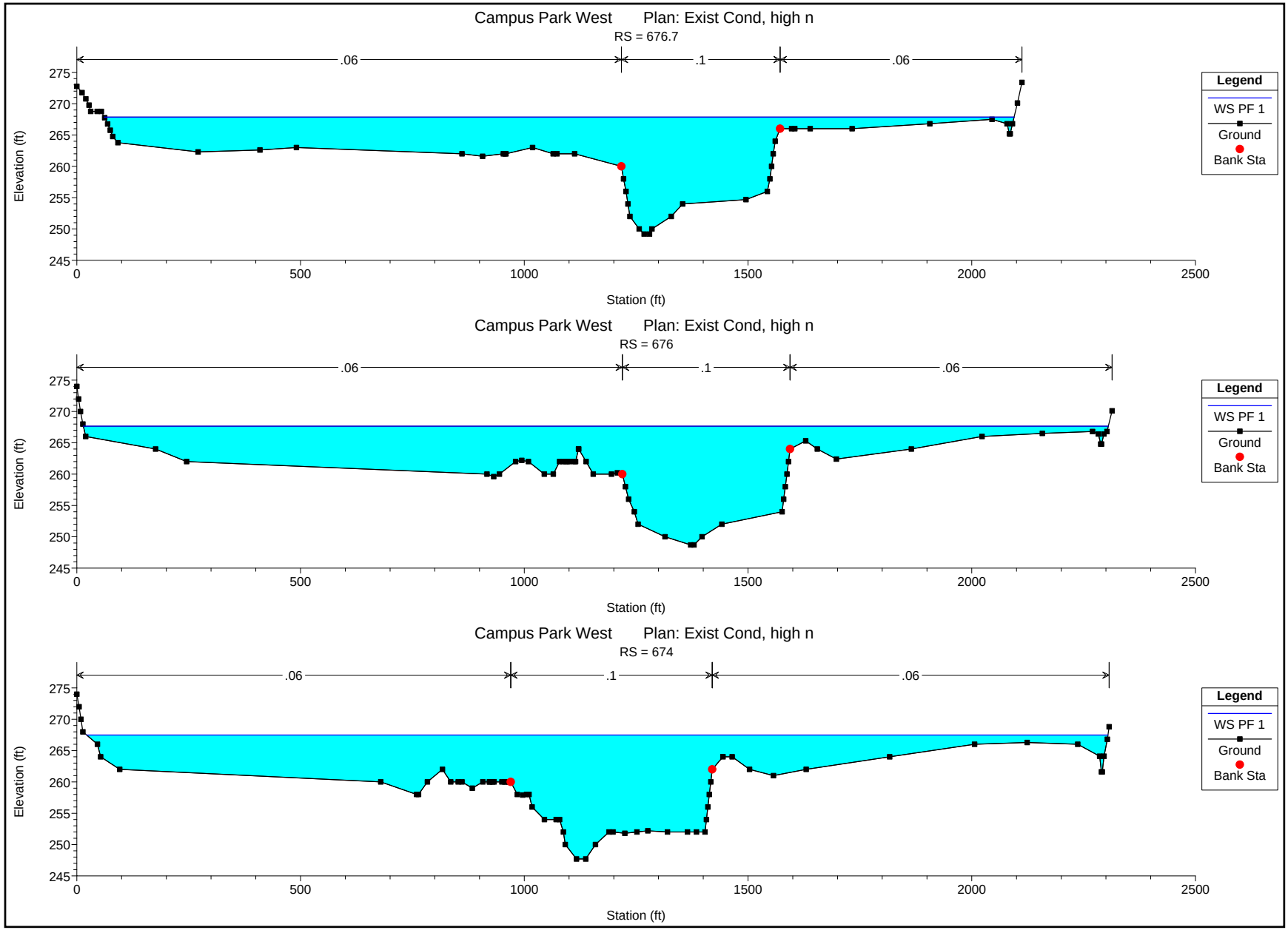

Campus Park West Plan: Exist Cond, low n
RS = 662
.03
.035
.035
Elevation (ft)
270
265
260
255
250
245
240
0
100
200
300
400
500
600
700
800
Station (ft)
Legend
WS PF 1
Ground
Bank Sta

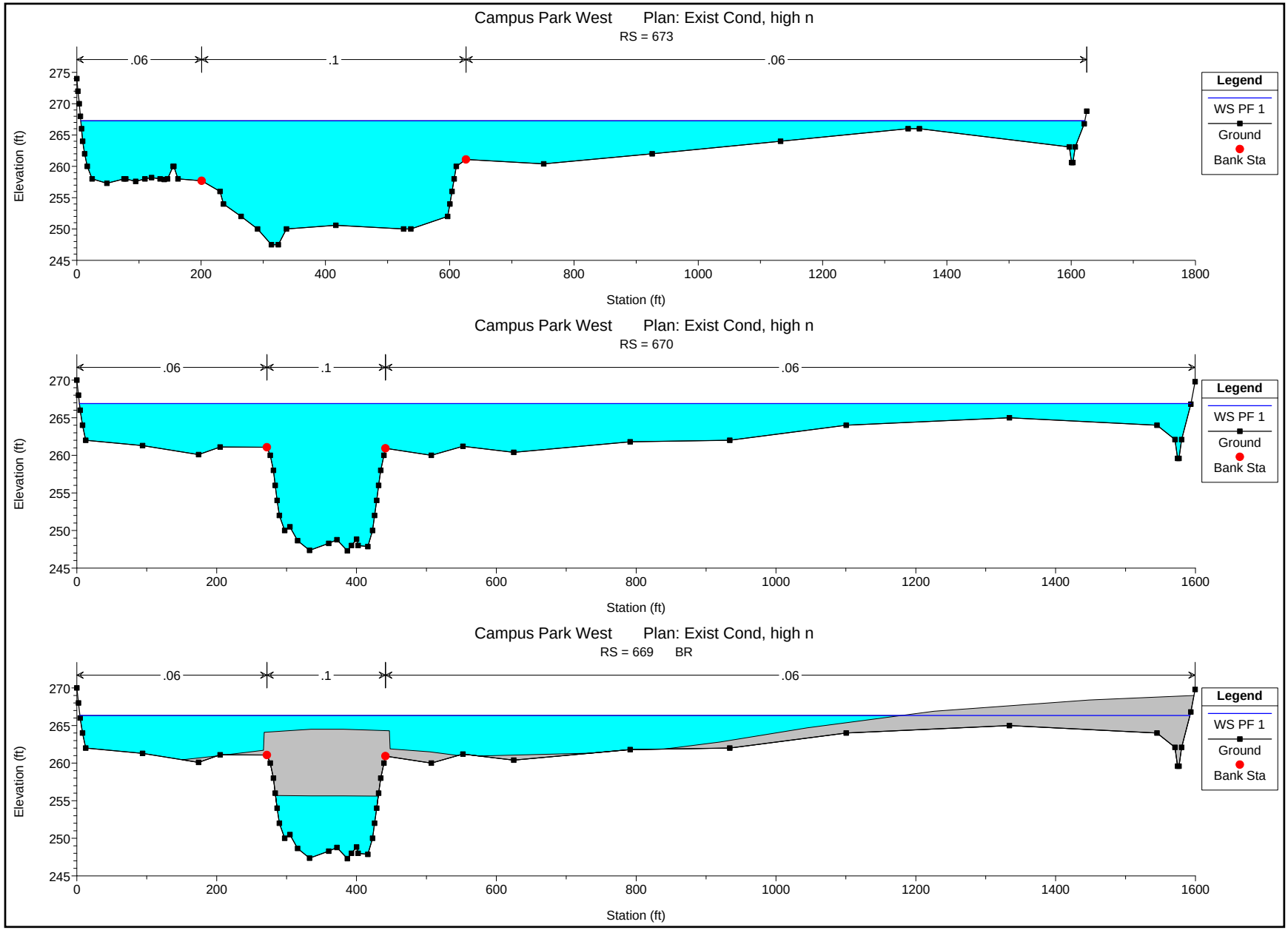
EXISTING CONDITION HIGH ROUGHNESS

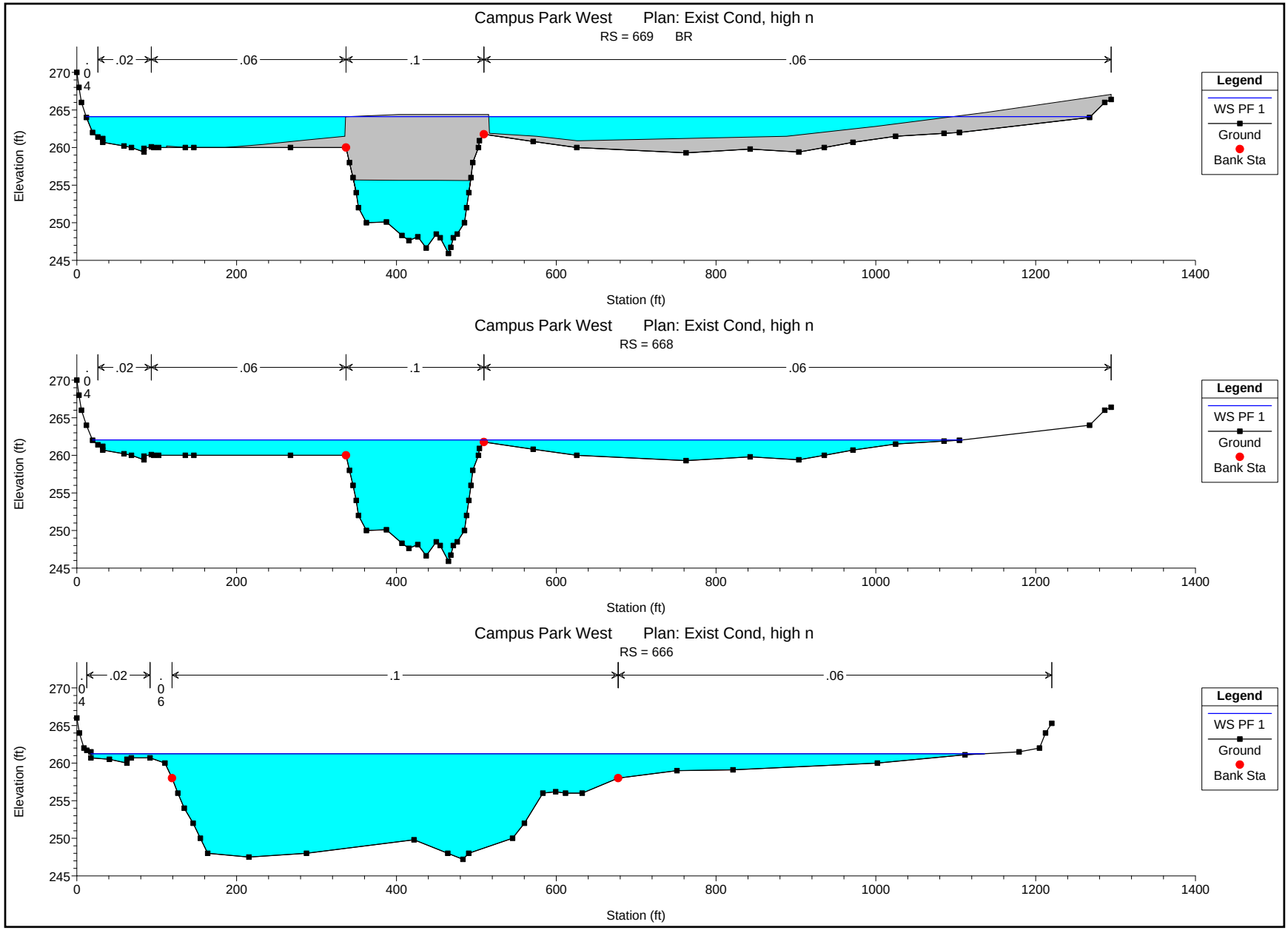
HEC-RAS Plan: Ex Cond, hi n River: RIVER-1 Reach: Reach-1 Profile: PF 1

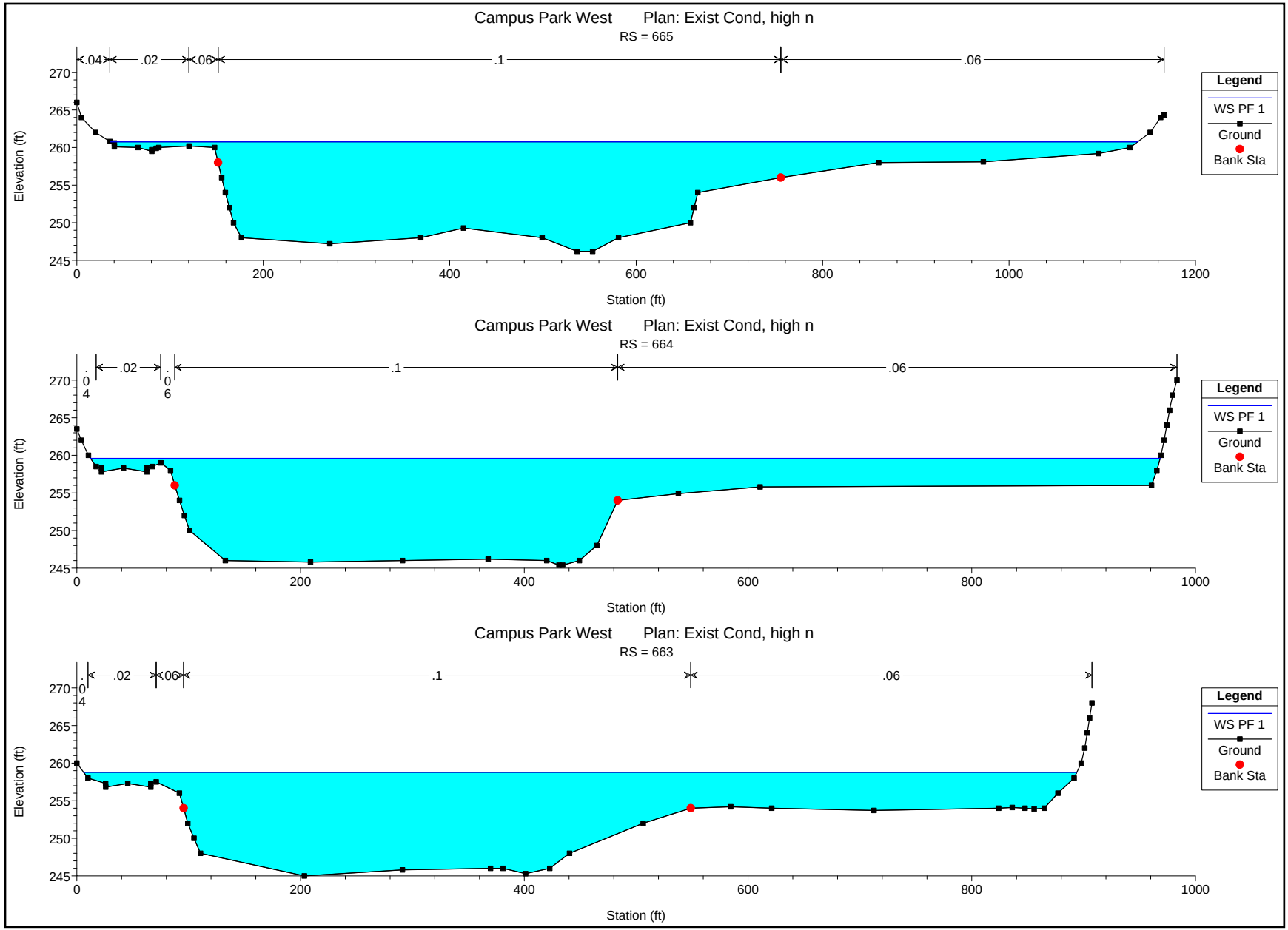
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	662	PF 1	33000.00	244.30	257.77	251.60	258.23	0.005519	5.6	6152.89	732.95	0.29
Reach-1	663	PF 1	33000.00	245.00	258.78		259.13	0.004166	4.8	6932.26	887.85	0.25
Reach-1	664	PF 1	33000.00	245.40	259.59		259.94	0.003692	5.0	7128.51	956.19	0.24
Reach-1	665	PF 1	33000.00	246.20	260.76		261.04	0.003286	4.3	8035.47	1101.58	0.22
Reach-1	666	PF 1	33000.00	247.20	261.25		261.63	0.005023	5.1	6854.46	1118.50	0.28
Reach-1	668	PF 1	33000.00	245.92	262.05	262.05	263.63	0.023511	11.3	3625.60	1089.10	0.59
Reach-1	669		Bridge									
Reach-1	670	PF 1	33000.00	247.30	266.88	263.02	267.11	0.002328	4.6	9056.74	1589.91	0.20
Reach-1	673	PF 1	33000.00	247.50	267.28		267.40	0.000968	2.9	12466.60	1615.65	0.13
Reach-1	674	PF 1	33000.00	247.70	267.48		267.55	0.000641	2.3	15866.48	2282.29	0.10
Reach-1	676	PF 1	33000.00	248.70	267.64		267.73	0.000744	2.5	14897.88	2290.65	0.11
Reach-1	676.7	PF 1	33000.00	249.20	267.86		267.99	0.001311	3.1	11831.31	2033.17	0.15
Reach-1	677.2	PF 1	33000.00	249.80	268.22		268.34	0.001254	3.0	12241.24	1920.38	0.14
Reach-1	677.8	PF 1	33000.00	250.77	268.79		268.96	0.002270	3.5	9988.52	1776.64	0.18
Reach-1	680	PF 1	33000.00	256.58	269.18	266.55	270.38	0.002046	9.3	4127.40	988.27	0.56

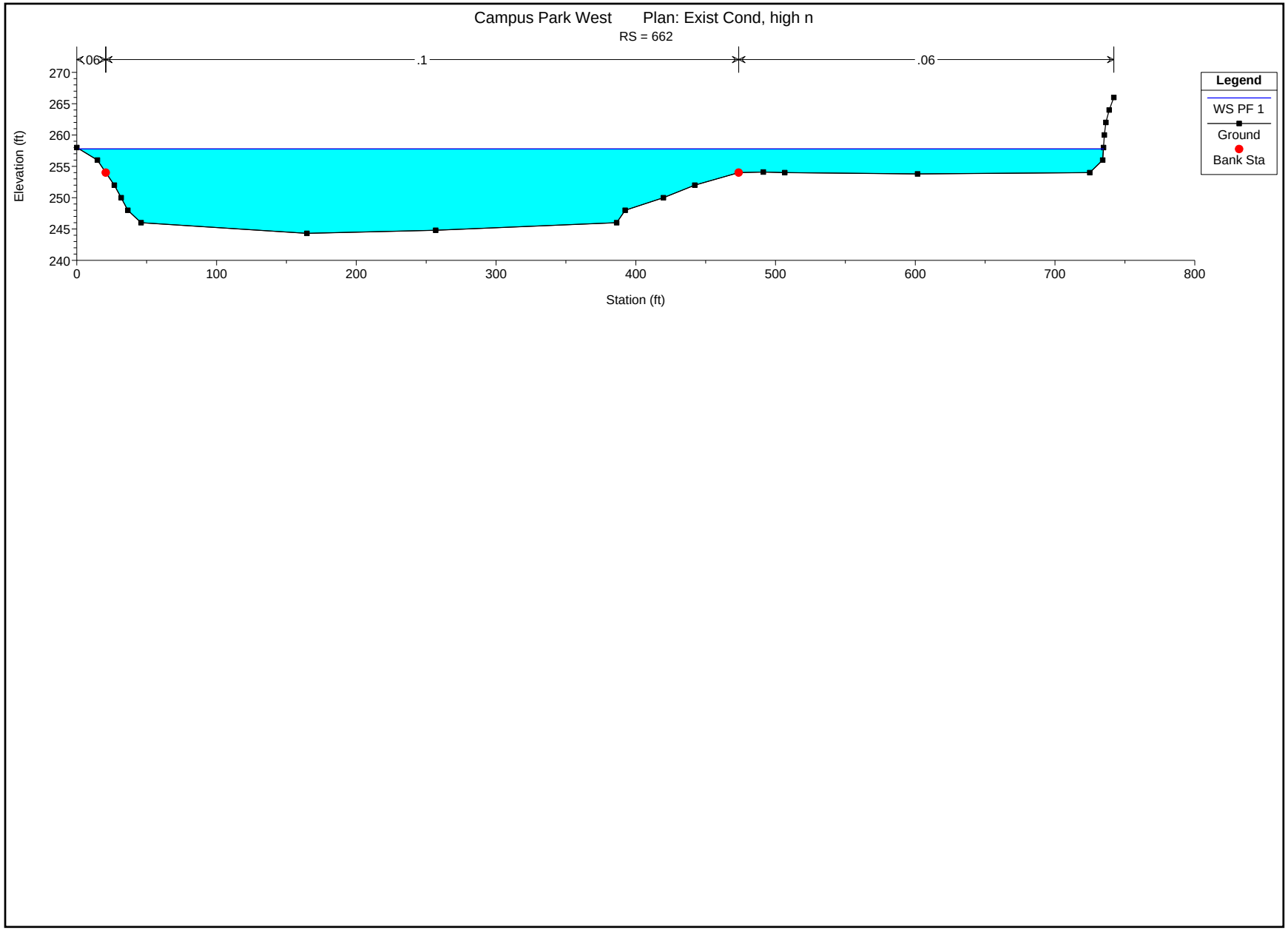

Campus Park West Plan: Exist Cond, high n
RS = 680
.035
.03
.035
Elevation (ft)
285
280
275
270
265
260
255
500
1000
1500
2000
2500
3000
Station (ft)
Legend
WS PF 1
Ground
Ineff
Bank Sta
Campus Park West Plan: Exist Cond, high n
RS = 677.8 Elevations reduced by 2.23 feet
.06
.1
.06
Elevation (ft)
285
280
275
270
265
260
255
250
0
500
1000
1500
2000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, high n
RS = 677.2
.06
.1
.06
Elevation (ft)
275
270
265
260
255
250
245
0
500
1000
1500
2000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Exist Cond, high n
RS = 676.7
.06
.1
.06
Elevation (ft)
275
270
265
260
255
250
245
0
500
1000
1500
2000
2500
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, high n
RS = 676
.06
.1
.06
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, high n
RS = 674
.06
.1
.06
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Exist Cond, high n
RS = 673
.06
.1
.06
Elevation (ft)
275
270
265
260
255
250
245
0
200
400
600
800
1000
1200
1400
1600
1800
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, high n
RS = 670
.06
.1
.06
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, high n
RS = 669 BR
.06
.1
.06
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Exist Cond, high n
RS = 669 BR
.04
.02
.06
.1
.06
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
1400
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, high n
RS = 668
.04
.02
.06
.1
.06
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, high n
RS = 666
.04
.02
.06
.1
.06
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta

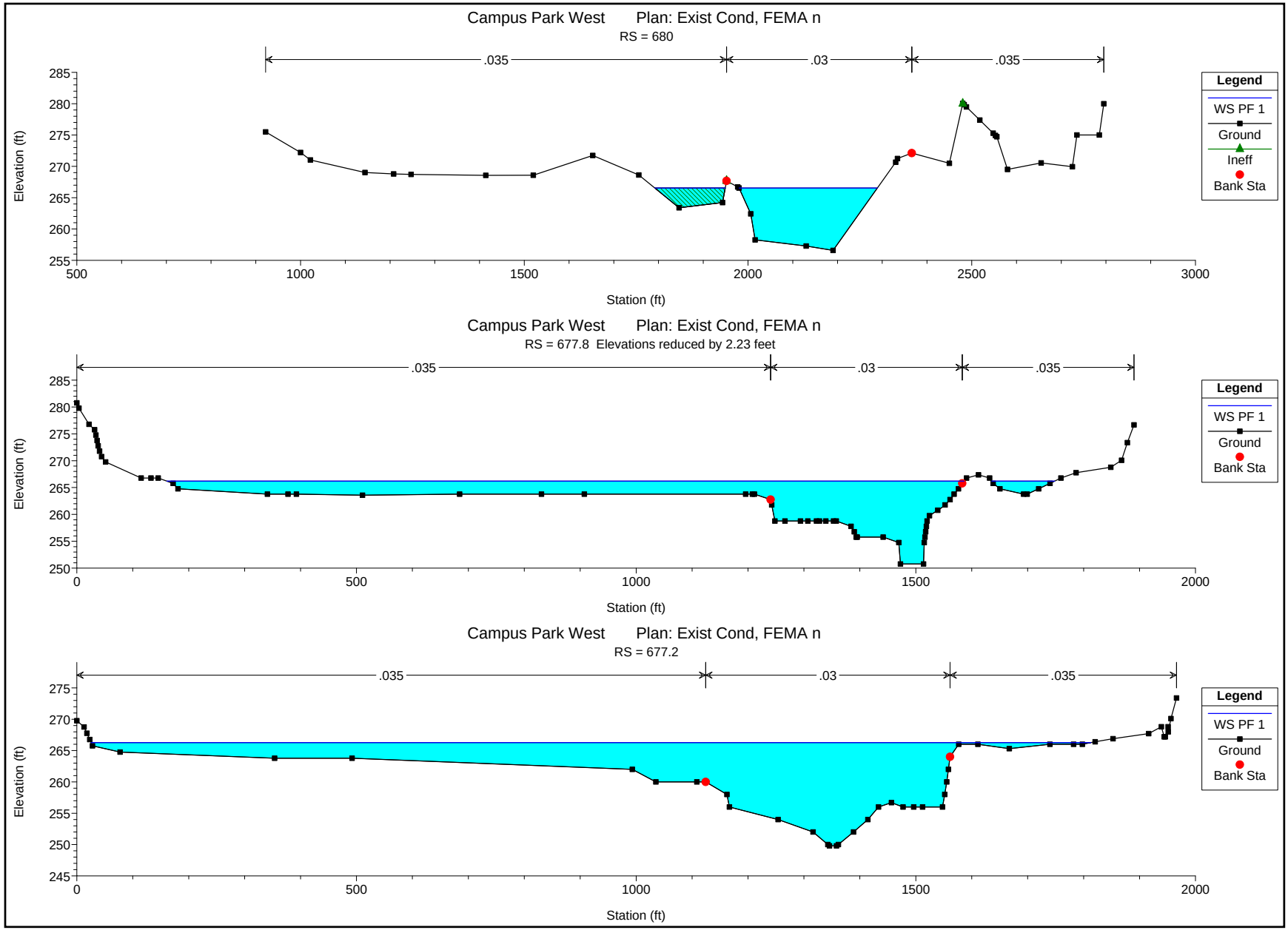

Campus Park West Plan: Exist Cond, high n
RS = 665
.04
.02
.06
.1
.06
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, high n
RS = 664
.02
.1
.06
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, high n
RS = 663
.02
.06
.1
.06
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Exist Cond, high n
RS = 662
.06
.1
.06
Elevation (ft)
270
265
260
255
250
245
240
0
100
200
300
400
500
600
700
800
Station (ft)
Legend
WS PF 1
Ground
Bank Sta

EXISTING CONDITION FEMA ROUGHNESS

HEC-RAS Plan: EX, FEMA n River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	662	PF 1	33000.00	244.30	257.77	251.60	258.27	0.000692	5.9	6152.89	732.95	0.31
Reach-1	663	PF 1	33000.00	245.00	257.85		258.41	0.000567	6.3	6108.05	876.95	0.34
Reach-1	664	PF 1	33000.00	245.40	257.89		258.59	0.000832	6.9	5535.36	888.86	0.36
Reach-1	665	PF 1	33000.00	246.20	258.28		258.84	0.000737	6.0	5612.48	841.74	0.35
Reach-1	666	PF 1	33000.00	247.20	258.18		259.09	0.001363	7.7	4311.96	572.02	0.49
Reach-1	668	PF 1	33000.00	245.92	262.46	262.46	264.37	0.002444	12.4	4083.15	1124.34	0.64
Reach-1	669		Bridge									
Reach-1	670	PF 1	33000.00	247.30	265.21	263.18	266.12	0.000945	9.0	6405.18	1582.81	0.41
Reach-1	673	PF 1	33000.00	247.50	266.03		266.26	0.000206	4.2	10454.31	1610.46	0.19
Reach-1	674	PF 1	33000.00	247.70	266.14		266.30	0.000175	3.7	12848.15	2137.60	0.18
Reach-1	676	PF 1	33000.00	248.70	266.16		266.37	0.000228	4.3	11576.64	2056.69	0.20
Reach-1	676.7	PF 1	33000.00	249.20	266.13		266.50	0.000461	5.5	8550.21	1696.81	0.28
Reach-1	677.2	PF 1	33000.00	249.80	266.27		266.62	0.000432	5.2	8600.85	1787.51	0.27
Reach-1	677.8	PF 1	33000.00	250.77	266.19		267.05	0.001672	8.4	5665.27	1537.85	0.50
Reach-1	680	PF 1	33000.00	256.58	266.55	266.55	270.09	0.006894	15.1	2185.51	466.43	1.00


Campus Park West Plan: Exist Cond, FEMA n
RS = 680
.035
.03
.035
Elevation (ft)
285
280
275
270
265
260
255
500
1000
1500
2000
2500
3000
Station (ft)
Legend
WS PF 1
Ground
Ineff
Bank Sta
Campus Park West Plan: Exist Cond, FEMA n
RS = 677.8 Elevations reduced by 2.23 feet
.035
.03
.035
Elevation (ft)
285
280
275
270
265
260
255
250
0
500
1000
1500
2000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, FEMA n
RS = 677.2
.035
.03
.035
Elevation (ft)
275
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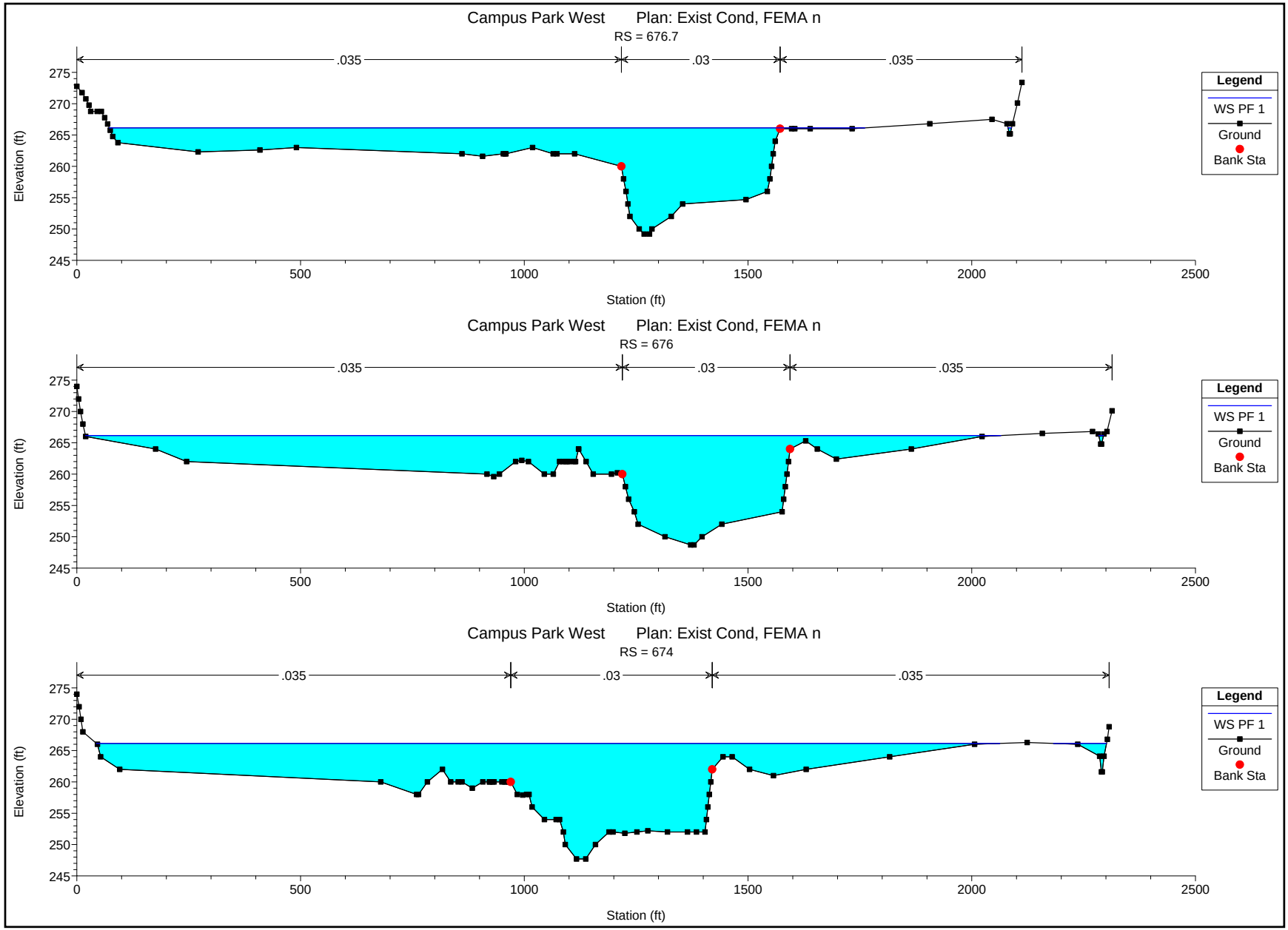
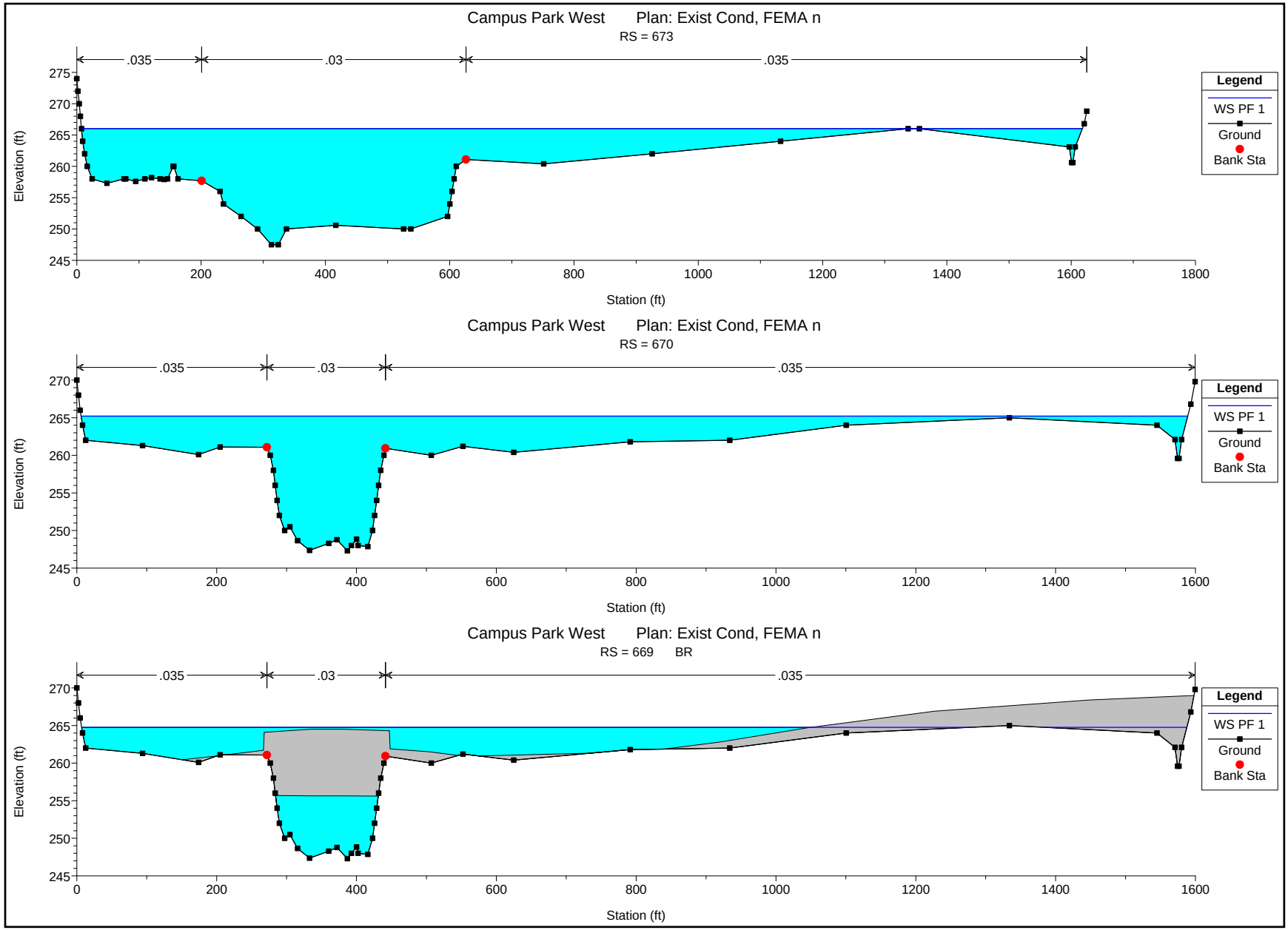
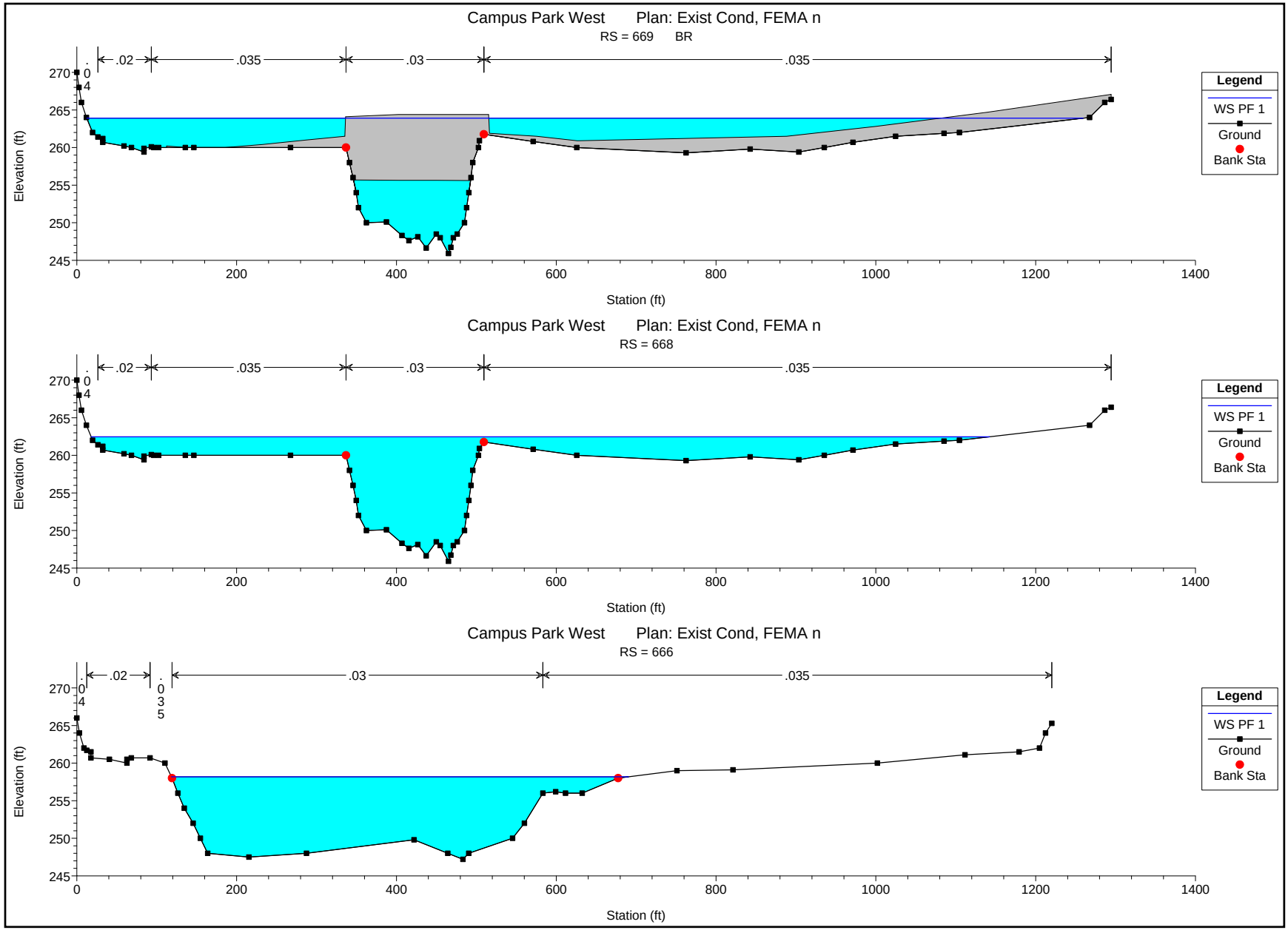
255
250
245
0
500
1000
1500
2000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Exist Cond, FEMA n
RS = 676.7
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, FEMA n
RS = 676
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, FEMA n
RS = 674
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Exist Cond, FEMA n
RS = 673
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, FEMA n
RS = 670
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, FEMA n
RS = 669 BR
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Exist Cond, FEMA n
RS = 669 BR
.04
.02
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
1400
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, FEMA n
RS = 668
.04
.02
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
1400
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, FEMA n
RS = 666
.04
.02
.035
.03
.035
Elevation (ft)
270
265
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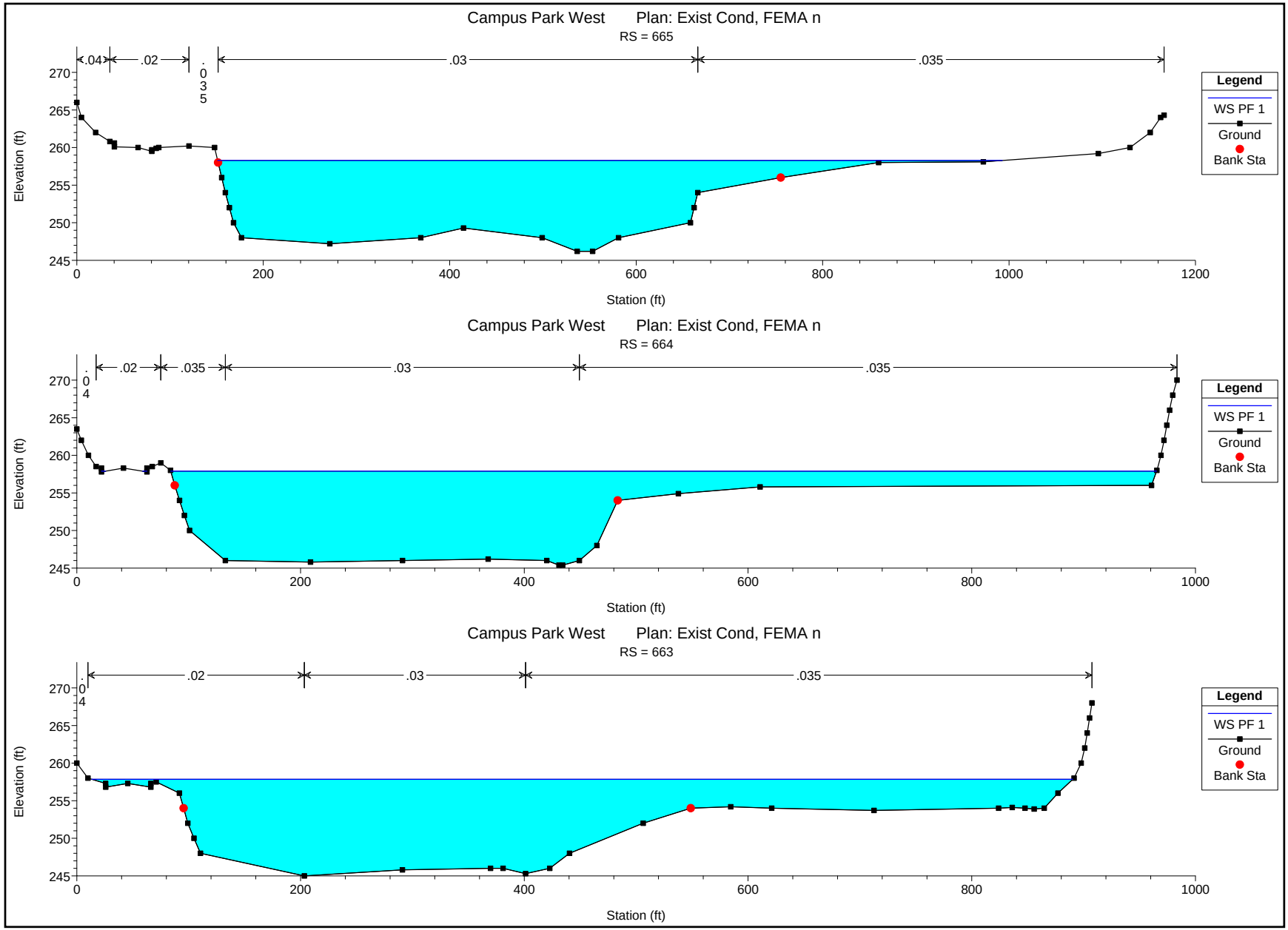
255
250
245
0
200
400
600
800
1000
1200
1400
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Exist Cond, FEMA n
RS = 665
.04
.02
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, FEMA n
RS = 664
.04
.02
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Exist Cond, FEMA n
RS = 663
.04
.02
.03
.035
Elevation (ft)
270
265
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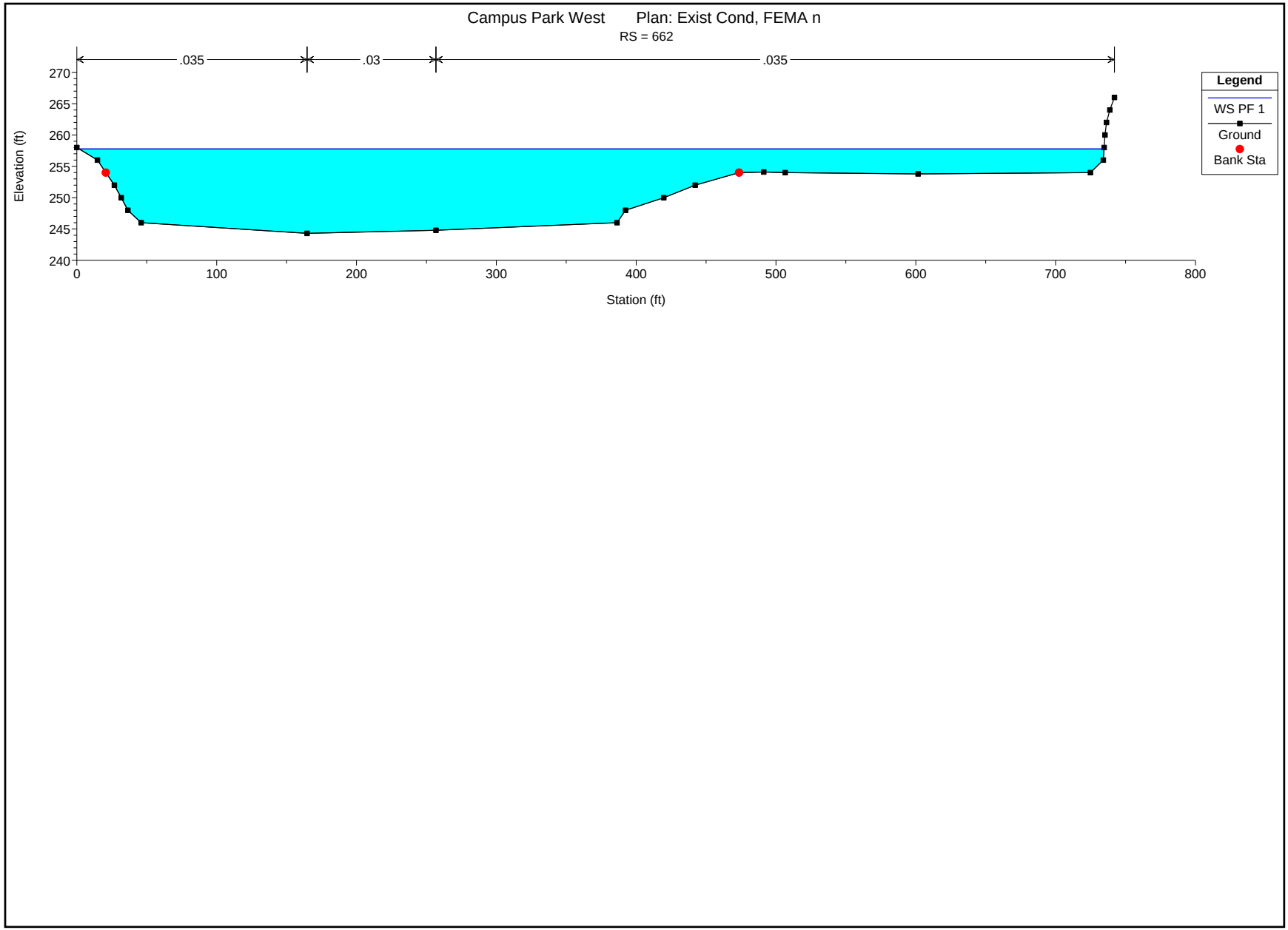
255
250
245
0
200
400
600
800
1000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta

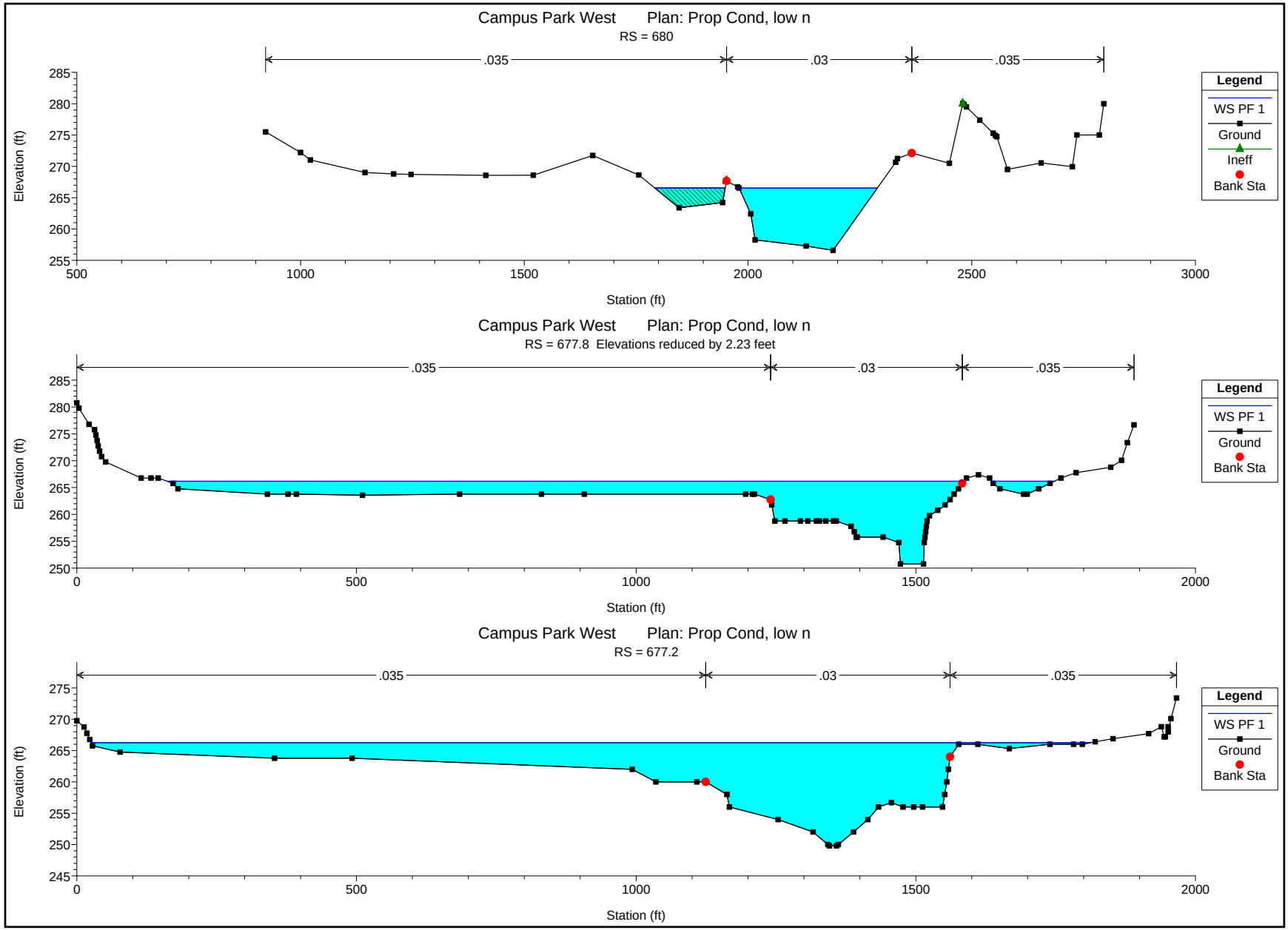

Campus Park West Plan: Exist Cond, FEMA n
RS = 662
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
240
0
100
200
300
400
500
600
700
800
Station (ft)
Legend
WS PF 1
Ground
Bank Sta

PROPOSED CONDITION ANALYSES

PROPOSED CONDITION LOW ROUGHNESS

HEC-RAS Plan: Pr Cond, lo River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	662	PF 1	33000.00	244.30	251.60	251.60	254.56	0.007413	13.8	2392.57	409.91	1.01
Reach-1	663	PF 1	33000.00	245.00	253.60	252.68	255.72	0.004731	11.7	2826.78	444.17	0.82
Reach-1	664	PF 1	33000.00	245.40	254.87		256.46	0.002500	10.1	3286.21	446.29	0.62
Reach-1	665	PF 1	33000.00	246.20	256.24		257.19	0.001863	7.8	4221.23	612.82	0.52
Reach-1	666	PF 1	33000.00	247.20	256.10		257.75	0.003611	10.3	3200.45	494.80	0.71
Reach-1	668	PF 1	33000.00	245.92	262.49	262.49	264.37	0.002411	12.4	4118.56	1137.15	0.63
Reach-1	669		Bridge									
Reach-1	670	PF 1	33000.00	247.30	265.25	263.16	266.11	0.000901	8.8	6035.04	1122.40	0.40
Reach-1	673	PF 1	33000.00	247.50	266.02		266.25	0.000206	4.2	9881.25	1163.22	0.19
Reach-1	674	PF 1	33000.00	247.70	266.13		266.29	0.000174	3.7	12672.26	2128.25	0.18
Reach-1	676	PF 1	33000.00	248.70	266.14		266.36	0.000229	4.3	11549.18	2052.96	0.20
Reach-1	676.7	PF 1	33000.00	249.20	266.12		266.48	0.000464	5.6	8527.19	1693.70	0.28
Reach-1	677.2	PF 1	33000.00	249.80	266.25		266.61	0.000435	5.3	8578.33	1786.72	0.27
Reach-1	677.8	PF 1	33000.00	250.77	266.18		267.04	0.001687	8.4	5643.08	1536.98	0.51
Reach-1	680	PF 1	33000.00	256.58	266.55	266.55	270.09	0.006894	15.1	2185.51	466.43	1.00


Campus Park West Plan: Prop Cond, low n
RS = 680
.035
.03
.035
Elevation (ft)
285
280
275
270
265
260
255
500
1000
1500
2000
2500
3000
Station (ft)
Legend
WS PF 1
Ground
Ineff
Bank Sta
Campus Park West Plan: Prop Cond, low n
RS = 677.8 Elevations reduced by 2.23 feet
.035
.03
.035
Elevation (ft)
285
280
275
270
265
260
255
250
0
500
1000
1500
2000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, low n
RS = 677.2
.035
.03
.035
Elevation (ft)
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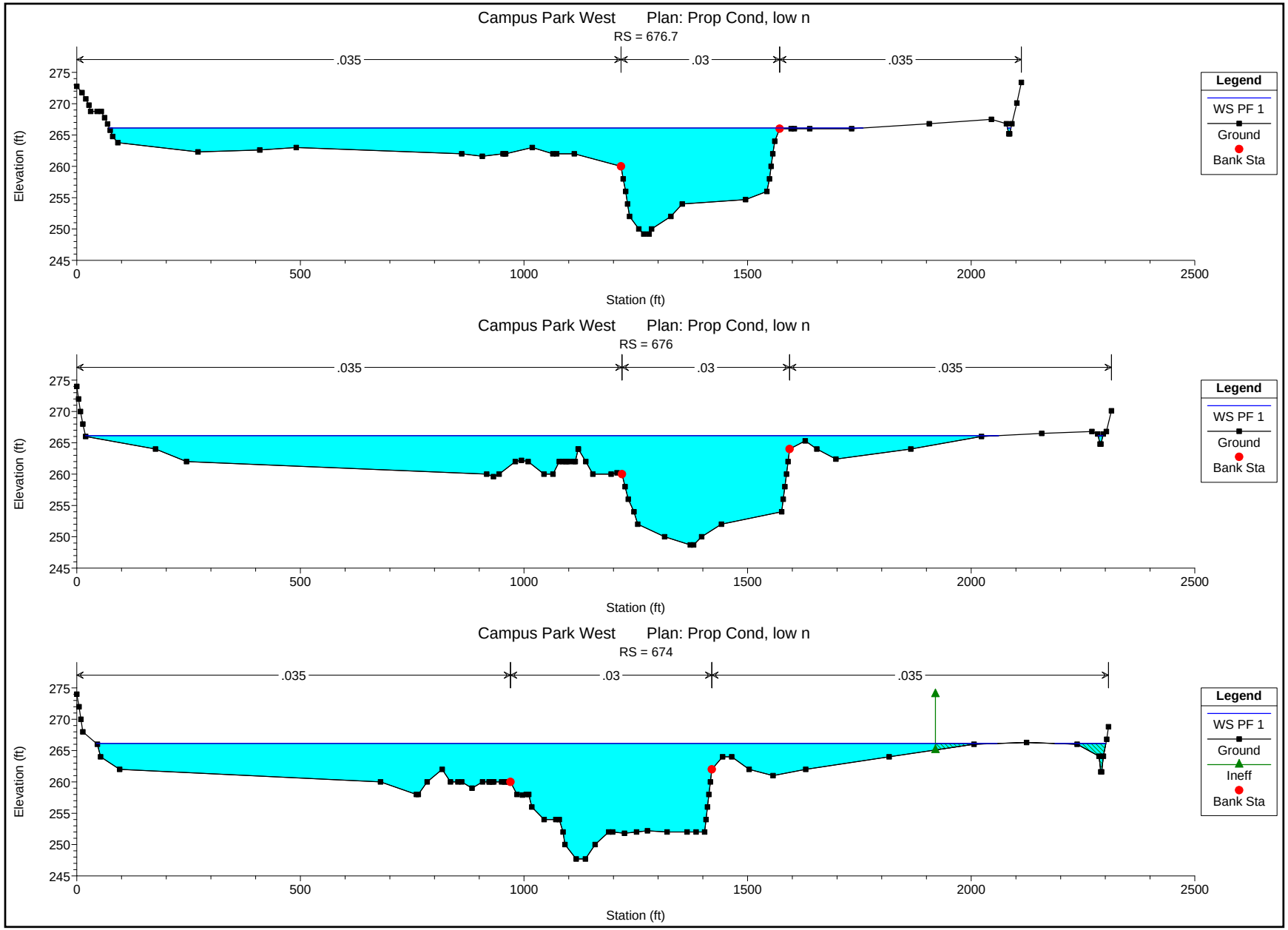
2000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta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.035
Elevation (ft)
275
270
265
260
255
250
245
0
500
1000
1500
2000
2500
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, low n
RS = 676
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, low n
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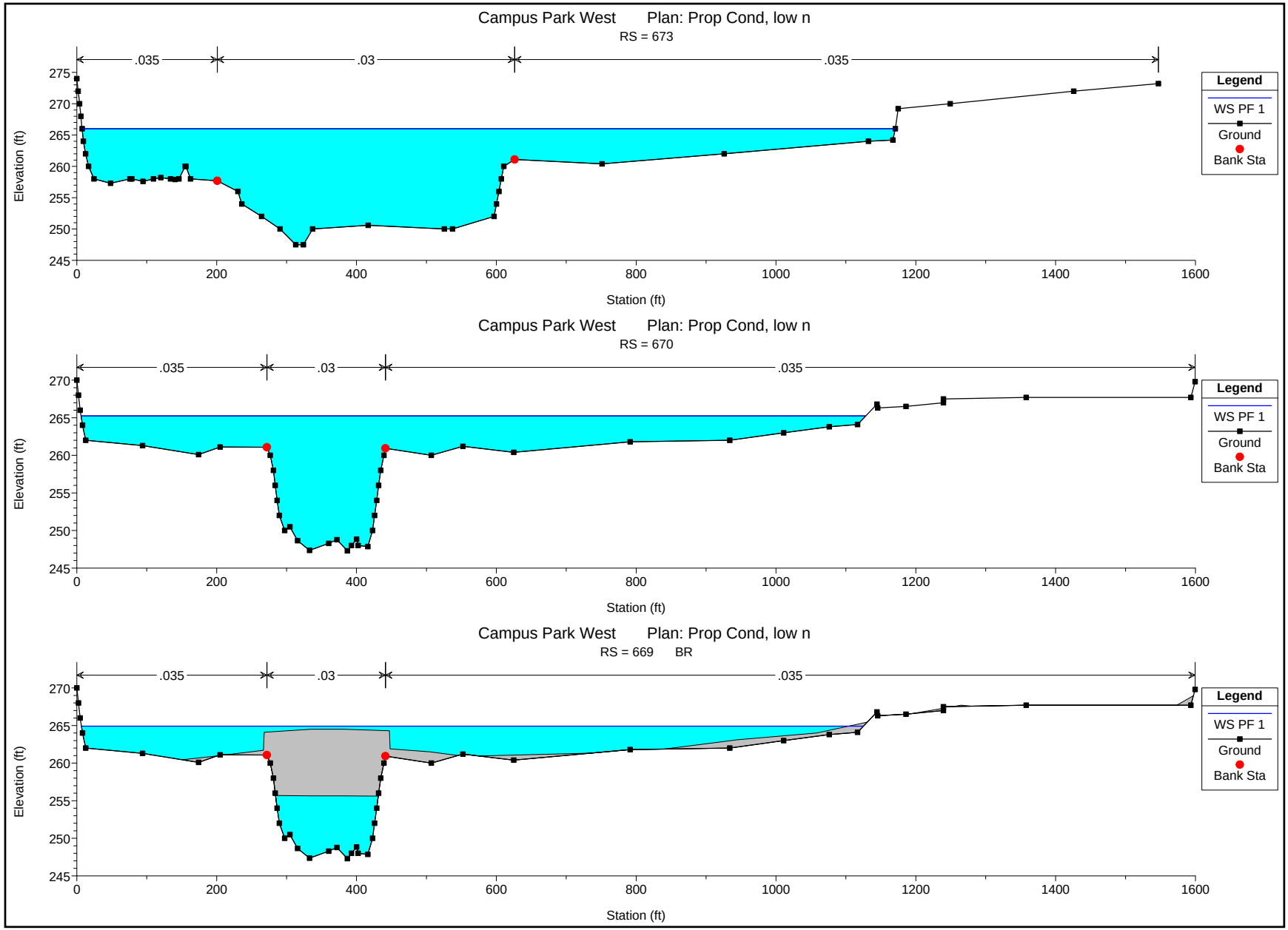
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Ineff
Bank Sta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255
250
245
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, low n
RS = 670
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, low n
RS = 669 BR
.035
.03
.035
Elevation (ft)
270
265
260
255
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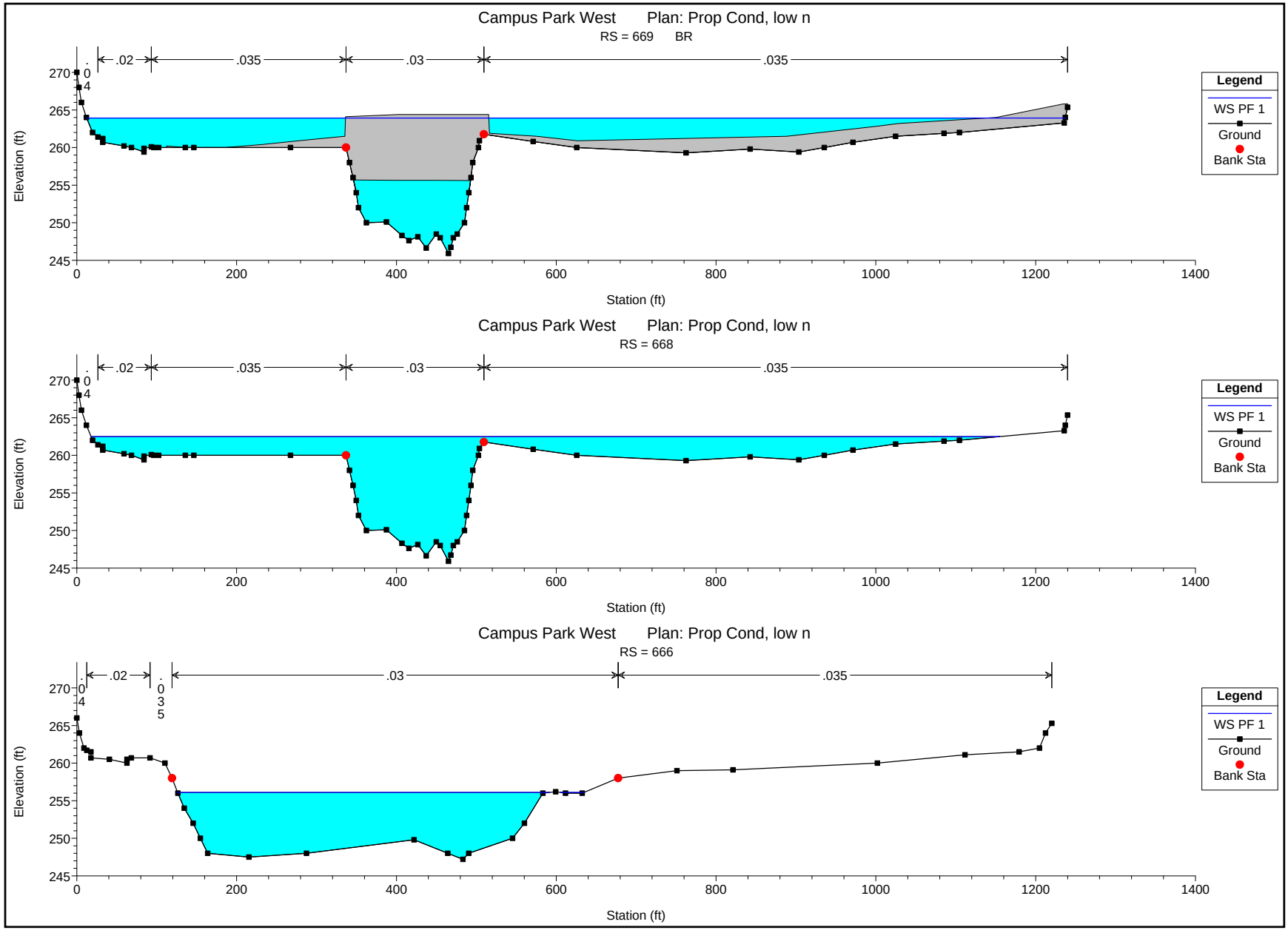
200
400
600
800
1000
1200
1400
1600
Station (ft)
Legend
WS PF 1
Ground
Bank Sta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Elevation (ft)
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250
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0
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600
800
1000
1200
1400
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, low n
RS = 668
.04
.02
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, low n
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.02
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.03
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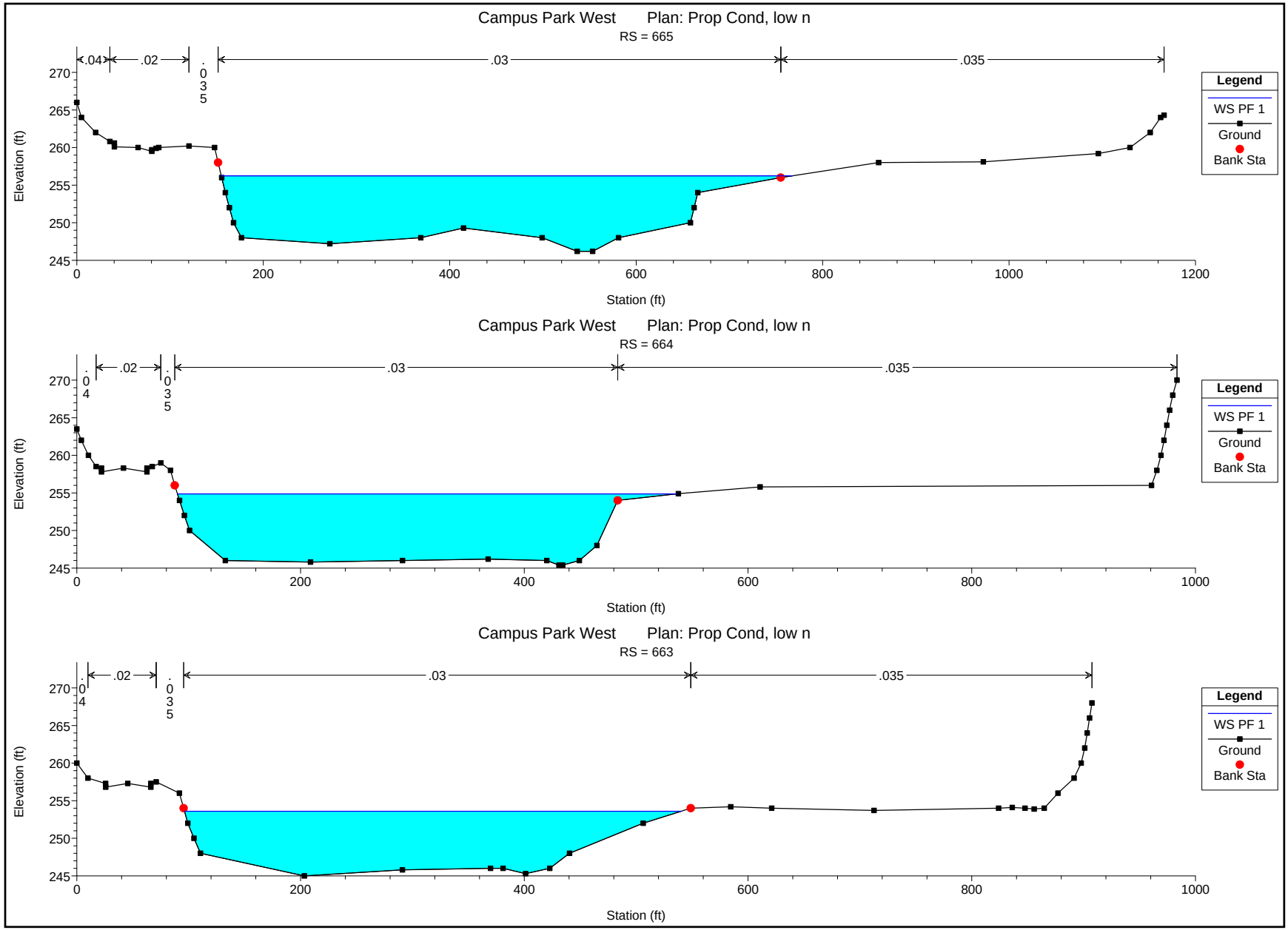
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta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Elevation (ft)
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260
255
250
245
0
200
400
600
800
1000
1200
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, low n
RS = 664
.04
.02
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, low n
RS = 663
.04
.02
.035
.03
.035
Elevation (ft)
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400
600
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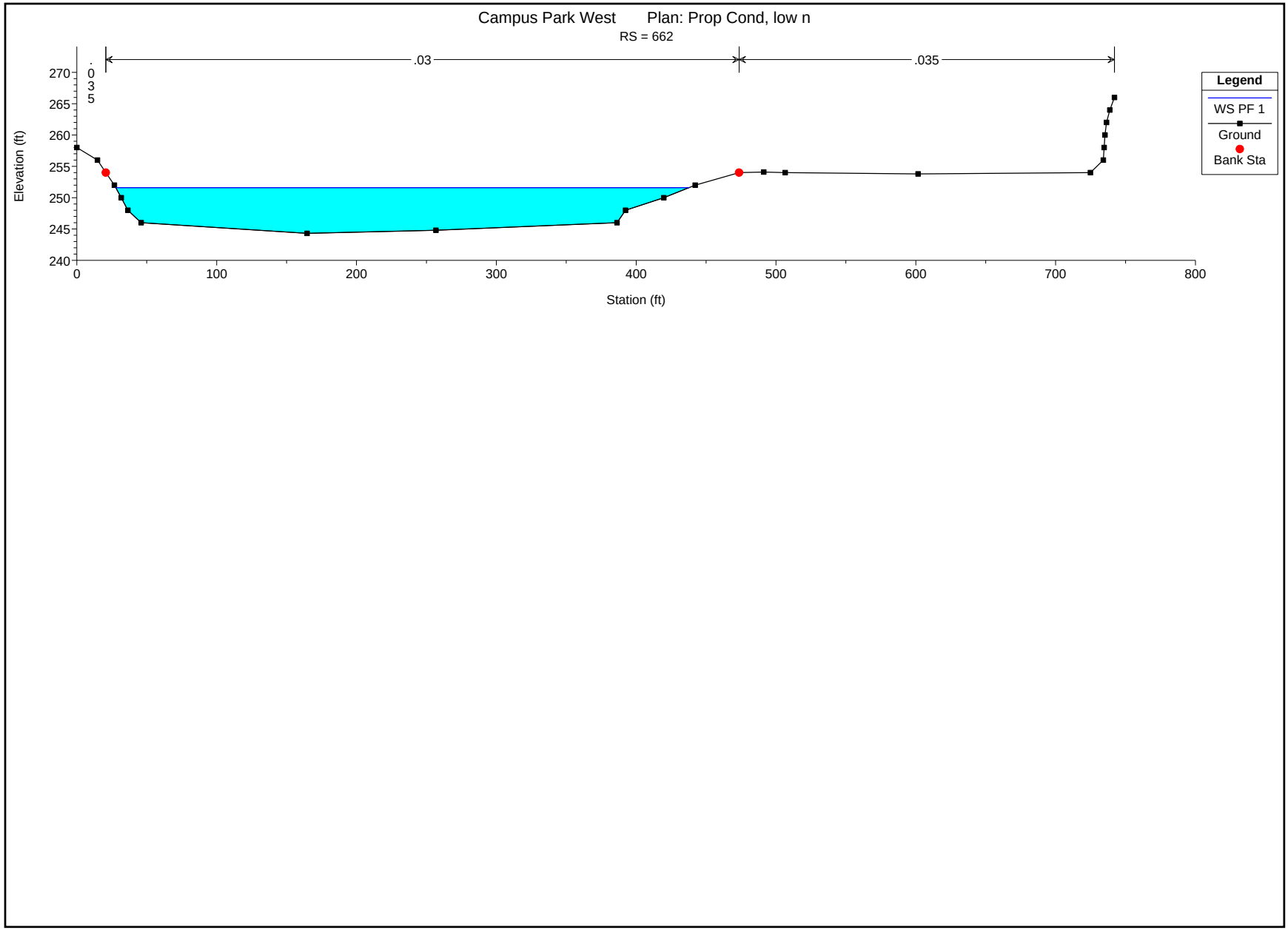
1000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Prop Cond, low n
RS = 662
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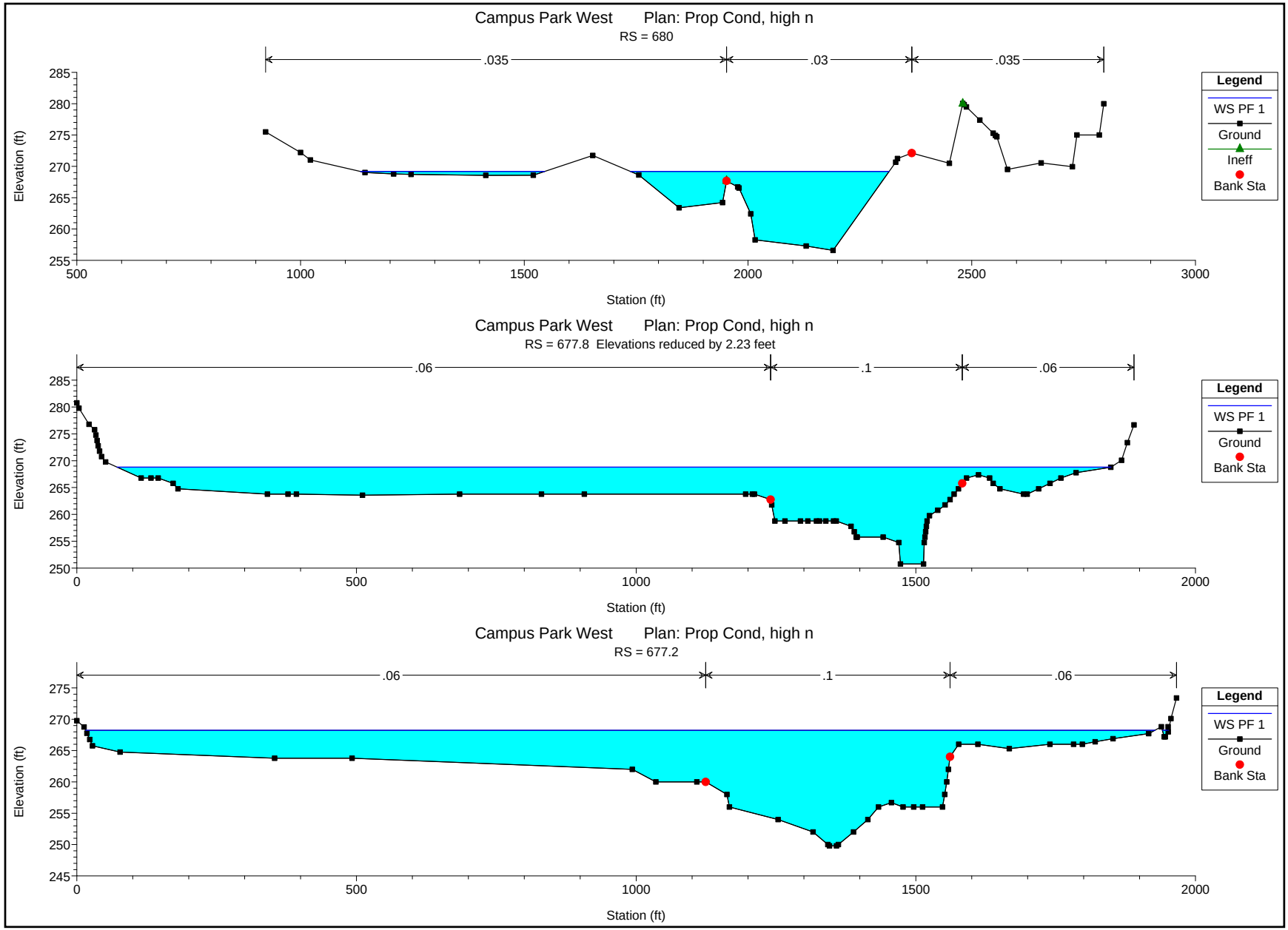
.035
.035
Elevation (ft)
270
265
260
255
250
245
240
0
100
200
300
400
500
600
700
800
Station (ft)
Legend
WS PF 1
Ground
Bank Sta

PROPOSED CONDITION HIGH ROUGHNESS

HEC-RAS Plan: Pr Cond, hi n River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	662	PF 1	33000.00	244.30	257.77	251.60	258.23	0.005519	5.6	6152.89	732.95	0.29
Reach-1	663	PF 1	33000.00	245.00	258.78		259.13	0.004166	4.8	6932.26	887.85	0.25
Reach-1	664	PF 1	33000.00	245.40	259.59		259.94	0.003692	5.0	7128.51	956.19	0.24
Reach-1	665	PF 1	33000.00	246.20	260.76		261.04	0.003286	4.3	8035.47	1101.58	0.22
Reach-1	666	PF 1	33000.00	247.20	261.25		261.63	0.005023	5.1	6854.46	1118.50	0.28
Reach-1	668	PF 1	33000.00	245.92	262.03	262.03	263.63	0.023801	11.4	3608.41	1088.45	0.59
Reach-1	669		Bridge									
Reach-1	670	PF 1	33000.00	247.30	266.80	262.99	267.09	0.002729	4.9	7811.96	1213.89	0.21
Reach-1	673	PF 1	33000.00	247.50	267.27		267.41	0.001033	3.0	11348.14	1166.00	0.13
Reach-1	674	PF 1	33000.00	247.70	267.50		267.57	0.000644	2.3	15245.94	2282.62	0.10
Reach-1	676	PF 1	33000.00	248.70	267.66		267.75	0.000737	2.5	14943.32	2290.78	0.11
Reach-1	676.7	PF 1	33000.00	249.20	267.88		268.01	0.001300	3.1	11867.55	2033.37	0.15
Reach-1	677.2	PF 1	33000.00	249.80	268.24		268.36	0.001245	3.0	12269.84	1920.89	0.14
Reach-1	677.8	PF 1	33000.00	250.77	268.80		268.97	0.002256	3.5	10008.14	1777.03	0.18
Reach-1	680	PF 1	33000.00	256.58	269.18	266.55	270.39	0.002039	9.3	4135.00	989.39	0.56


Campus Park West Plan: Prop Cond, high n
RS = 680
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.03
.035
Elevation (ft)
285
280
275
270
265
260
255
500
1000
1500
2000
2500
3000
Station (ft)
Legend
WS PF 1
Ground
Ineff
Bank Sta
Campus Park West Plan: Prop Cond, high n
RS = 677.8 Elevations reduced by 2.23 feet
.06
.1
.06
Elevation (ft)
285
280
275
270
265
260
255
250
0
500
1000
1500
2000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, high n
RS = 677.2
.06
.1
.06
Elevation (ft)
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0
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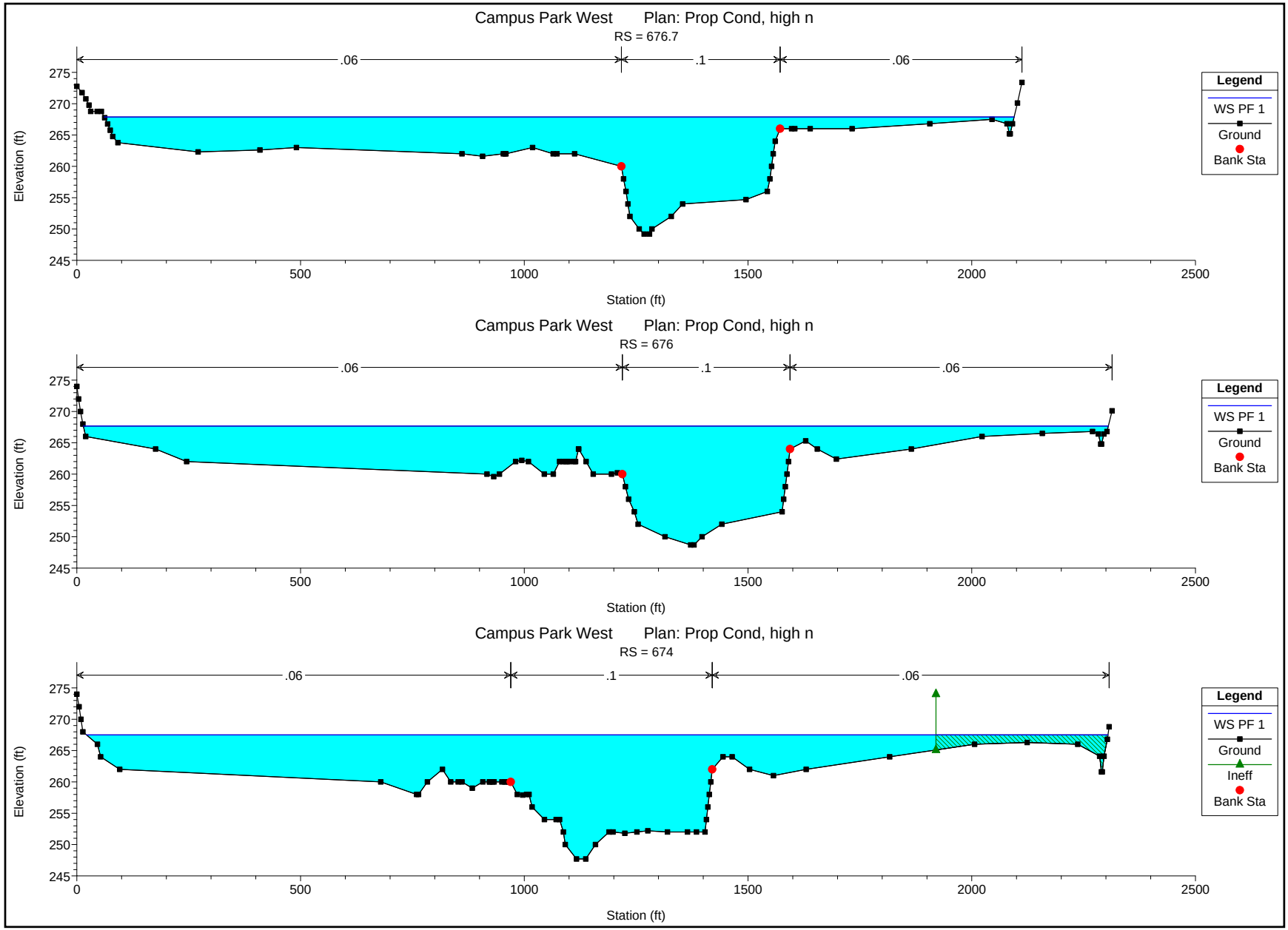
1000
1500
2000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Prop Cond, high n
RS = 676.7
.06
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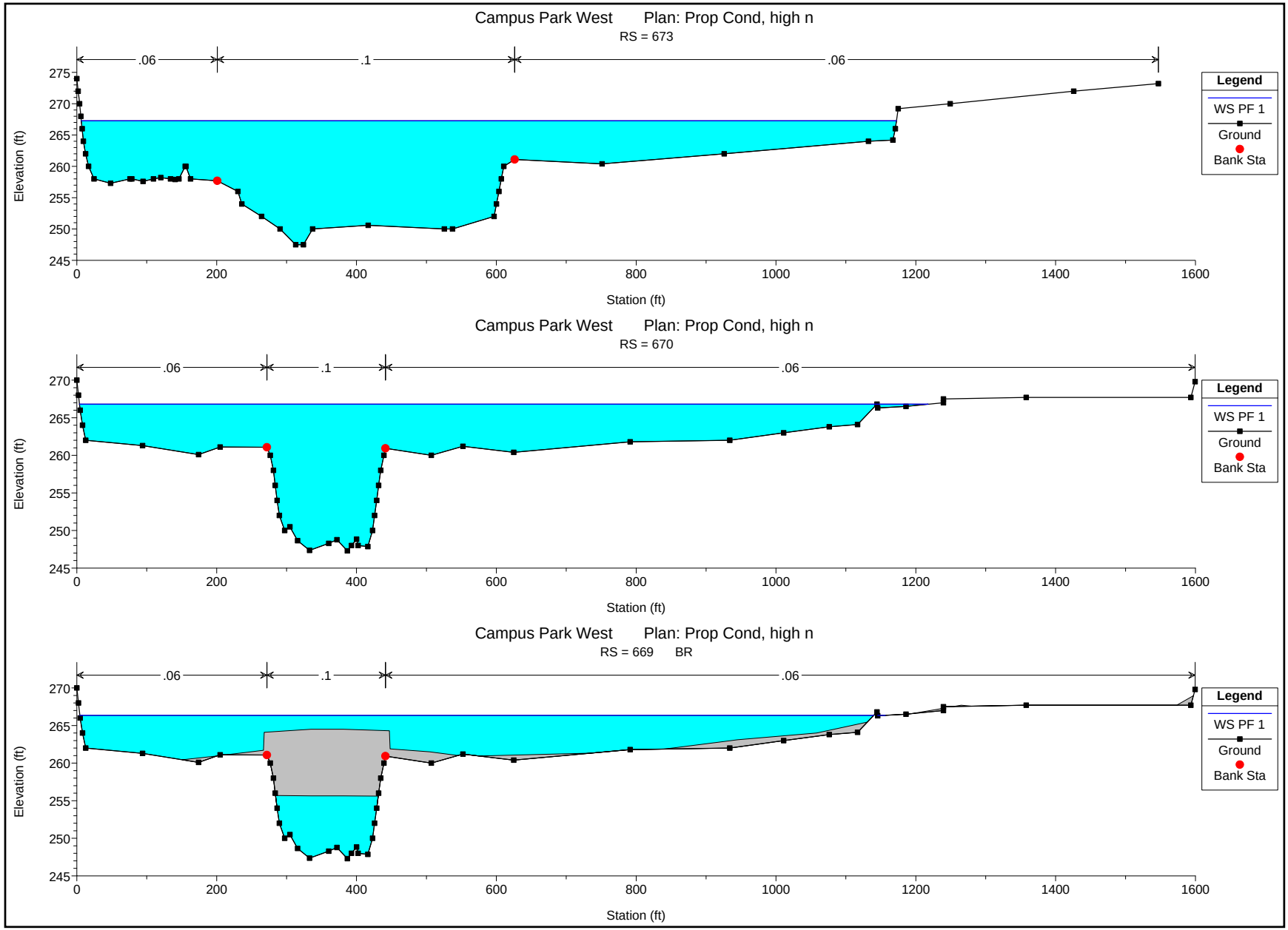
.06
Elevation (ft)
275
270
265
260
255
250
245
0
500
1000
1500
2000
2500
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, high n
RS = 676
.06
.1
.06
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, high n
RS = 674
.06
.1
.06
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Ineff
Bank Sta


Campus Park West Plan: Prop Cond, high n
RS = 673
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.1
.06
Elevation (ft)
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260
255
250
245
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, high n
RS = 670
.06
.1
.06
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, high n
RS = 669 BR
.06
.1
.06
Elevation (ft)
270
265
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200
400
600
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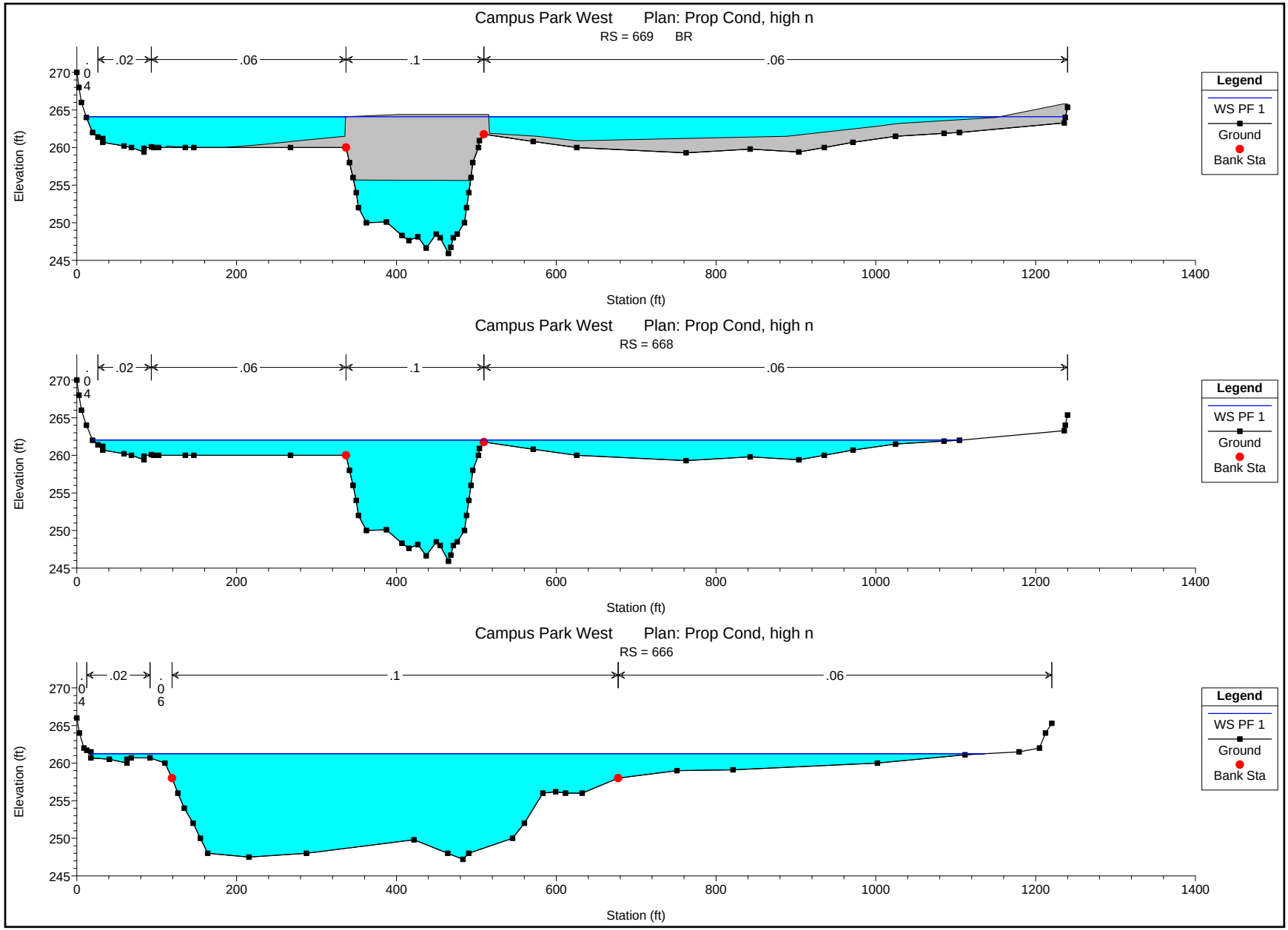
1000
1200
1400
1600
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Prop Cond, high n
RS = 669 BR
.04
.02
.06
.1
.06
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
1400
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, high n
RS = 668
.04
.02
.06
.1
.06
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, high n
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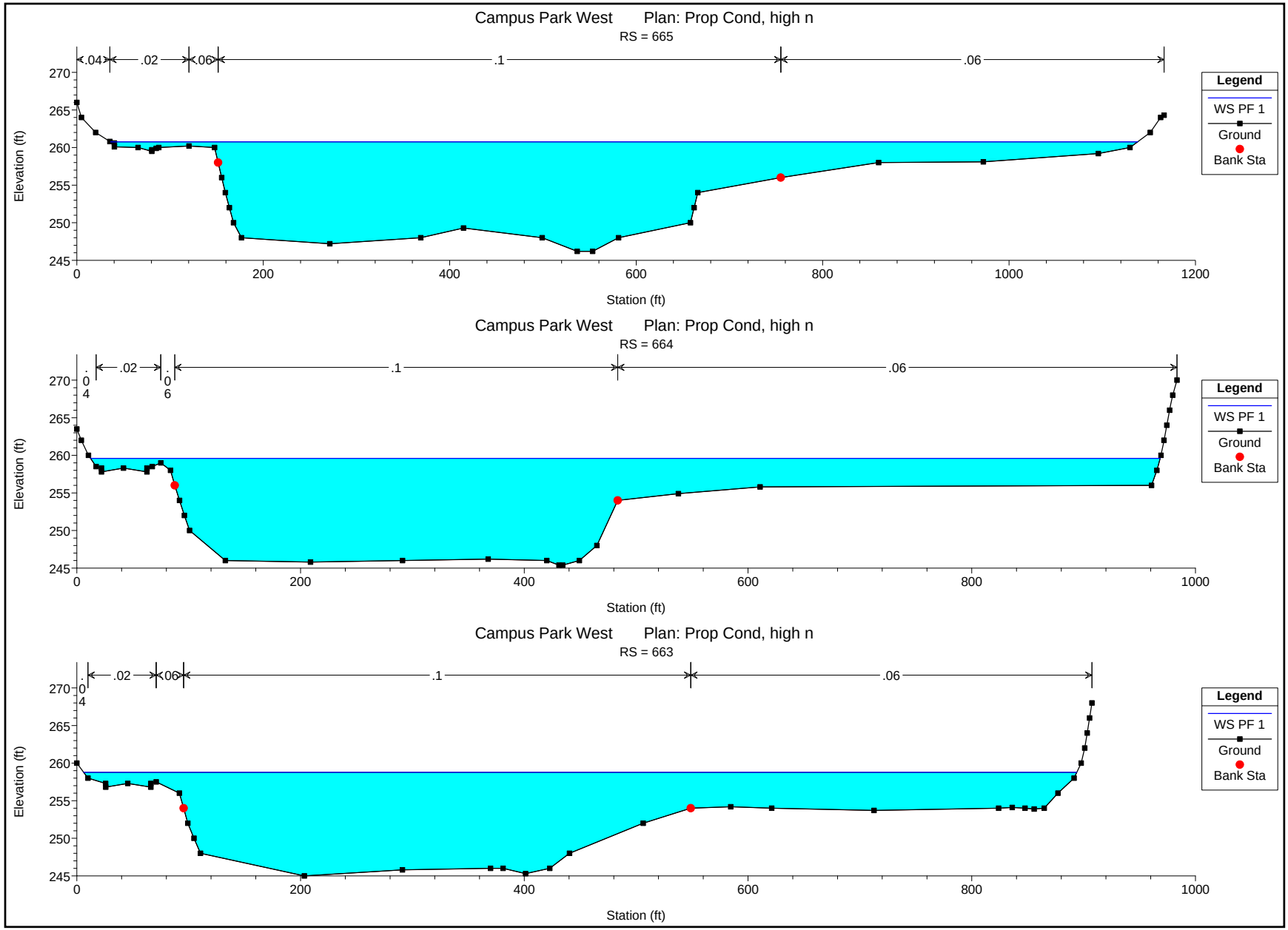
.02
.06
.1
.06
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Prop Cond, high n
RS = 665
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.02
.06
.1
.06
Elevation (ft)
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265
260
255
250
245
0
200
400
600
800
1000
1200
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, high n
RS = 664
.02
.1
.06
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, high n
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.06
.1
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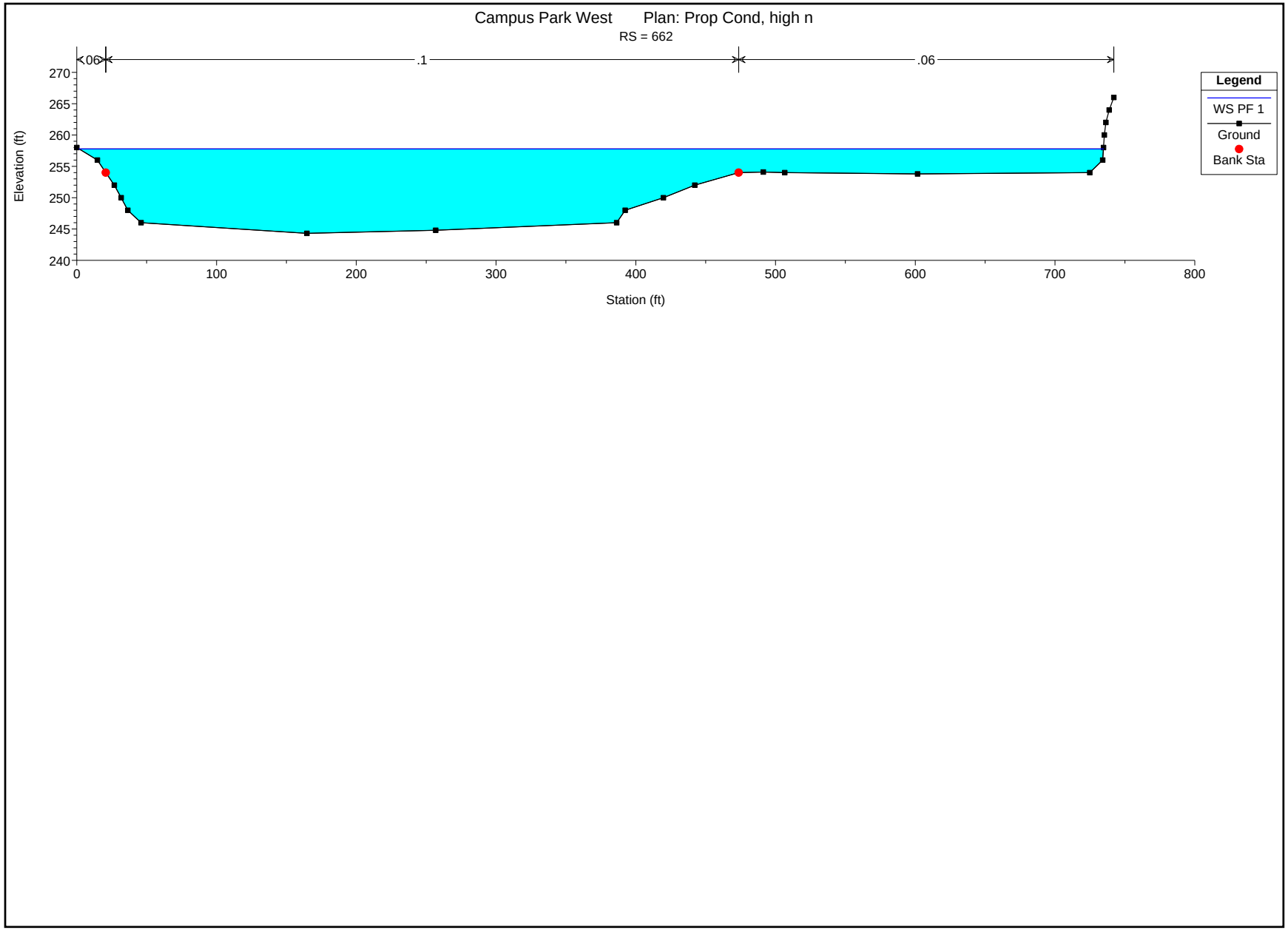
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Prop Cond, high n
RS = 662
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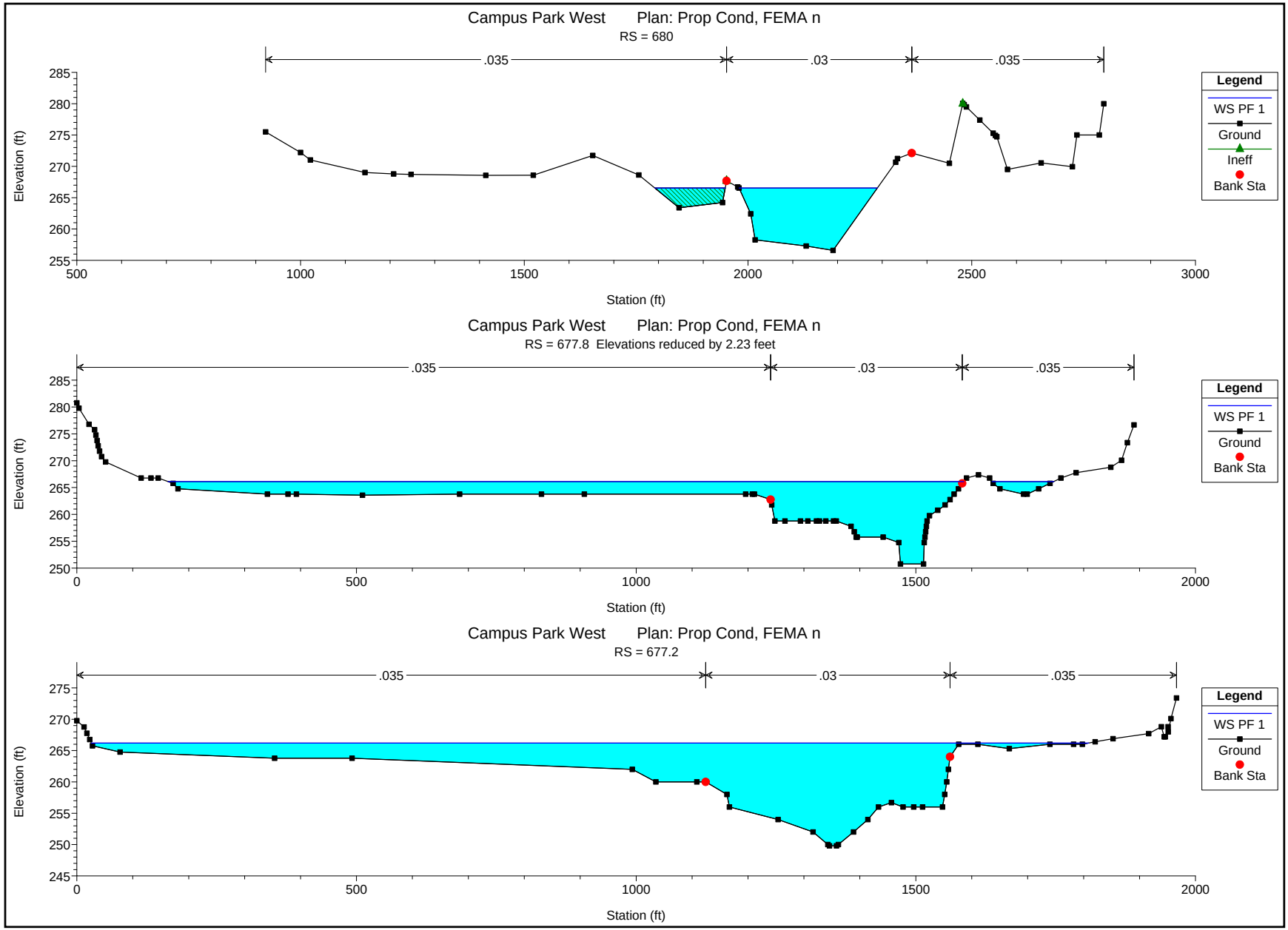
.1
.06
Elevation (ft)
270
265
260
255
250
245
240
0
100
200
300
400
500
600
700
800
Station (ft)
Legend
WS PF 1
Ground
Bank Sta

PROPOSED CONDITION FEMA ROUGHNESS

HEC-RAS Plan: PC FEMA n River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	680	PF 1	33000.00	256.58	266.55	266.55	270.09	0.006894	15.1	2185.51	466.43	1.00
Reach-1	677.8	PF 1	33000.00	250.77	266.11		267.01	0.001759	8.6	5544.32	1533.12	0.52
Reach-1	677.2	PF 1	33000.00	249.80	266.20		266.56	0.000446	5.3	8478.80	1783.24	0.28
Reach-1	676.7	PF 1	33000.00	249.20	266.06		266.43	0.000476	5.6	8425.94	1679.95	0.29
Reach-1	676	PF 1	33000.00	248.70	266.08		266.30	0.000234	4.4	11428.37	2036.47	0.21
Reach-1	674	PF 1	33000.00	247.70	266.07		266.23	0.000178	3.7	12561.16	2081.63	0.18
Reach-1	673	PF 1	33000.00	247.50	265.96		266.19	0.000210	4.2	9811.00	1163.06	0.20
Reach-1	670	PF 1	33000.00	247.30	265.15	263.16	266.05	0.000942	9.0	5922.85	1121.20	0.41
Reach-1	669		Bridge									
Reach-1	668	PF 1	33000.00	245.92	262.48	262.48	264.44	0.002493	12.6	4102.36	1135.63	0.64
Reach-1	666	PF 1	33000.00	247.20	258.27		259.15	0.001627	7.6	4363.52	579.02	0.48
Reach-1	665	PF 1	33000.00	246.20	258.34		258.90	0.000820	6.0	5664.53	848.77	0.35
Reach-1	664	PF 1	33000.00	245.40	257.94		258.62	0.000854	6.8	5579.03	893.06	0.36
Reach-1	663	PF 1	33000.00	245.00	257.88		258.42	0.000739	6.1	6138.39	877.98	0.33
Reach-1	662	PF 1	33000.00	244.30	257.77	251.60	258.27	0.000692	5.9	6152.89	732.95	0.31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.03
.035
Elevation (ft)
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280
275
270
265
260
255
500
1000
1500
2000
2500
3000
Station (ft)
Legend
WS PF 1
Ground
Ineff
Bank Sta
Campus Park West Plan: Prop Cond, FEMA n
RS = 677.8 Elevations reduced by 2.23 feet
.035
.03
.035
Elevation (ft)
285
280
275
270
265
260
255
250
0
500
1000
1500
2000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, FEMA n
RS = 677.2
.035
.03
.035
Elevation (ft)
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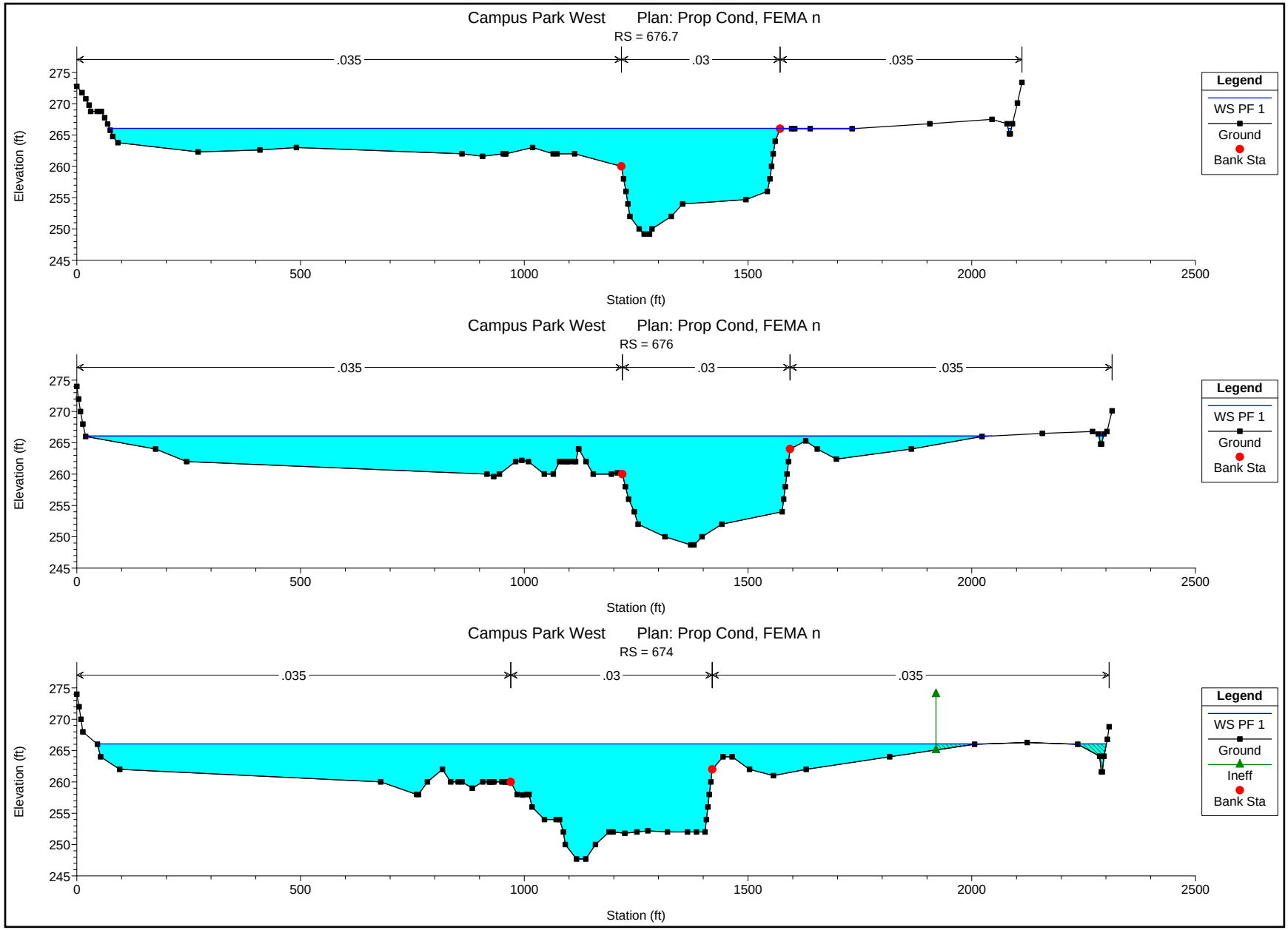
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Prop Cond, FEMA n
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.03
.035
Elevation (ft)
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265
260
255
250
245
0
500
1000
1500
2000
2500
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, FEMA n
RS = 676
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, FEMA n
RS = 674
.035
.03
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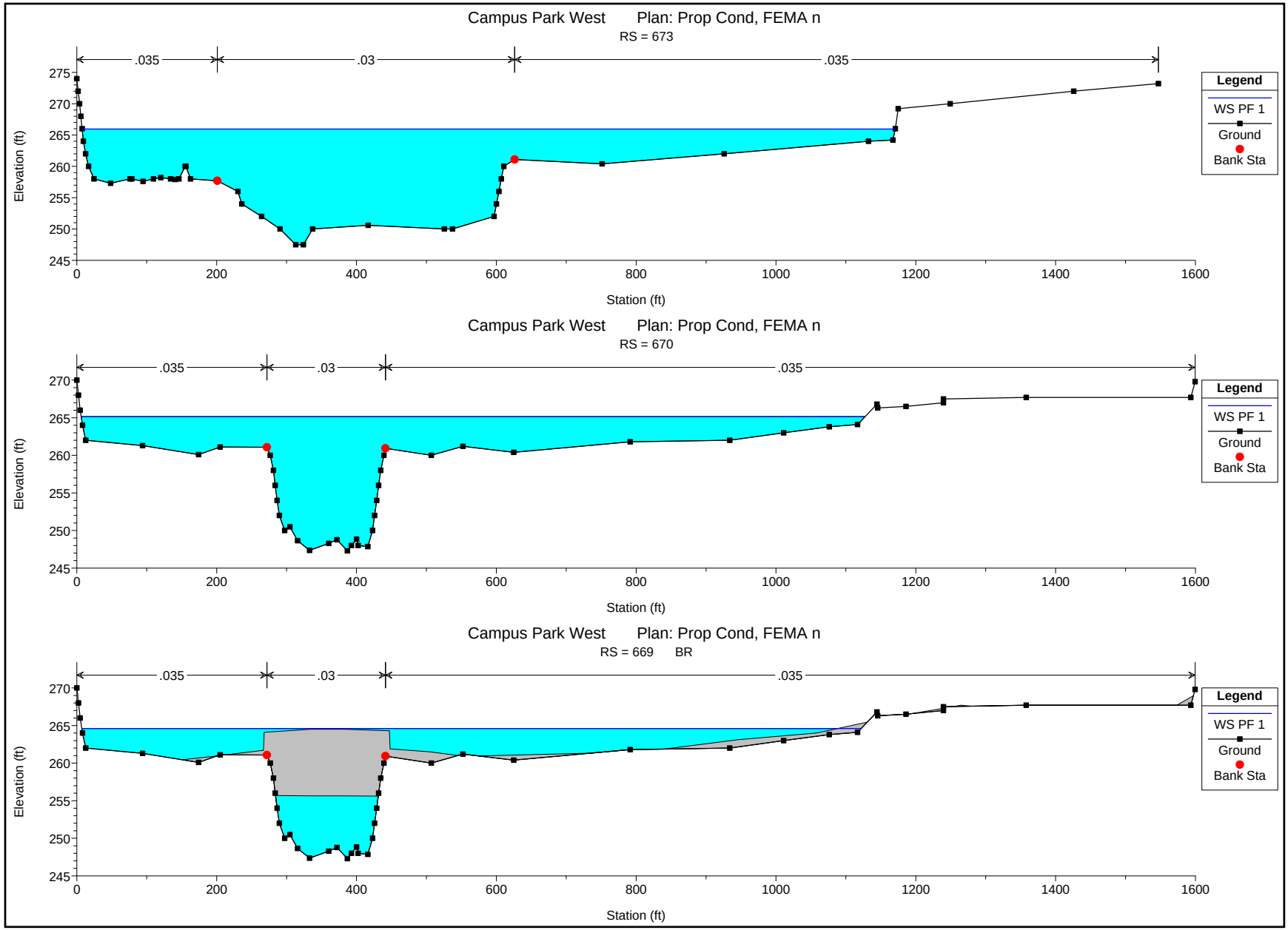
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Ineff
Bank Sta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.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, FEMA n
RS = 670
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, FEMA n
RS = 669 BR
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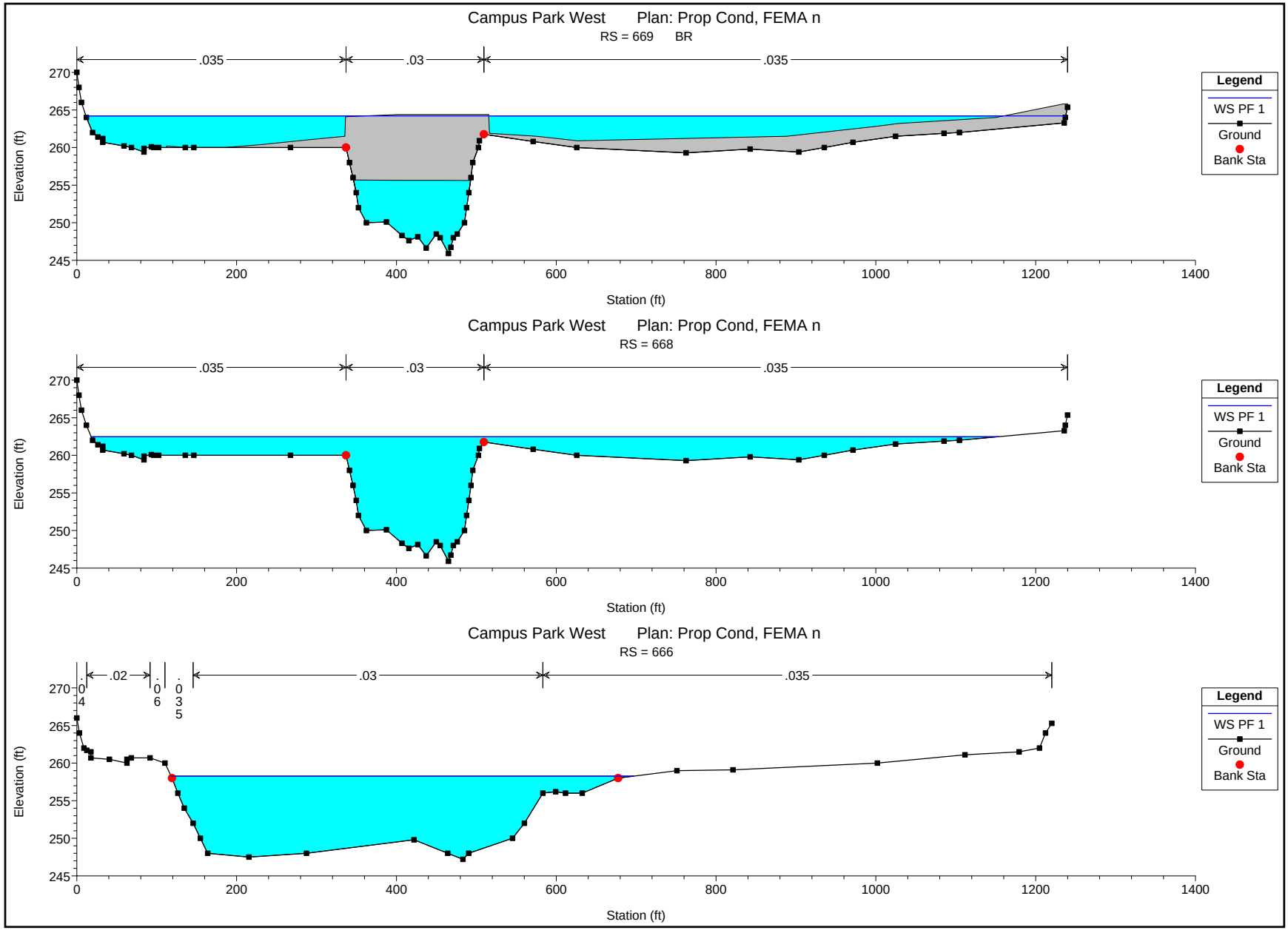
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Prop Cond, FEMA n
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.03
.035
Elevation (ft)
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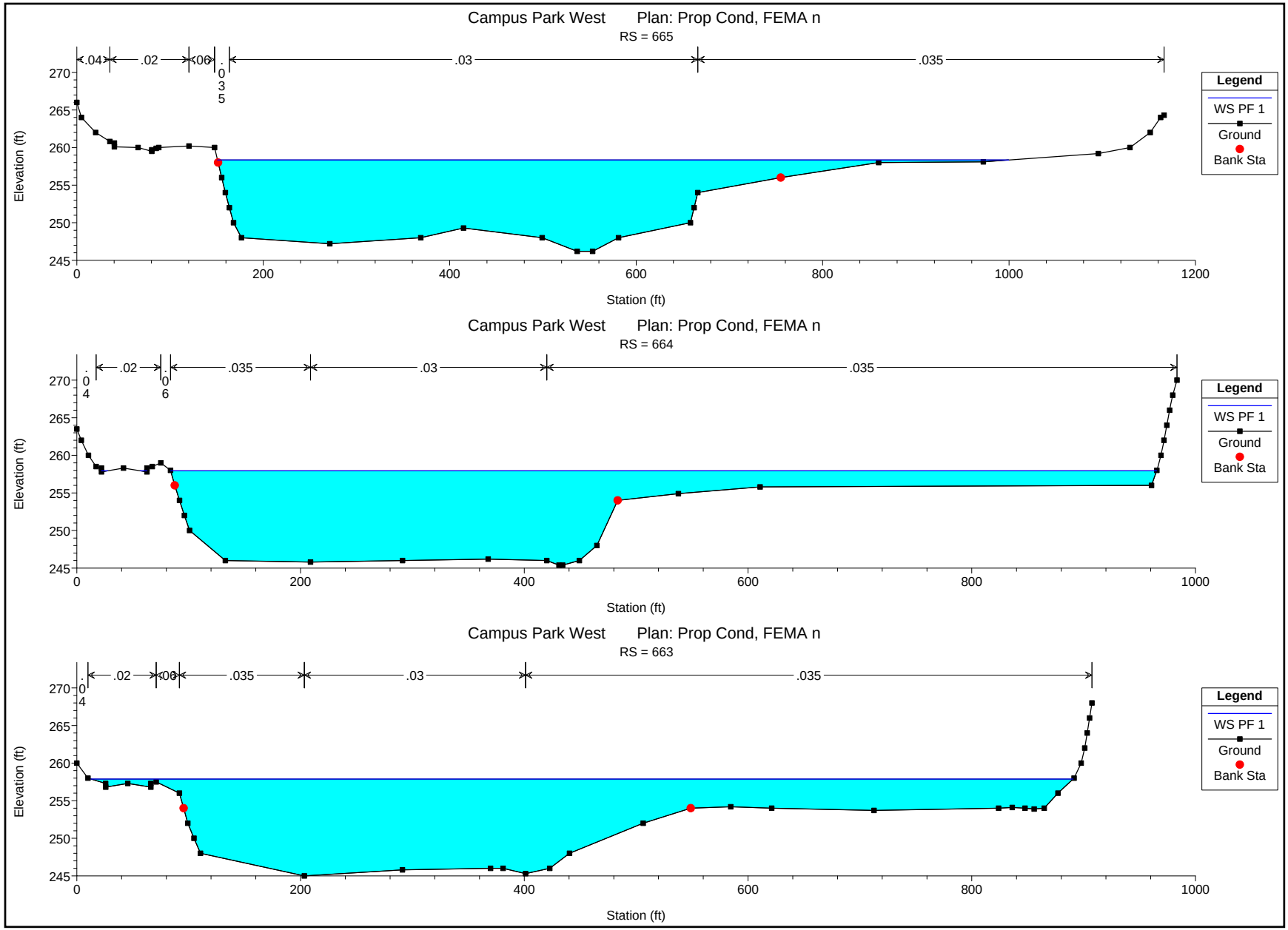
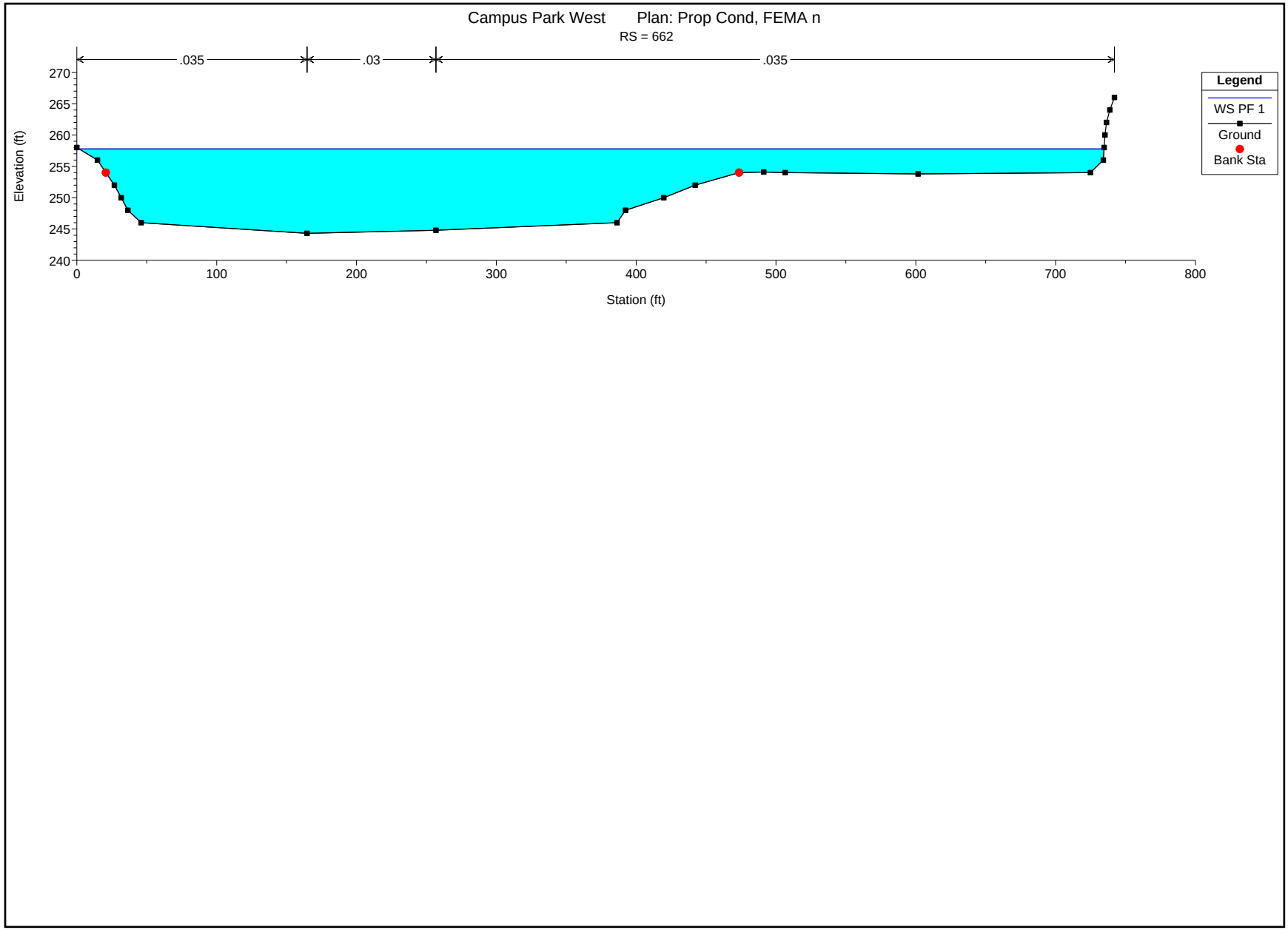
260
255
250
245
0
200
400
600
800
1000
1200
1400
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, FEMA n
RS = 668
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, FEMA n
RS = 666
.04
.02
.06
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Prop Cond, FEMA n
RS = 665
.04
.02
.00
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
1200
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, FEMA n
RS = 664
.04
.02
.06
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Campus Park West Plan: Prop Cond, FEMA n
RS = 663
.04
.02
.00
.035
.03
.035
Elevation (ft)
270
265
260
255
250
245
0
200
400
600
800
1000
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Campus Park West Plan: Prop Cond, FEMA n
RS = 662
.035
.03
.035
Elevation (ft)
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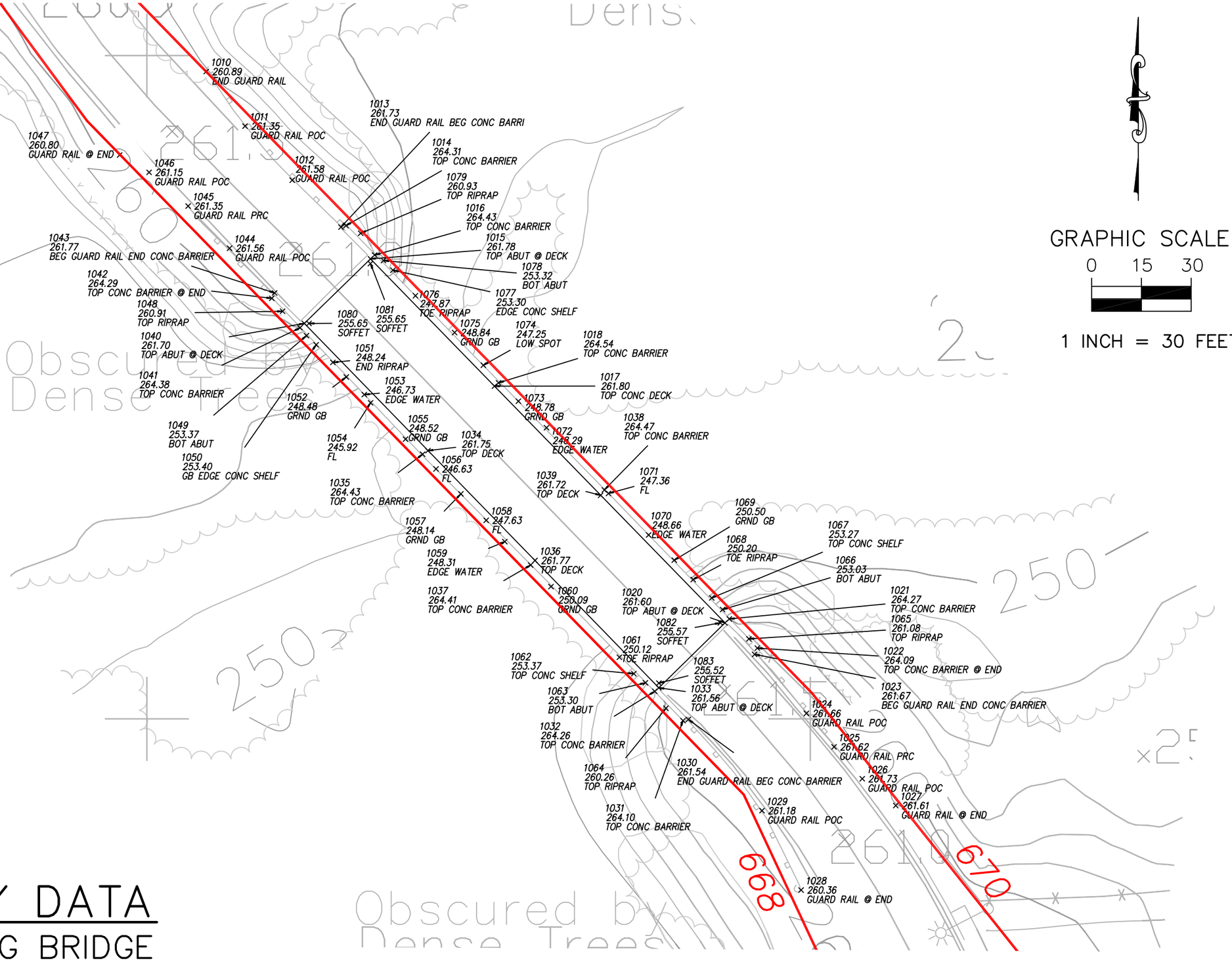
265
260
255
250
245
240
0
100
200
300
400
500
600
700
800
Station (ft)
Legend
WS PF 1
Ground
Bank Sta



NOTE:
THIS EXHIBIT SHOWS PROJECT DESIGN CONSULTANTS' FIELD SURVEY DATA (NGVD 29) AT THE SHEARER CROSSING BRIDGE USED FOR HEC-RAS CROSS-SECTIONS 668 AND 670 (IN RED).

FIELD SURVEY DATA

SHEARER CROSSING BRIDGE

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	76	R28.0-30.1	50	151

Hadi R. Sami 2/14/08
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — HADI SAMI — No. 46173 — Exp. 12/31/08 — CIVIL — STATE OF CALIFORNIA

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GRANITE CONSTRUCTION COMPANY
38000 MONROE STREET
INDIO, CALIFORNIA 92203

URS CORPORATION
1615 MURRAY CANYON RD, SUITE 1000
SAN DIEGO, CALIFORNIA 92108

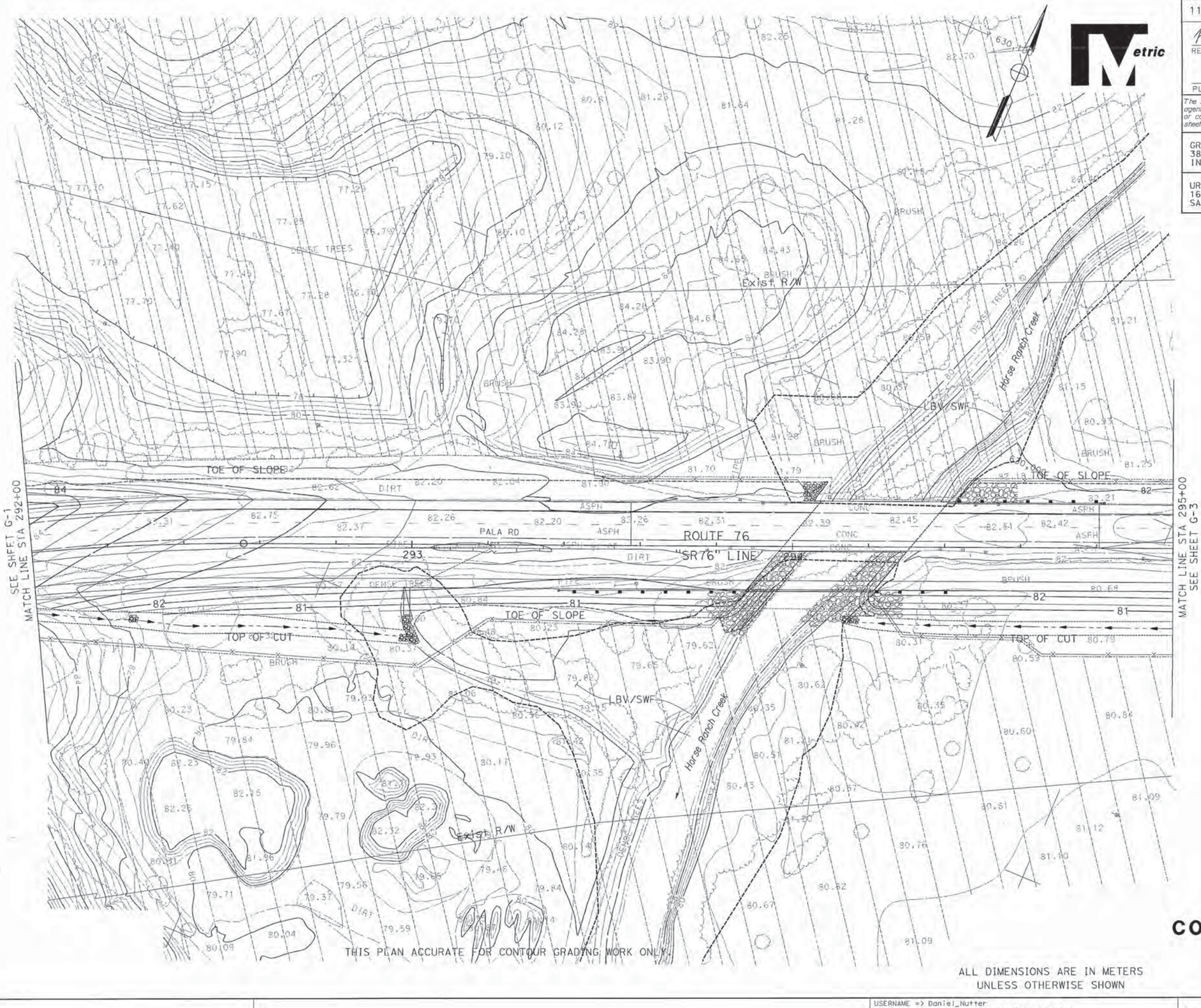
DESIGN OVERSIGHT

CALCULATED/ DESIGNED BY

CHECKED BY

DATE	REVISION No.	DATE REVISED
-		

Metric



11-08-NMC-0245

PERMIT NUMBER 11- ~~231504~~
CO SD RTE 76 PM R28.0-30.1
AS-BUILT PLANS FOR ROADWAY GEOMETRIC AND ABOVE GROUND FEATURES

STATE REPRESENTATIVE — DATE 3-15-11

CONTOUR GRADING PLAN

SCALE 1:500

G-2

ALL DIMENSIONS ARE IN METERS
UNLESS OTHERWISE SHOWN

LAST REVISION 00-00-00
DATE PLOTTED => 1/27/2011
TIME PLOTTED => 12:42:32 PM

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DGN FILE => ...\07 Contour Grading\ha002.dgn

CU 00000

EA 231501

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	76	R28.0-30.1	51	151

Hadi R. Samii 2/14/08
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
HADI SAMII
No. 46173
Exp. 12/31/08
CIVIL
STATE OF CALIFORNIA

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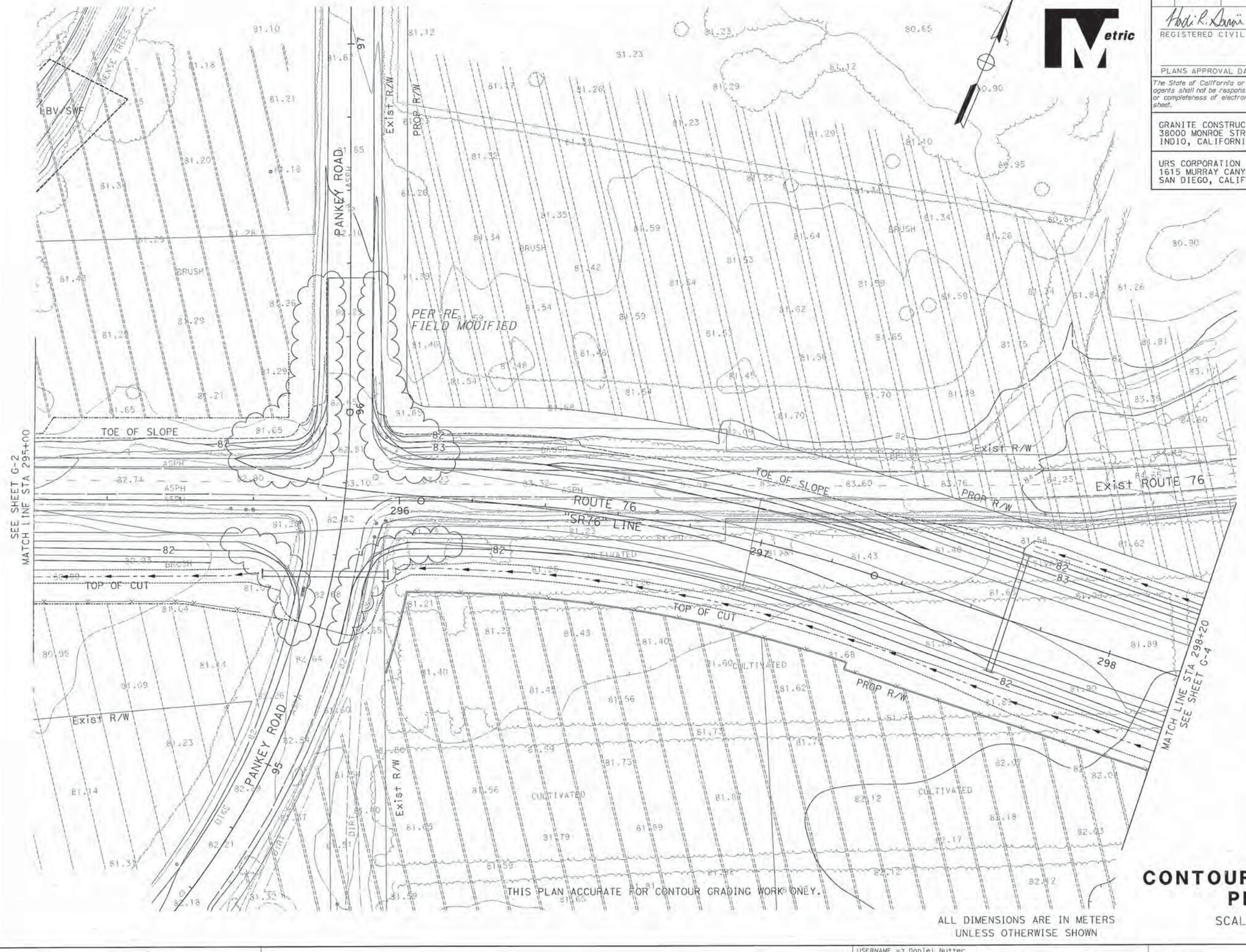
INDIO, CALIFORNIA 92203

URS CORPORATION
1615 MURRAY CANYON RD, SUITE 1000
SAN DIEGO, CALIFORNIA 92108

Metric

DESIGN OVERSIGHT	CALCULATED/ DESIGNED BY	DATE	REVISION No.	DATE REVISED
	CHECKED BY			



ALL DIMENSIONS ARE IN METERS
UNLESS OTHERWISE SHOWN

11-08-NMC-0245

PERMIT NUMBER 11- ~~231504~~
CO SD RTE 76 PM R28.0-30.1
AS-BUILT PLANS FOR ROADWAY GEOMETRIC AND ABOVE GROUND FEATURES

STATE REPRESENTATIVE DATE 3-15-11

CONTOUR GRADING PLAN

SCALE 1:500

G-3

LAST REVISION 00-00-00 DATE PLOTTED =>1/27/2011 TIME PLOTTED =>12:43:37 PM

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CU 00000

EA 231501

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	76	R28.0-30.1	52	151

Hadi R. Santi 2/14/08
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
HADI SANTI
No. 46173
Exp. 12/31/08
CIVIL
STATE OF CALIFORNIA

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38000 MONROE STREET
INDIO, CALIFORNIA 92203

URS CORPORATION
1615 MURRAY CANYON RD, SUITE 1000
SAN DIEGO, CALIFORNIA 92108

Metric

DESIGN OVERSIGHT

CALCULATED/ DESIGNED BY

CHECKED BY

DATE | REVISION No. | DATE REVISED

SEE SHEET G-3
MATCH LINE STA 298+20

PROP R/W
TOP OF CUT
PROP R/W
TOP OF CUT
ROUTE 76
"SR76" LINE
299
300
301
MATCH LINE 301+20
SEE SHEET G-5
TOE OF SLOPE
INFILTRATION
BASIN BY OTHERS
65 dBA LINE
EXIST R/W
ASPH
DENSE TREES
CULTIVATED
ORCHARD
DIRT
PER RE
FIELD MODIFIED

11-08-NMC-0245

PERMIT NUMBER 11- ~~231504~~
CO SD RTE 76 PM R28.0-30.1
AS-BUILT PLANS FOR ROADWAY GEOMETRIC AND ABOVE GROUND FEATURES
STATE REPRESENTATIVE DATE 3-15-11

THIS PLAN ACCURATE FOR CONTOUR GRADING WORK ONLY.

ALL DIMENSIONS ARE IN METERS
UNLESS OTHERWISE SHOWN

CONTOUR GRADING PLAN

SCALE 1:500

G-4

LAST REVISION 00-00-00 | DATE PLOTTED => 1/27/2011 | TIME PLOTTED => 11:03:05 PM

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CU 00000

EA 231501

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	76	R28.0-30.1	54	151

Hadi R. Sami 2/14/08
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

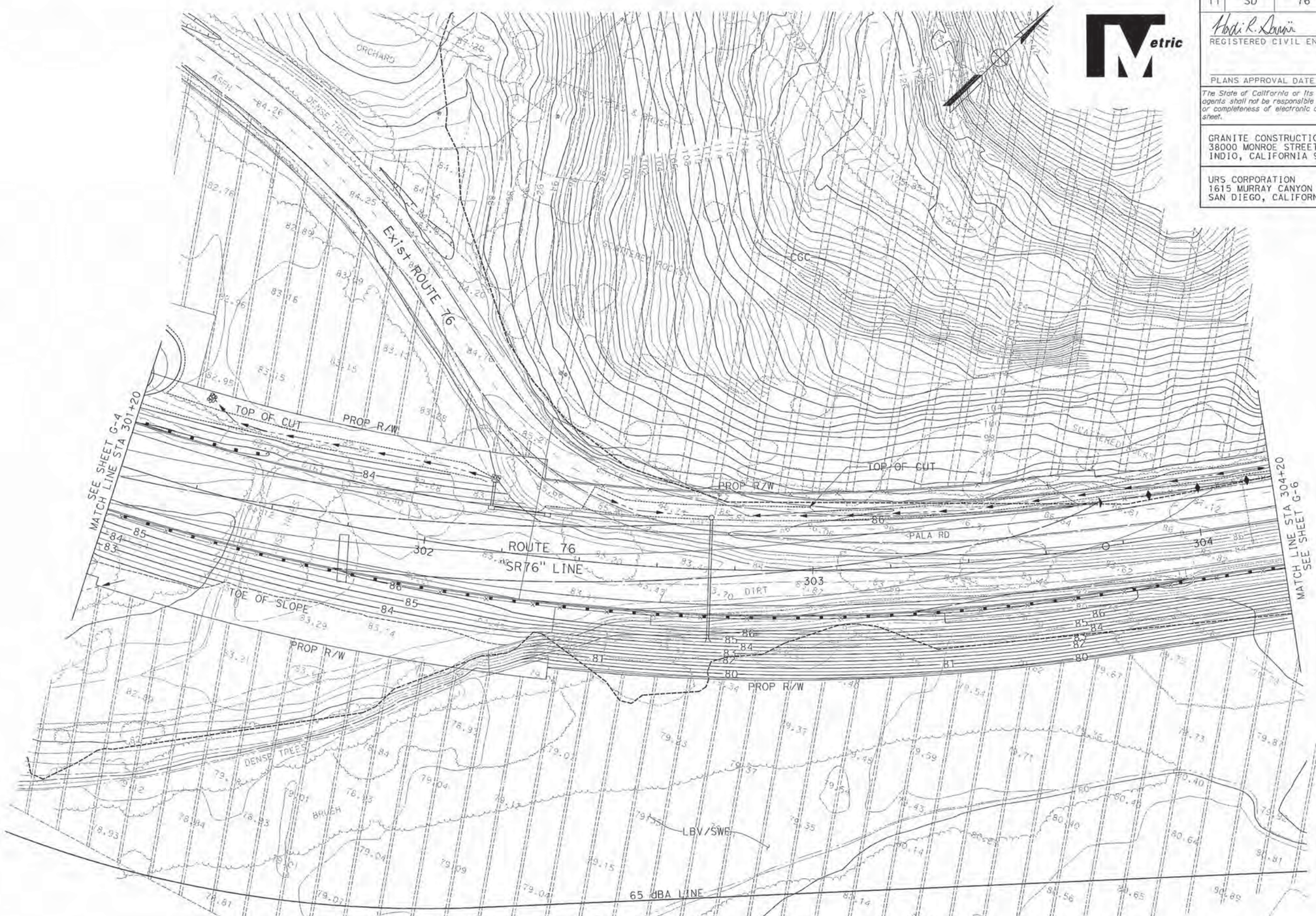
REGISTERED PROFESSIONAL ENGINEER — HADI SAMII — No. 46173 — Exp. 12/31/08 — CIVIL — STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

GRANITE CONSTRUCTION COMPANY
38000 MONROE STREET
INDIO, CALIFORNIA 92203

URS CORPORATION
1615 MURRAY CANYON RD, SUITE 1000
SAN DIEGO, CALIFORNIA 92108

Metric



THIS PLAN ACCURATE FOR CONTOUR GRADING WORK ONLY.

ALL DIMENSIONS ARE IN METERS
UNLESS OTHERWISE SHOWN

11-08-NMC-0245

PERMIT NUMBER 11- ~~231504~~
CO SD RTE 76 PM R28.0-30.1
AS-BUILT PLANS FOR ROADWAY GEOMETRIC AND ABOVE GROUND FEATURES

STATE REPRESENTATIVE — DATE 3-15-11

CONTOUR GRADING PLAN

SCALE 1:500

G-5

DESIGN OVERSIGHT

	DATE	REVISION No.	DATE REVISED
CALCULATED/ DESIGNED BY			
CHECKED BY			

LAST REVISION 00-00-00 DATE PLOTTED => 1/27/2011 TIME PLOTTED => 11:27:37 PM

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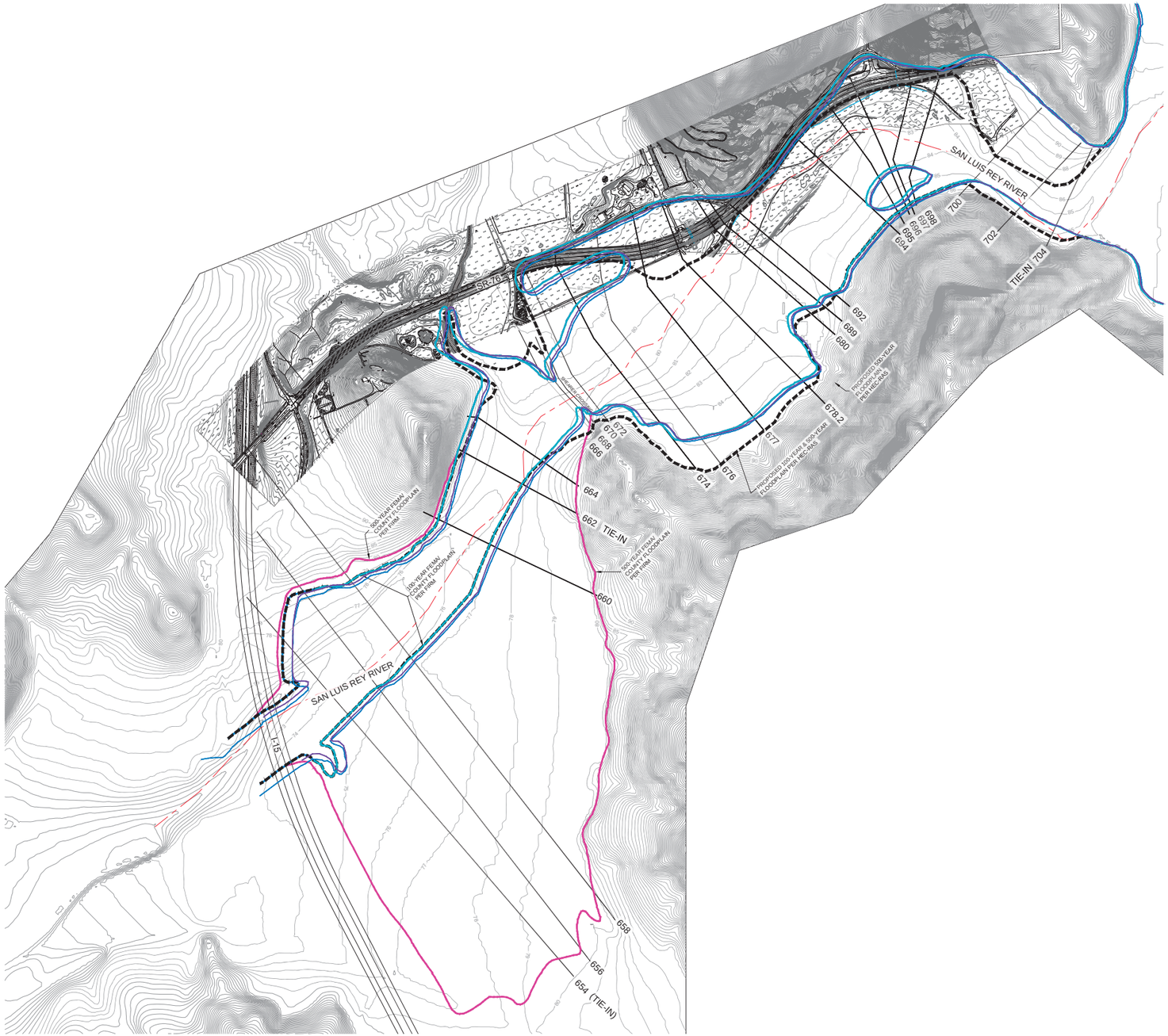
DGN FILE => ...\07 Contour Grading\ha005.dgn

CU 00000

EA 231501



LEGEND

- RIVER CENTERLINE
- 100-YR FLOODPLAIN LIMITS PER HEC-RAS
- 100-YR FLOODPLAIN LIMITS (EFFECTIVE)
- 500-YR FLOODPLAIN LIMITS PER HEC-RAS
- 500-YR FLOODPLAIN LIMITS (EFFECTIVE)
- 100-YR PROPOSED FLOODPLAIN LIMITS
- HEC-RAS CROSS-SECTION
- HEC-RAS CROSS-SECTION I.D. 704

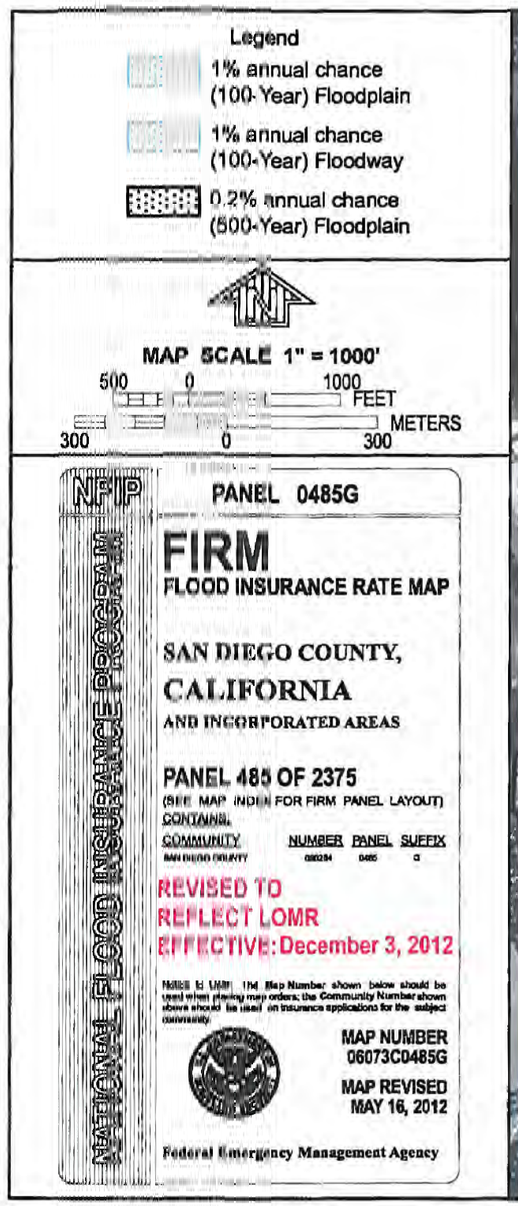
NOTE: FLOODPLAIN DELINEATIONS DO NOT REFLECT THE GROUND DATA FROM THE SAN DIEGO COUNTY TOPOGRAPHY MAPS. THE HEC-RAS FLOODPLAIN RESULTS REFLECT THE GEOMETRY FROM THE DETAILED CROSS-SECTION SURVEY CONDUCTED IN APRIL 2004 AND THE AS-BUILT SURVEY DATA FOR STATE ROUTE 76.

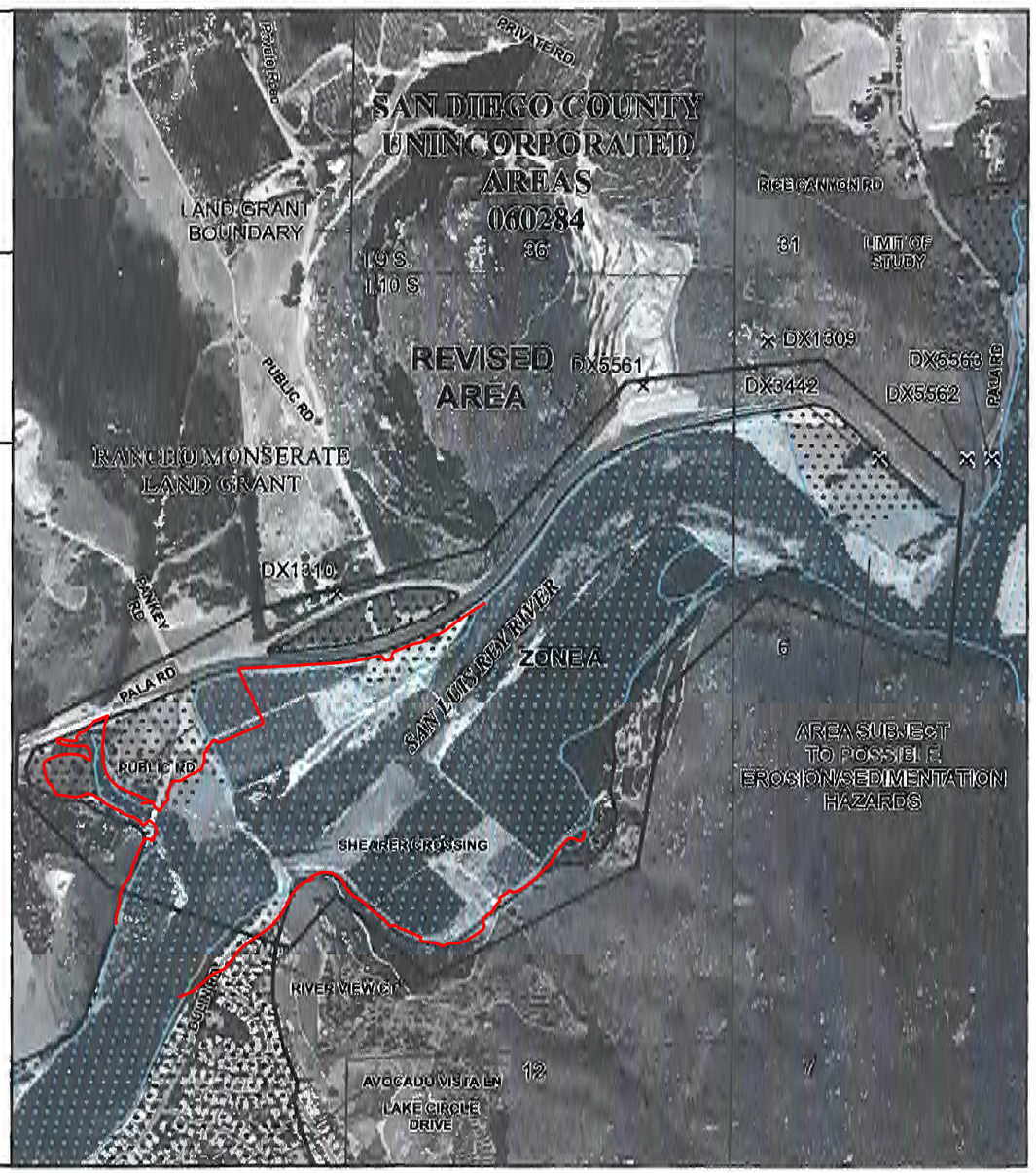
FEMA LETTER OF MAP REVISION
SR-76 WIDENING AND REALIGNMENT
FROM I-15 TO 3.9 KM EAST, SAN DIEGO COUNTY

URS | 250 0 250 500 FEET | SCALE: 1"= 500' (NGVD 1929) | CHECKED BY: | DATE: 03-08-12 | PM: MM | PROJ. NO: 27683001.04300 | FIG. NO: A

NOTE:
THIS EXHIBIT CONTAINS THE REVISED FIRM ASSOCIATED WITH URS' APPROVED LOMR.

THE 100–YEAR FLOODPLAIN ASSOCIATED WITH THE PROPOSED CONDITION HIGH ROUGHNESS HEC–RAS FROM THIS REPORT IS DELINEATED IN RED. THIS PROPOSED CONDITION FLOODPLAIN HAS BEEN GRAPHICALLY TIED INTO THE LOMR FLOODPLAIN UPSTREAM OF THE PROJECT SINCE THE HEC–RAS RESULTS SHOW THAT THE PROJECT WILL NOT INCREASE THE 100–YEAR WATER SURFACE ELEVATIONS.





LEGEND:

- HEC–RAS CROSS–SECTION
- EFFECTIVE STUDY HEC–RAS CROSS–SECTION
- PROPOSED CONDITION 100–YEAR FLOODPLAIN
- EXISTING CONDITION 100–YEAR FLOODPLAIN (EXISTING FLOODPLAIN IS COINCIDENT WITH PROPOSED FLOODPLAIN EXCEPT ALONG LIGHT BLUE LINE)
- COUNTY OF SAN DIEGO FLOODWAY
- EFFECTIVE FEMA 100–YEAR FLOODPLAIN

FILL WILL BE PLACED HIGHER THAN THE 100–YEAR WATER SURFACE ELEVATION BETWEEN THE PROPOSED SOUTHERLY PAD AND SR 78. A PIPE WILL BE INSTALLED WITHIN THE FILL TO CONVEY LOCAL DRAINAGE.

GRAPHIC SCALE

200 0 100 200 400

1 INCH = 200 FEET

PALA ROAD
SR-76

PANKEY ROAD

HORSE RANCH CREEK

NOLTE TOPO

PDC TOPO

680

678.2

677.8

677

677.2

676.7

676

674

673

670

668

666

665

664

663

662

NOTE:
THE UNDERLYING TOPOGRAPHIC MAPPING SHOWN HEREON COMBINES 2–FOOT CONTOUR INTERVAL MAPPING BY PROJECT DESIGN CONSULTANTS (NGVD 29), 1–FOOT CONTOUR INTERVAL MAPPING FROM NOLTE ASSOCIATES, INC. (NAVD 88), AND CALTRANS GRADING PLANS FOR STATE ROUTE 76 (NAVD 88). NGVD 29 = NAVD 88 – 2.23 FEET. THE ACCURACY OF THE FLOWN TOPOGRAPHIC MAPPING IS +/– HALF THE CONTOUR INTERVAL.

HEC–RAS WORK MAP