DS #: 4115

APN: 137-33-801-002

PROJECT: Summerlin Village 24- Parcel COS-4

SUBMITTAL: 2nd Submittal

SCANNED BY/DATE:

CHECKED BY/DATE:

CITY OF LAS VEGAS NEVADA

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: April 7, 2016
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin Village 24 – Parcel COS-4**			**COPIES TO:** GCW Engineers / Surveyors
Cross Streets:	West of Sky Vista Drive & Charleston Blvd.			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS4775B.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-33-801-002			
Zoning Action:	FMP-62680			
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	12/31/2015	1/25/2016	Not Approved	$400.00	428201: $400
2nd Submittal	3/10/2016	4/7/2016	See Comments Below	$400.00	436539: $400
			TOTAL FEES (LDDRS):	**$800.00**	**----**

REMARKS:

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

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

1. The subject "COS-4" wash is a common lot and public drainage easement to be privately maintained by the developer and future *Homeowners Association*. Record as such in the final map.

2. The hydraulic grade line (HGL) shown in all plan & profile sheets are below the centerline grade. It is understood that the centerline will remain natural and may not be the flowline (ie, lowest point in the cross sections). Add a profile of the lowest points in the natural wash in all plan & profile sheets.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section.* Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

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

END OF REMARKS

ays

T/R/S: T20S/R59E/33

AREA K-33

****
*** FAX TX REPORT ***
****

TRANSMISSION OK

JOB NO.	4468
DESTINATION ADDRESS	7028042299
PSWD/SUBADDRESS	
DESTINATION ID	
ST. TIME	04/07 14:52
USAGE T	00'30
PGS.	1
RESULT	OK

CITY OF LAS VEGAS
INTER-OFFICE MEMORANDUM

DATE: April 7, 2016

TO:
Land Development Services
Department of Building & Safety

FROM:
Albert Sung, P.E.
Flood Control Project Engineer
Department of Public Works

SUBJECT: Drainage Study for:
Summerlin Village 24 – Parcel COS-4

COPIES TO:
GCW Engineers / Surveyors
Howard Hughes Company, LLC
Bart Anderson, P.E., DevCo

Cross Streets:	West of Sky Vista Drive & Charleston Blvd.		
File Number:	F:\Depot\DSMemos\DS4775B.doc		
Parcel Number:	137-33-801-002		
Zoning Action:	FMP-62680		
FEMA Flood Zone	YES	NO	X
Proposed Storm Drain	YES	NO	X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	12/31/2015	1/25/2016	Not Approved	$400.00	428201: $400
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			TOTAL FEES (LDDRS):	**$800.00**	----

REMARKS:

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

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

1. The subject "COS-4" wash is a common lot and public drainage easement to be privately maintained by the developer and future *Homeowners Association*. Record as such in the final map.

2. The hydraulic grade line (HGL) shown in all plan & profile sheets are below the centerline grade. It is understood that the centerline will remain natural and may not be the flowline (ie, lowest point in the cross sections). Add a profile of the lowest points in the natural wash in all plan & profile sheets.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a

LETTER OF TRANSMITTAL

GCW
ENGINEERS \ SURVEYORS

Project No.: 62024-234
Date: March 10, 2016

To: City of Las Vegas
333 N. Rancho Drive
Las Vegas, NV 89106
Attention: Albert Sung, PE

Subject: **Technical Drainage Study for Summerlin Village 24 - Parcel COS-4 Wash**

Sent Via: Hand Delivery

Items being sent:

One (1) Copy – Response to Comments on the Subject Study
One (1) Copy – Improvement Plans (rolled)
One (1) Copy – Stamped and Signed Standard Form 1 (bound)
One (1) CD
THHC Check (#40101283) for $400

These items are submitted:

- ☐ At your request
- ☒ For your approval
- ☐ For your review and comments
- ☒ For your action
- ☐ For your files
- ☐ For your information

Acknowledgment of receipt:

☒ **Required**

Received by: _____
Date: _____
Time: _____

Remarks:

Cordially,

GCW, INC.

Rachael R. Dennis, PE
Project Manager
Flood Control Division

Copies to: Ryan Belsick, GCW
Josh Johnson, GCW
Vicki Marjerrison, GCW
Jennifer Veras, GCW

1555 South Rainbow Boulevard \ O 702.804.2000 \ info@gcwengineering.com
Las Vegas, Nevada 89146 F 702.804.2299 gcwengineering.com

RESPONSE TO COMMENTS
ON THE
TECHNICAL DRAINAGE STUDY
FOR
SUMMERLIN VILLAGE 24
PARCEL COS-4 WASH

62024-232

March 2016

Prepared for:

The Howard Hughes Company, LLC
10801 W. Charleston Blvd., 3rd Floor
Las Vegas, Nevada 89135
Phone: (702) 791-4300
Fax: (702) 791-4450

GCW
ENGINEERS \ SURVEYORS

62024.234

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Summerlin Village 24 Parcel COS-4 Wash Date: March 2016

Location of Development a) Descriptive (Cross Streets) North/South: Sky Vista Drive

East/West: Crossbridge Drive

b) Section: 33 Township: 20S Range: 59E

c) APN: 137-33-801-002

Name of Owner: The Howard Hughes Company, LLC.

Telephone No.: 791-4300 Fax No. 791-4450 E-Mail Address: Not available

Address: 10801 W. Charleston Blvd, 3rd Floor; Las Vegas, Nevada 89135

Contact Person-Name: Rachael R. Dennis, P.E. **Telephone No.:** (702) 804-2000

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

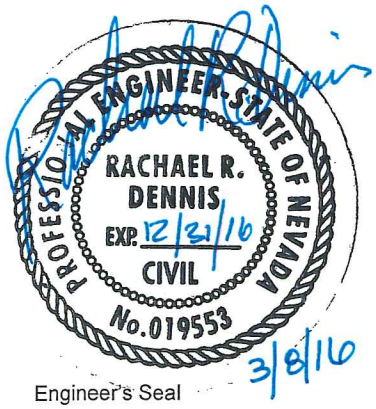
Firm: GCW, INC.

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

Type of Land Development/Land Disturbance

☐	Rezoning	☐	Subdivision Map	☐	Clearing and Grading Only
☐	Parcel Map	☐	Planned Unit Development	☒	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit	Storm Drain and Channel Improvements	

1. Total Owned Land Area: At Site: 396.57 ± acres Being Developed/Disturbed: 9.4 ± acres
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ **Yes**** ☒ **No**
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☐ **Yes**** ☒ **No**
4. Proposed type of development (Residential, Commercial, Etc.): Storm Drain and Channel Improvements
5. Approximate upstream land area which drains to the subject site: 530.6 ± acres
6. Has the site drainage been evaluated in the past? ☒ **Yes** ☐ **No** If yes, please identify documentation: Conceptual Drainage Study for Summerlin Village 24, GCW; Technical Drainage Study for Summerlin Village 24 Unit 2 Improvements, GCW; Technical Drainage Study for Summerlin Village 24 Unit 1 Improvements including Parcels "A" & "B" Mass Grading, GCW.
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing natural washes south of Village 24.
8. Briefly describe your proposed schedule for the subject project: ASAP



Engineer's Seal

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

*New Required Field

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

Local Entity File No.

Revision	Date

REFERENCE:

STANDARD FORM 1

CITY OF LAS VEGAS **INTER-OFFICE MEMORANDUM**				**DATE:** **January 26, 2016**
TO: **Land Development Services** Department of Building & Safety				**FROM:** Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin Village 24 – Parcel COS-4**			**COPIES TO:** GCW Engineers / Surveyors
Cross Streets:	West of Sky Vista Drive & Charleston Blvd.			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS4775A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-33-801-002			
Zoning Action:	FMP-62680			
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	12/31/2015	1/25/2016	See Comments Below	$400.00	428201: $400
			TOTAL FEES (LDDRS):	**$400.00**	**----**

REMARKS:

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

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

1. Note that flood channels in a master planned community not to be concrete lined must comply with *City of Las Vegas* Ordinance Title 20.10.050 (Flood Channels – Alternate Processes). Address in the next submittal regarding the following requirements which are quoted verbatim from Title 20.10.050:

   (A) Provisions must be included within a Master Drainage Study to address how the criteria within the Hydrologic Criteria and Drainage Design Manual are proposed to be met.

   (B) An operation and maintenance plan must be provided for. That plan must cover the entire development and include or provide for:

   (1) A demonstration of how an owners' association or maintenance organization will ensure that the necessary maintenance is completed after each event;

   (2) The establishment and maintenance of a perpetual minimum financial reserve;

   (3) The posting of a maintenance bond in favor of the City to cover one hundred percent of the construction cost of the drainage facility, with a minimum of hundred thousand dollars bond, maintained by the developer in perpetuity until an acceptable replacement bond is provided by the association or maintenance organization;

   (4) The transfer of obligations from the developer to the association or maintenance organization in perpetuity;

   (5) Provisions within (or in association with) applicable covenants, conditions and restrictions governing the site to address maintenance needs of the flood channel, including a clause for the maintenance bond to be maintained in perpetuity, with such provisions to be provided to the City for review and approval prior to the approval of a final subdivision map; and

(6) The recordation of the provisions referred to in Paragraph (5) concurrent with recordation of the final subdivision map.

(C) A geotechnical report performed by a registered professional engineer must certify that proposed natural washes meet erosion requirements for existing and future channel velocities. Recommendations for necessary improvements shall be included.

(D) The flood channel must be established as a multi-use facility with a trail system incorporated into the development's usable open space.

(E) A six-foot wide concrete low flow channel must be provided, with appropriate erosion protection or appropriate underground storm drain systems, in any otherwise non-concrete channel.

(F) Provision must be made for appropriate access into and out of the flood channel for purposes of channel maintenance.

(G) Riprap must be installed in the flood channel in a minimum size of eight inches (D_{50}), with larger sizes to be provided as required by the Hydrologic Criteria and Drainage Design Manual.

(H) Public drainage easements must be located on parcels recorded as common lots.

(I) Offsite inspection and testing by or on behalf of the City must be allowed, to the City's satisfaction and to the extent deemed necessary, to verify over-excavation, compaction, and concrete testing.

2. The subject "COS-4" wash is a common lot and public drainage easement to be privately maintained by the developer and future *Homeowners Association*. Label in the grading plans and to be recorded as such in the final map.

3. **FIG-7 (Proposed Conditions HEC-RAS Exhibit)**: A 48"-pipe culvert is proposed to discharge the drainage from future Parcel F at approximately between River Stations 45 and 50 into the wash. However, this additional discharge is not accounted in the *HEC-RAS Summary Table.* Address and resolve in the next submittal.

4. **Sheet 5 (Grading Plan 1)**: Provide a wing wall at the end of a proposed 54"-RCP at Plan Station 2930+80 (approximate).

5. **Sheet 8 (Grading Plan 4)**: Provide a wing wall at the end of a proposed 48"-RCP at Plan Station 2944+00 (approximate).

6. **Sheet 9 (Grading Plan 5)**: The anticipated 100-year flow velocity at the end of the proposed channel is more than 10ft/s. This can bring debris and erosion to the adjacent downstream property, ie, *Red Rock Conservation Area*. Address in the next submittal how to preserve the downstream property in a natural and undisturbed condition.

7. Show the hydraulic grade line (HGL) in all plan & profile sheets.

8. Provide a copy of *Section 610 (Slope and Channel Protection)* to justify the size of concrete embedded riprap as shown in Sheet 14 (Details and Sections).

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

END OF REMARKS

ays

T/R/S: T20S/R59E/33

AREA K-33

RESPONSE TO COMMENTS
ON THE
TECHNICAL DRAINAGE STUDY
FOR
SUMMERLIN VILLAGE 24
PARCEL COS-4 WASH

62024-232

March 2016

Prepared for:

The Howard Hughes Company, LLC
10801 W. Charleston Blvd., 3rd Floor
Las Vegas, Nevada 89135
Phone: (702) 791-4300
Fax: (702) 791-4450

Prepared By:

GCW, Inc.
1555 South Rainbow Boulevard
Las Vegas, NV 89146
Phone: (702) 804-2000
Fax: (702) 804-2299

GCW
ENGINEERS \ SURVEYORS

62024-234

March 8, 2016

Albert Sung, PE
Flood Control Project Engineer
City of Las Vegas Department of Public Works
333 N. Rancho Drive
Las Vegas, NV 89106

Re: Response to Comments on the Technical Drainage Study for Summerlin Village 24 Parcel COS-4 Wash DS4774A

Dear Mr. Sung:

The purpose of this letter is to address your comments dated January 26, 2016, regarding the above-referenced project. The comments are individually addressed as follows:

Comment: "1. Note that flood channels in a master planned community not to be concrete lined must comply with *City of Las Vegas* Ordinance Title 20.10.050 (Flood Channels – Alternate Processes). Address in the next submittal regarding the following requirements which are quoted verbatim from Title 20.10.050:"

"(A) Provisions must be included within a Master Drainage Study to address how the criteria within the Hydrologic Criteria and Drainage Design Manual are proposed to be met.

"(B) An operation and maintenance plan must be provided for. That plan must cover the entire development and include or provide for:

"(1) A demonstration of how an owners' association or maintenance organization will ensure that the necessary maintenance is completed after each event;

"(2) The establishment and maintenance of a perpetual minimum financial reserve;

"(3) The posting of a maintenance bond in favor of the City to cover one hundred percent of the construction cost of the drainage facility, with a minimum of hundred thousand dollars bond, maintained by the developer in perpetuity until an acceptable replacement bond is provided by the association or maintenance organization;

"(4) The transfer of obligations from the developer to the association or maintenance organization in perpetuity;

"(5) Provisions within (or in association with) applicable covenants, conditions and restrictions governing the site to address maintenance needs of the flood channel, including a clause for the maintenance bond to be maintained in perpetuity, with such provisions to be provided to the City for review and approval

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F 702.804.2298
info@gcwengineering.com
gcwengineering.com

prior to the approval of a final subdivision map; and

"(6) The recordation of the provisions referred to in Paragraph (5) concurrent with recordation of the final subdivision map.

"(C) A geotechnical report performed by a registered professional engineer must certify that proposed natural washes meet erosion requirements for existing and future channel velocities. Recommendations for necessary improvements shall be included.

"(D) The flood channel must be established as a multi-use facility with a trail system incorporated into the development's usable open space.

"(E) A six-foot wide concrete low flow channel must be provided, with appropriate erosion protection or appropriate underground storm drain systems, in any otherwise non-concrete channel.

"(F) Provision must be made for appropriate access into and out of the flood channel for purposes of channel maintenance.

"(G) Riprap must be installed in the flood channel in a minimum size of eight inches (D_{50}), with larger sizes to be provided as required by the Hydrologic Criteria and Drainage Design Manual.

"(H) Public drainage easements must be located on parcels recorded as common lots.

"(I) Offsite inspection and testing by or on behalf of the City must be allowed, to the City's satisfaction and to the extent deemed necessary, to verify over-excavation, compaction, and concrete testing."

Response: Per a meeting held on February 10, 2016 with the City of Las Vegas (CLV) and GCW, the above listed Title 20 requirements do not apply based on the Summerlin West Development Agreement between THHC and CLV. A CLV email response has been included in Appendix C.

Comment: "2. The subject "COS-4" parcel is a common lot and public drainage easement to be privately maintained by the developer and future *Homeowners Association.* Label in the grading plans and to be recorded as such in the final map."

Response: Noted. The grading plans have been revised to include a label for Parcel COS-2 as a "Public Drainage Easement to be Privately Maintained" and will be recorded as such in the Final Map.

Comment: "3. **FIG-7 (Proposed Conditions HEC-RAS Exhibit):** A 48"-pipe culvert is proposed to discharge the drainage from future Parcel F at approximately between River Stations 45 and 50 into the wash. However, this additional discharge is not accounted in the *HEC-RAS Summary Table*. Address and resolve in the next submittal"

Response: Both the existing and ultimate conditions HEC-RAS models have been updated to show the increased flowrate of 1,120 cfs at Cross Section 45. The results of the revised models have been included in Tables shown on Figure 6R and Figure 7R. Copies of Figures 6R and 7R have been included in Appendix A. Copies of the revised HEC-RAS models (including digital files) have been included in Appendix B. Additionally, the scour calculations have been revised. The previously proposed 5-foot deep minimum vertical riprap cutoff wall is designed along the toe of the proposed channel improvements. Revised scour calculations have been included in Appendix B. The results of the calculations are summarized in Table 4R.

TABLE 4R
COS3-4 - SCOUR WALL CALCULATIONS (ULTIMATE CONDITIONS)

Sta	Plan Sta	ULT Q	FL Elevation	WS Elevation	Depth	Vel	Calculated Scour Depth	Provided Scour Protection
		(cfs)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)
700	30+14.92	799	3421.00	3422.63	1.63	11.72	<1	5.00
550	31+10.26	1031	3415.41	3416.57	1.16	15.31		
500	31+64.49	1031	3412.00	3413.63	1.63	10.50	3.10	
400	32+40.88	1031	3406.78	3408.46	1.68	13.05		
300	33+62.68	1031	3399.62	3401.75	2.13	11.32	3.76	
250	34+23.30	1031	3396.22	3397.86	1.64	11.58		
175	35+17.24	1031	3390.96	3392.49	1.53	10.80		
100	36+14.97	1031	3384.96	3386.83	1.87	11.00		
95	36+61.08	1031	3381.93	3383.76	1.83	11.08		
90	37+17.65	1031	3378.92	3380.53	1.61	10.70		
87	37+48.34	1031	3376.89	3378.73	1.84	10.86		
85	37+92.84	1031	3373.00	3375.53	2.53	11.58		
83	38+47.42	1031	3370.00	3372.59	2.59	10.24		
80	38+95.33	1031	3368.00	3370.81	2.81	9.51	3.46	
75	39+56.20	1031	3365.45	3367.41	1.96	11.15		
72	39+85.09	1031	3363.00	3365.27	2.27	11.49	<1	
70	40+17.18	1031	3360.73	3362.89	2.16	11.59		
65	40+70.16	1031	3357.57	3359.59	2.02	10.91		
63	41+07.62	1031	3354.00	3356.45	2.45	12.07		
60	41+35.51	1031	3353.00	3354.59	1.59	11.22		
58	41+79.54	1031	3350.05	3351.73	1.68	11.16		
55	42+25.29	1031	3347.25	3348.89	1.64	10.82		
50	43+17.42	1031	3341.92	3343.85	1.93	10.28	4.41	
45	43+97.91	1120	3337.00	3339.06	2.06	11.24		
40	44+77.01	1120	3332.62	3334.11	1.49	11.39		
35	45+24.82	1120	3329.00	3330.90	1.90	11.61	4.19	
30	45+83.77	1120	3325.94	3327.22	1.28	11.33		

TABLE 4R
COS3-4 - SCOUR WALL CALCULATIONS (ULTIMATE CONDITIONS)

Sta	Plan Sta	ULT Q	FL Elevation	WS Elevation	Depth	Vel	Calculated Scour Depth	Provided Scour Protection
		(cfs)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)
28	46+27.38	1120	3323.00	3325.04	2.04	10.57		
25	46+66.69	1120	3320.66	3322.57	1.91	11.59		
23	47+13.40	1120	3319.00	3321.67	2.67	8.77		
20	47+62.46	1120	3317.00	3318.72	1.72	8.62		
10	47+78.43	1120	3315.37	3318.83	3.46	7.46		

Comment: "4. **Sheet 5 (Grading Plan 1):** Provide a wing wall at the end of a proposed 54"-inch RCP at Plan Station 2930+80 (approximate)."

Response: An NDOT end section for the 54-inch RCP was provided with the Crossbridge Unit 2 Improvements (CLV #62303). Since the Crossbridge Unit 2 improvements will be constructed prior to of concurrently with this project, the end section from the approved Crossbridge Unit 2 plans has been shown on Sheet 6. Please note that the proposed cutoff wall will match the cutoff wall shown on the approved Crossbridge Unit 2 plans. Copies of the Crossbridge Unit 2 plans have been included in Appendix C.

Comment: "5. **Sheet 8 (Grading Plan 4):** Provide a wing wall at the end of a proposed 48"-inch RCP at Plan Station 2944+00 (approximate)."

Response: An NDOT end section has been provided at the end of the proposed 48-inch RCP. See Sheet 9. Additionally, the inverts and length of the proposed 48-inch RCP were revised. The Standard Form 6 model was revised accordingly and has been included in Appendix B.

Comment: "6. **Sheet 9 (Grading Plan 5):** The anticipated 100-year flow velocity at the end of the proposed channel is more than 10 ft/s. This can bring debris and erosion to the adjacent downstream property, ie, *Red Rock Conservation Area*. Address in the next submittal how to preserve the downstream property in a natural and undisturbed condition."

Response: The proposed grading along the southern boundary of the wash at the boundary of the project was revised to provide a wider flow path to reduce the velocity at the outlet of the proposed channel system. Cross Section 10 has been added to the existing and proposed conditions HEC-RAS Models to show the hydraulic characteristics of the revised grading as well as the revised velocity at the outlet of the proposed channel. HEC-RAS output summary and station locations have been included on Figures 6R and 7R. Copies of Figures 6R and 7R have been included in Appendix A. Copies of the revised HEC-RAS models (including digital files) have been included in Appendix B. The existing conditions HEC-RAS Cross Section 10 yields a velocity of 6.59 ft/s. The proposed conditions HEC-RAS Cross Section 10 yields a velocity of 7.46 ft/s. Per a meeting held on February 10, 2016 with the City of Las Vegas (CLV) and GCW, it was acknowledged that the existing channel velocities are currently supercritical with velocities greater than 5 ft/s. The proposed grading revisions and velocities were

presented in the meeting and since the velocities at the outlet were reduced, the revision was acceptable to CLV.

Comment: "7. Show the hydraulic grade line (HGL) in all plan & profile sheets."

Response: The HGL has been added to the plan and profile sheets. Please note that the existing grade is shown at the centerline of the channel which is not always representative of the flowline since it is a meandering natural channel.

Comment: "7. Provide a copy of *Section 610 (Slope and Channel Protection)* to justify the size of concrete embedded riprap as shown on Sheet 14 (Details and Sections)."

Response: Portions of the *Clark County Uniform Standard Specifications Section 610 (Slope and Channel Protection)* pertinent to the project riprap has been added to Sheet 17. A copy of the *Clark County Uniform Standard Specifications Section 610 (Slope and Channel Protection)* has been included in Appendix C.

Additional Comments:

Please note that the alignment of the U.S. Waters has been corrected on Figures 6R and 7R. The corresponding stations correlating the hydraulic modeling stationing with the improvement plan U.S. Waters alignment stationing have been included in tables shown on Figures 6R and 7R. Although the alignment has been revised, the locations of the existing and proposed HEC-RAS cross sections remain unchanged. Copies of Figures 6R and 7R have been included in Appendix A.

If you have any questions or require additional information, please contact our office at 804-2000.

Cordially,

GCW, INC.

Rachael R. Dennis

Rachael R. Dennis, PE
Project Manager
Flood Control Division

RD/vlr

Enclosures

c: Chris Anderson, THHC
Ryan Belsick, GCW
Vicki Marjerrison, GCW
Josh Johnson, GCW

TECHNICAL DRAINAGE STUDY FOR SUMMERLIN V24 PARCEL COS-4 APPENDIX LAYOUT

Appendix A. Hydrologic Calculations and Information

1. Figure 6R – Existing Conditions HEC-RAS Exhibit
2. Figure 7R – Proposed Conditions HEC-RAS Exhibit

Appendix B. Hydraulic Calculations

1. Standard Form 6 Calculation
2. COS3-4 HEC-RAS Models: COS3-4.prj – 2008 Supercritical Flow: EXT and ULT
3. CD Containing HEC-RAS Models

Appendix C. Referenced Materials

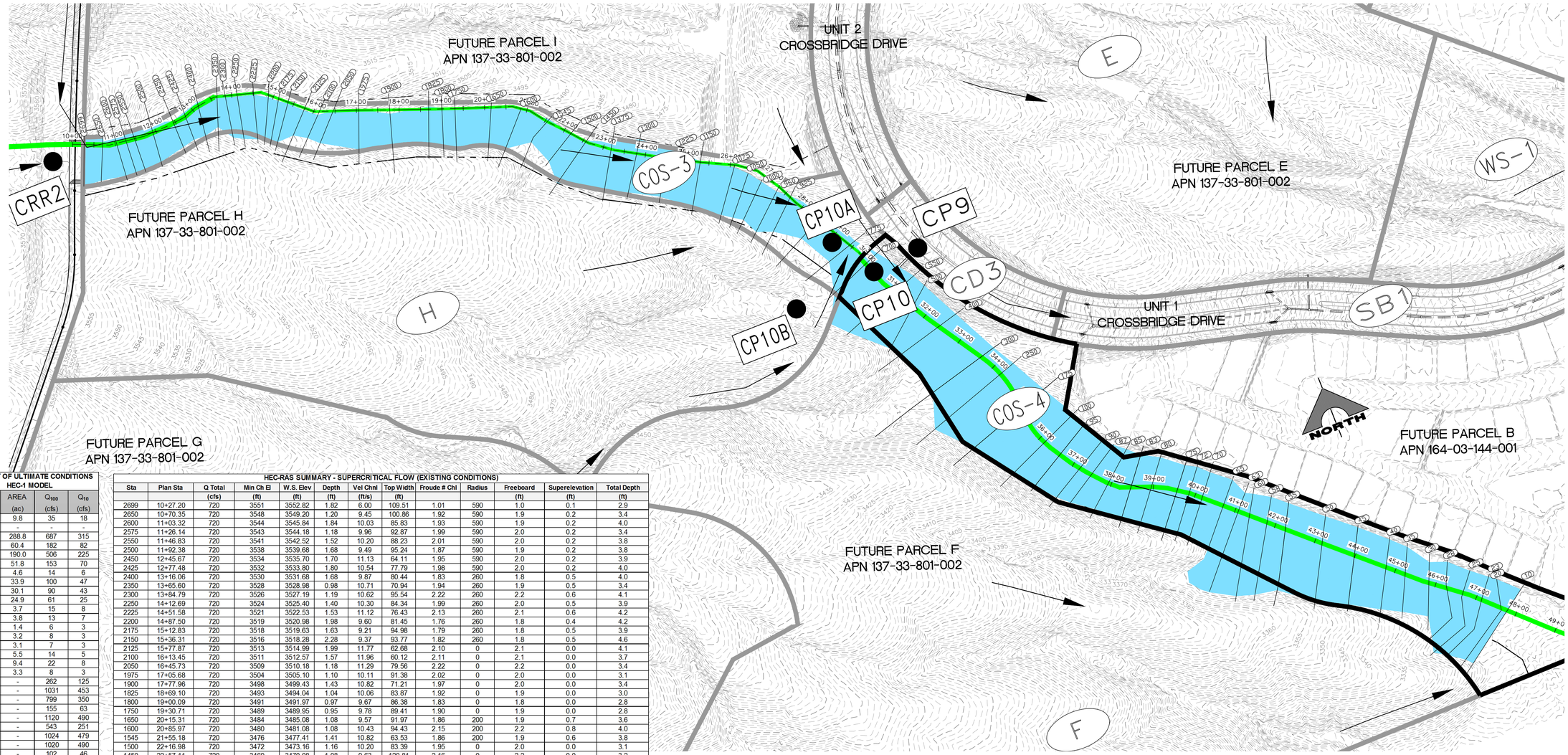
1. CLV Email correspondence regarding the new Title 20 Requirements and the Summerlin West Development Agreement

2. Summerlin Village 24 Crossbridge Unit 2 Improvement Plans
   a) Sheets 1, 6, 16 & 37

3. Clark County Uniform Standard Specifications Section 610 (Slope and Channel Protection)

APPENDIX A

Hydrologic Calculations and Information



SUMMARY OF ULTIMATE CONDITIONS HEC-1 MODEL

SC OR CP	AREA (ac)	Q_{100} (cfs)	Q_{10} (cfs)
ALTA	9.8	35	18
7-2A	288.8	687	315
7-2B	60.4	182	82
7-5A	190.0	506	225
7-7A	51.8	153	70
A1	4.6	14	6
A2	33.9	100	47
B	30.1	90	43
C	24.9	61	25
CD1	3.7	15	8
CD2	3.8	13	7
CD3	1.4	6	3
COS-1	3.2	8	3
COS-2	3.1	7	3
COS-3	5.5	14	5
COS-4	9.4	22	8
COS-6	3.3	8	3
CP1	-	262	125
CP10	-	1031	453
CP10A	-	799	350
CP10B	-	155	63
CP11	-	1120	490
CP12	-	543	251
CP15	-	1024	479
CP16	-	1020	490
CP17	-	102	46
CP17A	-	78	34
CP18	-	1102	525
CP19	-	1172	558
CP2	-	354	164
CP3	-	356	165
CP5	-	408	192
CP6	-	435	204
CP7	-	595	274
CP8	-	949	446
CP9	-	123	52
CPA2	-	114	54
CPAD	-	40	21
CPSV2	-	23	12
CPSV3	-	25	12
CRR1	-	841	386
CRR2	-	720	313
CS-1	16.8	55	27
D	34.8	88	37
DIV1	-	287	132
E	24.1	64	27
F	37.8	92	36
FS1	-	554	255
G	42.6	100	39
H	22.1	58	24
I	38.6	102	43
J	43.6	110	46
K	29.6	80	34
L	15.5	53	26
M	22.0	73	36
NP-1	10.5	22	8
RETD1	-	287	132
SB1	3.5	14	7
SB2	1.3	5	3
SB3	3.5	13	7
SB4	0.5	2	1
ST1	1.1	5	2
ST2	9.6	33	17
ST4	6.0	22	12
ST6	1.8	8	4
SV1	3.6	14	8
SV2	2.1	9	4
SV3	2.7	11	6
WS-1	5.9	19	9

HEC-RAS SUMMARY - SUPERCRITICAL FLOW (EXISTING CONDITIONS)

Sta	Plan Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Depth (ft)	Vel Chnl (ft/s)	Top Width (ft)	Froude # Chl	Radius	Freeboard (ft)	Superelevation (ft)	Total Depth (ft)
2699	10+27.20	720	3551	3552.82	1.82	6.00	109.51	1.01	590	1.0	0.1	2.9
2650	10+70.35	720	3548	3549.20	1.20	9.45	100.86	1.92	590	1.9	0.2	3.4
2600	11+03.32	720	3544	3545.84	1.84	10.03	85.83	1.93	590	1.9	0.2	4.0
2575	11+26.14	720	3543	3544.18	1.18	9.96	92.87	1.99	590	2.0	0.2	3.4
2550	11+46.83	720	3541	3542.52	1.52	10.20	88.23	2.01	590	2.0	0.2	3.8
2500	11+92.38	720	3538	3539.68	1.68	9.49	95.24	1.87	590	1.9	0.2	3.8
2450	12+45.67	720	3534	3535.70	1.70	11.13	64.11	1.95	590	2.0	0.2	3.9
2425	12+77.48	720	3532	3533.80	1.80	10.54	77.79	1.98	590	2.0	0.2	4.0
2400	13+16.06	720	3530	3531.68	1.68	9.87	80.44	1.83	260	1.8	0.5	4.0
2350	13+65.60	720	3528	3528.98	0.98	10.71	70.94	1.94	260	1.9	0.5	3.4
2300	13+84.79	720	3526	3527.19	1.19	10.62	95.54	2.22	260	2.2	0.6	4.1
2250	14+12.69	720	3524	3525.40	1.40	10.30	84.34	1.99	260	2.0	0.5	3.9
2225	14+51.58	720	3521	3522.53	1.53	11.12	76.43	2.13	260	2.1	0.6	4.2
2200	14+87.50	720	3519	3520.98	1.98	9.60	81.45	1.76	260	1.8	0.4	4.2
2175	15+12.83	720	3518	3519.63	1.63	9.21	94.98	1.79	260	1.8	0.5	3.9
2150	15+36.31	720	3516	3518.28	2.28	9.37	93.77	1.82	260	1.8	0.5	4.6
2125	15+77.87	720	3513	3514.99	1.99	11.77	62.68	2.10	0	2.1	0.0	4.1
2100	16+13.45	720	3511	3512.57	1.57	11.96	60.12	2.11	0	2.1	0.0	3.7
2050	16+45.73	720	3509	3510.18	1.18	11.29	79.56	2.22	0	2.2	0.0	3.4
1975	17+05.68	720	3504	3505.10	1.10	10.11	91.38	2.02	0	2.0	0.0	3.1
1900	17+77.96	720	3498	3499.43	1.43	10.82	71.21	1.97	0	2.0	0.0	3.4
1825	18+69.10	720	3493	3494.04	1.04	10.06	83.87	1.92	0	1.9	0.0	3.0
1800	19+00.09	720	3491	3491.97	0.97	9.67	86.38	1.83	0	1.8	0.0	2.8
1750	19+30.71	720	3489	3489.95	0.95	9.78	89.41	1.90	0	1.9	0.0	2.8
1650	20+15.31	720	3484	3485.08	1.08	9.57	91.97	1.86	200	1.9	0.7	3.6
1600	20+85.97	720	3480	3481.08	1.08	10.43	94.43	2.15	200	2.2	0.8	4.0
1545	21+55.18	720	3476	3477.41	1.41	10.82	63.53	1.86	200	1.9	0.6	3.8
1500	22+16.98	720	3472	3473.16	1.16	10.20	83.39	1.95	0	2.0	0.0	3.1
1450	22+57.11	720	3469	3470.08	1.08	9.63	120.81	2.16	0	2.2	0.0	3.2
1375	23+18.62	720	3464	3464.65	0.65	9.95	113.47	2.20	0	2.2	0.0	2.9
1300	23+79.17	720	3459	3460.36	1.36	10.60	125.87	2.54	0	2.5	0.0	3.9
1225	24+69.35	720	3453	3455.14	2.14	9.08	116.12	1.94	0	1.9	0.0	4.1
1150	25+29.34	720	3450	3450.83	0.83	8.35	108.32	1.65	0	1.7	0.0	2.5
1075	26+10.01	720	3444	3445.70	1.70	10.60	92.07	2.17	0	2.2	0.0	3.9
1050	26+45.61	720	3442	3443.67	1.67	9.46	108.82	1.99	0	2.0	0.0	3.7
1000	26+86.80	720	3441	3442.09	1.09	8.82	99.78	1.72	0	1.7	0.0	2.8
960	27+27.71	720	3438	3439.74	1.74	8.77	104.98	1.75	0	1.8	0.0	3.5
925	27+63.01	720	3436	3437.31	1.31	9.33	95.87	1.83	0	1.8	0.0	3.1
850	28+47.94	799	3431	3432.83	1.83	9.30	81.97	1.60	0	1.6	0.0	3.4
775	29+42.50	799	3424	3426.14	2.14	11.29	77.14	2.08	0	2.1	0.0	4.2
700	30+14.92	799	3421	3422.65	1.65	11.54	62.06	1.93	0	1.9	0.0	3.6
550	31+10.26	1031	3416	3417.29	1.29	7.76	141.19	1.41	0	1.4	0.0	2.7
500	31+64.49	1031	3411	3412.66	1.66	9.01	130.68	1.70	0	1.7	0.0	3.4
400	32+40.88	1031	3407	3408.30	1.30	11.50	99.52	2.14	0	2.1	0.0	3.4
300	33+62.68	1031	3400	3401.40	1.40	9.59	125.74	1.83	0	1.8	0.0	3.2
250	34+23.30	1031	3396	3397.38	1.38	8.16	198.80	1.80	0	1.8	0.0	3.2
175	35+17.24	1031	3390	3391.31	1.31	9.05	173.01	1.96	878	2.0	0.3	3.5
100	36+14.97	1031	3384	3385.58	1.58	10.51	143.53	2.24	878	2.2	0.3	4.1
95	36+61.08	1031	3382	3383.09	1.09	7.63	183.29	1.57	878	1.6	0.2	2.8
90	37+17.65	1031	3378	3379.45	1.45	9.47	143.56	1.92	878	1.9	0.2	3.6
87	37+48.34	1031	3376	3377.79	1.79	8.96	128.13	1.67	878	1.7	0.2	3.6
85	37+92.84	1031	3373	3375.16	2.16	8.30	157.51	1.65	878	1.7	0.2	4.0
83	38+47.42	1031	3370	3372.04	2.04	8.74	154.57	1.76	878	1.8	0.2	4.0
80	38+95.33	1031	3367	3368.98	1.98	10.55	103.43	1.91	878	1.9	0.2	4.1
75	39+56.20	1031	3364	3366.31	2.31	9.18	120.60	1.68	878	1.7	0.2	4.2
72	39+85.09	1031	3363	3364.38	1.38	9.11	121.21	1.66	878	1.7	0.2	3.2
70	40+17.18	1031	3361	3362.26	1.26	9.33	155.26	1.95	878	2.0	0.2	3.4
65	40+70.16	1031	3358	3359.21	1.21	9.18	162.11	1.94	0	1.9	0.0	3.2
63	41+07.62	1031	3353	3354.38	1.38	13.12	82.53	2.37	0	2.4	0.0	3.8
60	41+35.51	1031	3351	3353.47	2.47	8.36	155.99	1.66	0	1.7	0.0	4.1
58	41+79.54	1031	3349	3351.07	2.07	7.57	231.48	1.74	0	1.7	0.0	3.8
55	42+25.29	1031	3347	3348.53	1.53	7.22	204.89	1.52	0	1.5	0.0	3.1
50	43+17.42	1031	3342	3343.30	1.30	7.48	199.62	1.59	0	1.6	0.0	2.9
45	43+97.91	1120	3337	3338.29	1.29	8.13	181.87	1.65	0	1.7	0.0	3.0
40	44+77.01	1120	3333	3333.93	0.93	8.74	161.55	1.73	0	1.7	0.0	2.6
35	45+24.82	1120	3329	3330.87	1.87	9.20	148.09	1.79	0	1.8	0.0	3.6
30	45+83.77	1120	3326	3326.85	0.85	9.58	148.33	1.90	0	1.9	0.0	2.7
28	46+27.38	1120	3323	3324.61	1.61	8.26	192.57	1.74	0	1.7	0.0	3.3
25	46+66.69	1120	3321	3322.13	1.13	8.14	228.23	1.85	0	1.8	0.0	3.0
23	47+13.40	1120	3319	3320.89	1.89	6.49	165.43	1.12	0	1.1	0.0	3.0
20	47+62.46	1120	3317	3318.72	1.72	8.53	152.12	1.62	0	1.5	0.0	3.2
10	47+78.43	1120	3316	3317.86	1.86	6.59	151.31	1.10	0	1.1	0	3.0

SCALE 120 0 120 240 FEET

LEGEND

- COS-3 — DRAINAGE SUBBASIN
- CP1 — CONCENTRATION POINT
- SUBBASIN BOUNDARY
- AREA OF INUNDATION
- 850 — HEC-RAS CROSS SECTION
- EX. US WATERS DELINEATION

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 03-01-16
PLOT TIME: 14:37:33

REV	DATE	DESCRIPTION	DATE: AGEN. APP	DATE: GCW APP

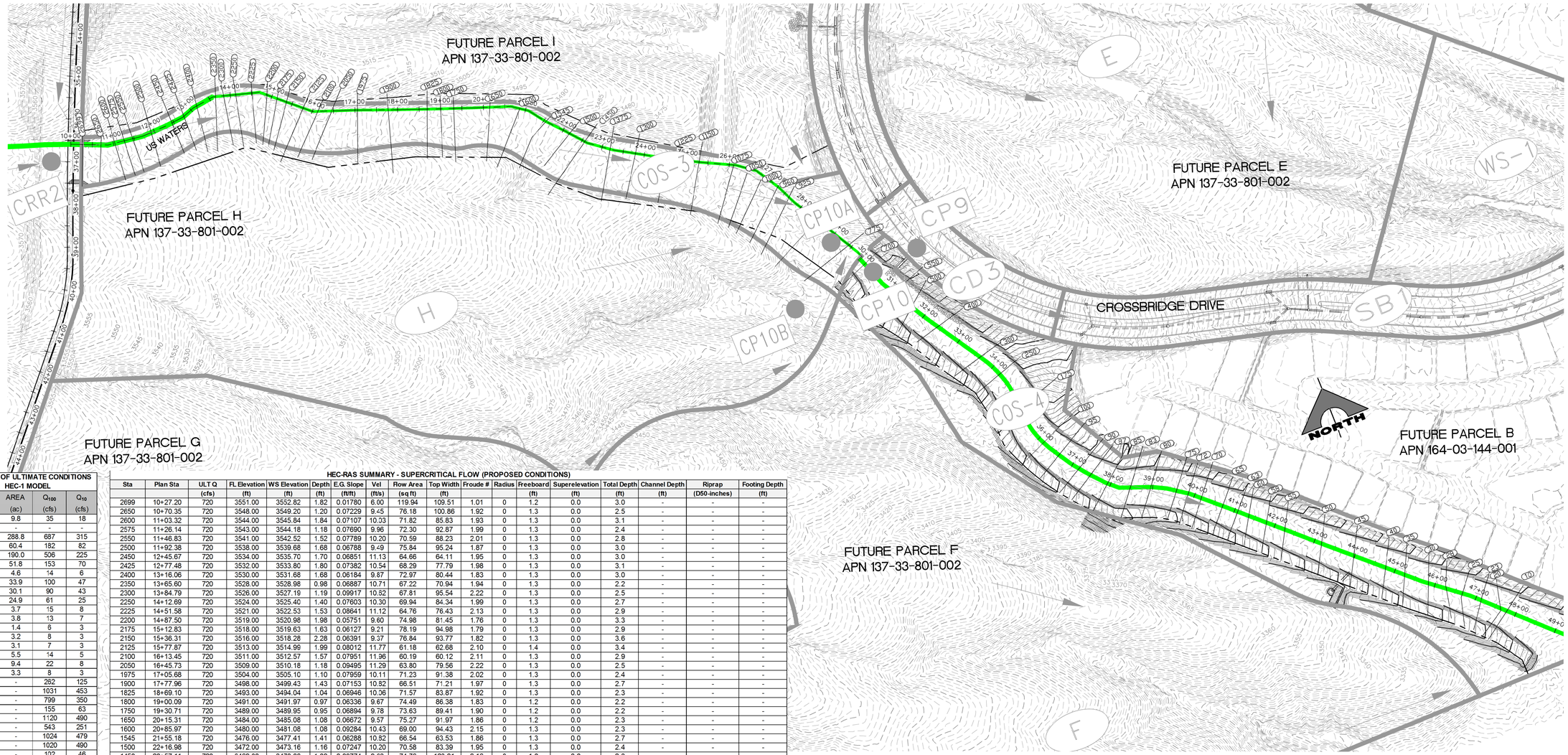
GCW
ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\600\602024 - 224\Division 1\Civil\Figures\Fig-6R Existing COS-4 RAS1.dwg

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 24 - US WATERS
COS-4 WASH
EXISTING CONDITIONS HEC-RAS EXHIBIT

DRAWING
FIG-6R
OF SHTS

gc24JS.dwg 060117.jpv



SUMMARY OF ULTIMATE CONDITIONS HEC-1 MODEL

SC OR CP	AREA (ac)	Q_{100} (cfs)	Q_{10} (cfs)
ALTA	9.8	35	18
-	-	-	-
7-2A	288.8	687	315
7-2B	60.4	182	82
7-5A	190.0	506	225
7-7A	51.8	153	70
A1	4.6	14	6
A2	33.9	100	47
B	30.1	90	43
C	24.9	61	25
CD1	3.7	15	8
CD2	3.8	13	7
CD3	1.4	6	3
COS-1	3.2	8	3
COS-2	3.1	7	3
COS-3	5.5	14	5
COS-4	9.4	22	8
COS-6	3.3	8	3
CP1	-	282	125
CP10	-	1031	453
CP10A	-	799	350
CP10B	-	155	63
CP11	-	1120	490
CP12	-	543	251
CP15	-	1024	479
CP16	-	1020	490
CP17	-	102	46
CP17A	-	78	34
CP18	-	1102	525
CP19	-	1172	558
CP2	-	354	164
CP3	-	356	165
CP5	-	408	192
CP6	-	435	204
CP7	-	595	274
CP8	-	949	446
CP9	-	123	52
CPA2	-	114	54
CPAD	-	40	21
CPSV2	-	23	12
CPSV3	-	25	12
CRR1	-	841	386
CRR2	-	720	313
CS-1	16.8	55	27
D	34.8	88	37
DIV1	-	287	132
E	24.1	64	27
F	37.8	92	36
FS1	-	554	255
G	42.6	100	39
H	22.1	58	24
I	38.6	102	43
J	43.6	110	46
K	29.6	80	34
L	15.5	53	26
M	22.0	73	36
NP-1	10.5	22	8
RETD1	-	287	132
SB1	3.5	14	7
SB2	1.3	5	3
SB3	3.5	13	7
SB4	0.5	2	1
ST1	1.1	5	2
ST2	9.6	33	17
ST4	6.0	22	12
ST6	1.8	8	4
SV1	3.6	14	8
SV2	2.1	9	4
SV3	2.7	11	6
WS-1	5.9	19	9

HEC-RAS SUMMARY - SUPERCRITICAL FLOW (PROPOSED CONDITIONS)

Sta	Plan Sta	ULT Q (cfs)	FL Elevation (ft)	WS Elevation (ft)	Depth (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #	Radius	Freeboard (ft)	Superelevation (ft)	Total Depth (ft)	Channel Depth (ft)	Riprap (D50-inches)	Footing Depth (ft)
2699	10+27.20	720	3551.00	3552.82	1.82	0.01780	6.00	119.94	109.51	1.01	0	1.2	0.0	3.0	-	-	-
2650	10+70.35	720	3548.00	3549.20	1.20	0.07229	9.45	76.18	100.86	1.92	0	1.3	0.0	2.5	-	-	-
2600	11+03.32	720	3544.00	3545.84	1.84	0.07107	10.33	71.82	85.83	1.93	0	1.3	0.0	3.1	-	-	-
2575	11+26.14	720	3543.00	3544.18	1.18	0.07690	9.96	72.30	92.87	1.99	0	1.3	0.0	2.4	-	-	-
2550	11+46.83	720	3541.00	3542.52	1.52	0.07789	10.20	70.59	88.23	2.01	0	1.3	0.0	2.8	-	-	-
2500	11+92.38	720	3538.00	3539.68	1.68	0.06788	9.49	75.84	95.24	1.87	0	1.3	0.0	3.0	-	-	-
2450	12+45.67	720	3534.00	3535.70	1.70	0.06851	11.13	64.66	64.11	1.95	0	1.3	0.0	3.0	-	-	-
2425	12+77.48	720	3532.00	3533.80	1.80	0.07382	10.54	68.29	77.79	1.98	0	1.3	0.0	3.1	-	-	-
2400	13+16.06	720	3530.00	3531.68	1.68	0.06184	9.87	72.97	80.44	1.83	0	1.3	0.0	3.0	-	-	-
2350	13+65.60	720	3528.00	3528.98	0.98	0.06887	10.71	67.22	70.94	1.94	0	1.3	0.0	2.2	-	-	-
2300	13+84.79	720	3526.00	3527.19	1.19	0.09917	10.62	67.81	95.54	2.22	0	1.3	0.0	2.5	-	-	-
2250	14+12.69	720	3524.00	3525.40	1.40	0.07603	10.30	69.94	84.34	1.99	0	1.3	0.0	2.7	-	-	-
2225	14+51.58	720	3521.00	3522.53	1.53	0.08641	11.12	64.76	76.43	2.13	0	1.3	0.0	2.9	-	-	-
2200	14+87.50	720	3519.00	3520.98	1.98	0.05751	9.60	74.98	81.45	1.76	0	1.3	0.0	3.3	-	-	-
2175	15+12.83	720	3518.00	3519.63	1.63	0.06127	9.21	78.19	94.98	1.79	0	1.3	0.0	2.9	-	-	-
2150	15+36.31	720	3516.00	3518.28	2.28	0.06391	9.37	76.84	93.77	1.82	0	1.3	0.0	3.6	-	-	-
2125	15+77.87	720	3513.00	3514.99	1.99	0.08012	11.77	61.18	62.68	2.10	0	1.4	0.0	3.4	-	-	-
2100	16+13.45	720	3511.00	3512.57	1.57	0.07951	11.96	60.19	60.12	2.11	0	1.3	0.0	2.9	-	-	-
2050	16+45.73	720	3509.00	3510.18	1.18	0.09495	11.29	63.80	79.56	2.22	0	1.3	0.0	2.5	-	-	-
1975	17+05.68	720	3504.00	3505.10	1.10	0.07959	10.11	71.23	91.38	2.02	0	1.3	0.0	2.4	-	-	-
1900	17+77.96	720	3498.00	3499.43	1.43	0.07153	10.82	66.51	71.21	1.97	0	1.3	0.0	2.7	-	-	-
1825	18+69.10	720	3493.00	3494.04	1.04	0.06946	10.06	71.57	83.87	1.92	0	1.3	0.0	2.3	-	-	-
1800	19+00.09	720	3491.00	3491.97	0.97	0.06336	9.67	74.49	86.38	1.83	0	1.2	0.0	2.2	-	-	-
1750	19+30.71	720	3489.00	3489.95	0.95	0.06894	9.78	73.63	89.41	1.90	0	1.2	0.0	2.2	-	-	-
1650	20+15.31	720	3484.00	3485.08	1.08	0.06672	9.57	75.27	91.97	1.86	0	1.2	0.0	2.3	-	-	-
1600	20+85.97	720	3480.00	3481.08	1.08	0.09284	10.43	69.00	94.43	2.15	0	1.3	0.0	2.3	-	-	-
1545	21+55.18	720	3476.00	3477.41	1.41	0.06288	10.82	66.54	63.53	1.86	0	1.3	0.0	2.7	-	-	-
1500	22+16.98	720	3472.00	3473.16	1.16	0.07247	10.20	70.58	83.39	1.95	0	1.3	0.0	2.4	-	-	-
1450	22+57.11	720	3469.00	3470.08	1.08	0.09774	9.63	74.76	120.81	2.16	0	1.2	0.0	2.3	-	-	-
1375	23+18.62	720	3464.00	3464.65	0.65	0.10041	9.95	72.34	113.47	2.20	0	1.2	0.0	1.9	-	-	-
1300	23+79.17	720	3459.00	3460.36	1.36	0.14232	10.80	67.95	125.87	2.54	0	1.3	0.0	2.7	-	-	-
1225	24+69.35	720	3453.00	3455.14	2.14	0.07647	9.08	79.32	116.12	1.94	0	1.3	0.0	3.4	-	-	-
1150	25+29.34	720	3450.00	3450.83	0.83	0.05257	8.35	86.22	108.32	1.65	0	1.2	0.0	2.0	-	-	-
1075	26+10.01	720	3444.00	3445.70	1.70	0.09472	10.50	67.95	92.07	2.17	0	1.3	0.0	3.0	-	-	-
1050	26+45.61	720	3442.00	3443.67	1.67	0.08044	9.46	76.09	108.82	1.99	0	1.3	0.0	3.0	-	-	-
1000	26+86.80	720	3441.00	3442.09	1.09	0.05654	8.82	81.62	99.78	1.72	0	1.2	0.0	2.3	-	-	-
960	27+27.71	720	3438.00	3439.74	1.74	0.05955	8.77	82.13	104.98	1.75	0	1.3	0.0	3.0	-	-	-
925	27+63.01	720	3436.00	3437.31	1.31	0.06483	9.33	77.15	95.87	1.83	0	1.3	0.0	2.6	-	-	-
850	28+47.94	799	3431.00	3432.83	1.83	0.04554	9.30	85.95	81.97	1.60	0	1.3	0.0	3.1	-	-	-
775	29+42.50	799	3424.00	3426.14	2.14	0.07972	11.29	70.76	77.14	2.08	0	1.4	0.0	3.5	-	-	-
700	30+14.92	799	3421.00	3422.63	1.63	0.01788	11.72	68.18	61.95	1.97	0	1.3	0.0	3.0	8.0	12 (LOB, ROB)	5.0
550	31+10.26	1031	3415.41	3416.57	1.16	0.17749	15.31	67.34	84.94	3.03	0	1.4	0.0	2.6	7.9	12 (LOB, ROB)	5.0
500	31+64.49	1031	3412.00	3413.63	1.63	0.04875	10.50	98.19	81.79	1.69	0	1.3	0.0	2.9	6.3	12 (LOB, ROB)	5.0
400	32+40.88	1031	3406.78	3408.46	1.68	0.06763	13.35	79.00	59.63	2.00	0	1.4	0.0	3.1	6.7	12 (LOB, ROB)	5.0
300	33+62.68	1031	3399.62	3401.75	2.13	0.05580	11.32	91.05	73.33	1.79	0	1.4	0.0	3.5	7.4	12 (LOB, ROB)	5.0
250	34+23.30	1031	3396.22	3397.86	1.64	0.06966	11.58	89.06	83.52	1.98	0	1.3	0.0	3.0	6.6	12 (LOB, ROB)	5.0
175	35+17.24	1031	3390.96	3392.49	1.53	0.05287	10.80	95.42	80.80	1.75	0	1.3	0.0	2.8	5.4	12 (LOB, ROB)	5.0
100	36+14.97	1031	3384.96	3386.83	1.87	0.06390	11.00	93.74	88.25	1.88	0	1.3	0.0	3.2	5.4	12 (LOB, ROB)	5.0
95	36+61.08	1031	3381.93	3383.76	1.83	0.06328	11.08	93.05	85.80	1.87	0	1.3	0.0	3.2	5.9	12 (LOB, ROB)	5.0
90	37+17.65	1031	3378.92	3380.53	1.61	0.05583	10.70	96.40	85.68	1.78	0	1.3	0.0	2.9	5.9	12 (LOB, ROB)	5.0
87	37+48.34	1031	3376.89	3378.73	1.84	0.06041	10.86	94.92	87.03	1.83	0	1.3	0.0	3.2	6.8	12 (LOB, ROB)	5.0
85	37+92.84	1031	3373.00	3375.53	2.53	0.07229	11.58	89.02	85.09	2.00	0	1.4	0.0	3.9	7.8	12 (LOB, ROB)	5.0
83	38+47.42	1031	3370.00	3372.59	2.59	0.05168	10.24	100.69	89.58	1.70	0	1.4	0.0	3.9	8.6	12 (LOB, ROB)	5.0
80	38+95.33	1031	3368.00	3370.81	2.81	0.03483	9.51	108.36	79.19	1.43	0	1.3	0.0	4.1	8.2	12 (LOB, ROB)	5.0
75	39+56.20	1031	3365.45	3367.41	1.96	0.06644	11.15	92.44	87.16	1.91	0	1.3	0.0	3.3	6.2	12 (LOB, ROB)	5.0
72	39+85.09	1031	3363.00	3365.27	2.27	0.07219	11.49	89.69	86.27	1.99	0	1.4	0.0	3.6	6.8	12 (LOB, ROB)	5.0
70	40+17.18	1031	3360.73	3362.89	2.16	0.07417	11.59	88.92	86.24	2.01	0	1.4	0.0	3.5	6.2	12 (LOB, ROB)	5.0
65	40+70.16	1031	3357.57	3359.59	2.02	0.05975	10.91	94.46	85.53	1.83	0	1.3	0.0	3.4	6.3	12 (LOB, ROB)	5.0
63	41+07.62	1031	3354.00	3356.45	2.45	0.08945	12.07	85.45	89.79	2.18	0	1.4	0.0	3.9	6.8	12 (LOB, ROB)	5.0
60	41+35.51	1031	3353.00	3354.59	1.59	0.06603	11.22	91.92	86.41	1.92	0	1.3	0.0	2.9	5.6	12 (LOB, ROB)	5.0
58	41+79.54	1031	3350.05	3351.73	1.68	0.06451	11.16	92.40	86.13	1.90	0	1.3	0.0	3.0	6.0	12 (LOB, ROB)	5.0
55	42+25.29	1031	3347.25	3348.89	1.64	0.06410	10.82	95.27	92.32	1.88	0	1.3	0.0	3.0	5.6	12 (LOB, ROB)	5.0
50	43+17.42	1031	3341.92	3343.85	1.93	0.05019	10.28	100.34	87.46	1.69	0	1.3	0.0	3.2	6.1	12 (LOB, ROB)	5.0
45	43+97.91	1120	3337.00	3339.06	2.06	0.06060	11.24	99.64	87.31	1.85	0	1.4	0.0	3.4	5.8	12 (LOB, ROB)	5.0
40	44+77.01	1120	3332.62	3334.11	1.49	0.06336	11.39	98.36	87.53	1.89	0	1.3	0.0	2.8	4.8	12 (LOB, ROB)	5.0
35	45+24.82	1120	3329.00	3330.90	1.90	0.06755	11.81	96.45	87.91	1.95	0	1.4	0.0	3.3	4.1	12 (LOB, ROB)	5.0
30	45+83.77	1120	3325.94	3327.22	1.28	0.06062	11.33	98.82	86.29	1.87	0	1.3	0.0	2.6	4.9	12 (LOB, ROB)	5.0
28	46+27.38	1120	3323.00	3325.04	2.04	0.04774	10.57	105.99	85.88	1.68	0	1.3	0.0	3.4	6.5	12 (LOB, ROB)	5.0
25	46+66.69	1120	3320.66	3322.57	1.91	0.06501	11.59	96.60	85.19	1.92	0	1.4	0.0	3.3	6.5	12 (LOB, ROB)	5.0
23	47+13.40	1120	3319.00	3321.67	2.67	0.02571	8.77	127.70	86.71	1.27	0	1.3	0.0	4.0	7.1	12 (LOB, ROB)	5.0
20	47+62.46	1120	3317.00	3318.72	1.72	0.04930	8.62	130.79	151.91	1.62	0	1.3	0.0	3.0	7.0	12 (LOB, ROB)	5.0
10	47+78.43	1120	3315.37	3318.83	3.46	0.015766	7.46	152.66	92.55	1.02	0	1.3	0.0	4.7	6.9	12 (LOB, ROB)	5.0

120 0 120 240
SCALE FEET

LEGEND

- COS-3 — DRAINAGE SUBBASIN
- CP1 — CONCENTRATION POINT
- SUBBASIN BOUNDARY
- 850 — HEC-RAS CROSS SECTION
- EX. US WATERS DELINEATION

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 03--07--16
PLOT TIME: 14:08:39

NO.	DESCRIPTION	DATE	APP	DATE	AGEN.	APP	DATE	CCW	APP	DATE:

GCW
ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\600\62024 - 234 Division Yard\Figures\Fig-7R_Proposed\HEC-RAS1.dwg

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 24 - US WATERS
COS-4 WASH
PROPOSED CONDITIONS HEC-RAS EXHIBIT

DRAWING
FIG-7R
OF SHTS

gcw2438.dwg 060117.pw

APPENDIX B

Hydraulic Calculations

Storm Drain Hydraulics Calculations

G.C. Wallace, Inc. | 48-inch RCP Culvert | DATE 03/01/16 | FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= d | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																								EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																														
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc					CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_i	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		100.00		48							38.21																		Outlet K_o=		1.0												42.83	42.00		
2	100.00	160.11	R	48					1	38.21	38.51	60.1	0.50%	12.57	0.0049	92	7.32	0.83	0.0041	0.0041	0.25																			0.00	43.34	42.51			FULL	D/S
3	160.11	160.11	R	48					1	38.51	38.51	0.0		12.57	0.0049	92	7.32	0.83	0.0041	0.0041	0.00										Ki=	0.4	0.33							0.33			43.68	43.68	FULL	U/S
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Summary of Results

	STATION	INVERT	SOFFIT	EGL	HGL	(Optional) GRADE	(Optional) LOCATION	(Optional) DESCRIPTION	HGL with respect to FG	Pressure Gasket Required?
1	100.00	38.21	42.21	42.83	42.00	43.00			OK	NO
2	160.11	38.51	42.51	43.34	42.51	45.00			OK	NO
3	160.11	38.51	42.51	43.68	43.68	45.00			OK	NO
4										
5										
6										
7										
8										
9										
10										
11										
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32										
33										

SCOUR CALCULATIONS AT CUTOFF WALLS

Cross Section Location	Approach Flowrate CFS Q_1	Contracted Flowrate CFS Q_2	Approach Top Width Feet W_1	Contracted Top Width Feet W_2	Average Velocity FPS V_m	Hydraulic Depth Upstream Channel Feet Y_h	Approach Depth Feet Y_1	Average Depth In Main Channel Feet Y_o	Embankment Length Main Channel Feet L'	Average Depth After Contraction Scour Feet Y_2	Soil Particle Size Feet d_{50}	Critical Velocity FPS V_c	Energy Slope At Approach Section ft/ft Se_2	α Degrees	Froude Number Fr_1	Long-Term Bed Elevation Changes Feet Z_{lt}	Anti-Dune Trough Feet Z_a	Bend Scour Feet Z_{bs}	Contraction Scour Feet Z_{cs}	Local Scour Feet Z_s	Total Scour Feet Z_t	Proposed Minimum Depth of Footings Z_f	Factor of Safety
72-50	1031	1031	86.27	86.13	11.19	1.16	2.27	1.97	332.30	2.27	0.01099	2.79	0.07219	0.00	1.99	-3.2	0.98	0.00	0.30	0.00	-1.89	5.00	N/A
50-35	1120	1120	87.46	87.31	11.13	1.15	1.93	1.85	207.40	1.93	0.01099	2.72	0.05019	0.00	1.69	3.4	0.92	0.00	0.09	0.00	4.41	5.00	1.1
35-10	1120	1120	87.91	85.19	9.99	1.10	1.90	2.14	156.10	1.94	0.01099	2.71	0.06755	0.00	1.95	3.1	1.07	0.00	0.00	0.00	4.19	5.00	1.2

(Equation 724) $Z_t = \{Z_{lt} + (1/2)Z_a + Z_{bs} + Z_{cs} + Z_s\}$

Where;

Z_t = The Total Scour Depth That Can Occur At A Structure.

Z_{lt} = The Long-Term Bed Elevation Changes Depth. (See attached worksheet.)

Z_a = The Anti-Dune Trough Depth

Z_{bs} = Bend-Scour Component of Total Scour Depth

Z_{cs} = Contraction-Scour Component of Total Scour Depth

Z_{cs} = Local Scour at Abutments Depth

Anti-Dune Trough Depth; Z_a

(Equation 708) $Z_a = (1/2)(0.14)(2\pi V^2/g) = 0.0137V^2$; Anti-Dune Trough Depth

Where;

V = Average Channel Velocity; fps

Bend-Scour Depth; Z_{bs}

(Equation 709) $Z_{bs} = (0.0685Y_{MAX}V^{0.8}/Y_h^{0.4}S_e^{0.5})[2.1[\mathrm{Sin}^2(\alpha/2)/\mathrm{Cos}\ \alpha]^{0.2} - 1]$

Where;

V = Average Channel Velocity; fps

Y_{MAX} = Maximum Depth of Flow Immediately Upstream of Bend; ft

Y_h = Hydraulic Depth of Flow Immediately Upstream of Bend; ft (Flow Area/ Flow Top Width)

S_{e1} = Energy Slope Immediately Upstream of Bend (or Bed Slope for Uniform Conditions), ft/ft

α = Angle Formed by the Projection of the Channel Centerline from the Point of Curvature to a Point Which Meets a Line Tangent to the Outer Bank of the Channel, degrees

Critical Velocity Above Which Material Will Be Transported; V_c

(Equation 712) $V_c = 10.95\ Y^{(1/6)}d_{50}^{(1/3)}$ Above Which Material Will Be Transported

Where;

Y = Average Depth of Flow in the Main Channel or Overbank at the Approach Section; ft

If $V_c < V$; use live bed contraction scour equations; if not assume clear-water contraction.

Live-Bed Contraction Scour; Z_{cs}

(Equation 713) $Y_2 = Y_1[Q_2/Q_1]^{(6/7)}[W_1/W_2]^{K1}$

(Equation 714) $Z_{cs} = Y_2 - Y_o$

Where;

Y_2 = Average Depth After Scour Contracted Section; ft

Y_1 = Average Depth in the Main Channel or Floodplain at the Approach Section; ft

Y_o = Average Depth in the Main Channel or Floodplain at the Contracted Section Before Scour; ft

Q_1 = Flow in the Main Channel or Floodplain at the Approach Section, Which is Transporting Sediment; cfs

Q_2 = Flow in the Main Channel or Floodplain at the Contracted Section, Which is Transporting Sediment; cfs

W_1 = Top Width of the Active Flow Area at the Approach Section; ft

W_2 = Top Width of the Active Flow Area at the Contracted Section; ft

K_1 = Exponent for Mode of Bed Material Transport

(1) $V_*/\omega < 0.5$, $K_1 = 0.59$: Mostly Contact Bed Material Discharge

(2) $V_*/\omega = 0.5$ to 2.0, $K_1 = 0.64$: Some Suspended Bed Material Discharge

(3) $V_*/\omega > 2.0$, $K_1 = 0.59$: Mostly Contact Bed Material Discharge

Where;

$V_* = (gY_1S_e)^{1/2}$, Shear Velocity in the Main Channel or Floodplain at the Approach Section, fps

ω = Fall Velocity of Bed material Based on d_{50}; fps

g = Acceleration of Gravity; fps

S_{e2} = Slope of the Energy Grade Line at the Approach Section; ft/ft

Clear-Water Contraction Scour; Z_{cs}

(Equation 715) $Y_2 = [Q_2^2/Cd_m^{(2/3)}W_2^2]^{(3/7)}$

(Equation 716) $Z_{cs} = Y_2 - Y_o$

Where;

d_m = Diameter of the Smallest Non-Transportable Particle in the Bed Material (1.25 d_{50}) in the Contracted Section; ft

d_{50} = Median Diameter of the Bed Material; ft

C = 120 for English Units (40 for Metric)

Local Scour At Abutments; Z_s

When the wetted embankment length, L', divided by by the approach flow depth, Y_1, is greater than 25, use equation 717

When the wetted embankment length, L', divided by by the approach flow depth, Y_1, is less than 25, use equation 718

(Equation 717) $Z_s = 4Y_1(K_1/0.55)K_2Fr_1^{0.33}$

Where;

Y_1 = Depth of Flow at the Toe of the Abutment on the Overbank or in the Main Channel; ft

K_1 = Correction Factor for Abutment Shape

1.00, for Vertical-Wall Abutment

0.82, for Vertical-Wall Abutment with Wing Walls

0.55, for Spill-Through Abutment

Specify K_1 Value: 1.00

K_2 = Correction Factor for Angle of Attack(θ) of Flow With Abutment, θ = 90 degrees When Abutments are Perpendicular to the Flow, θ < 90 degrees if Embankment Points Downstream, and θ > 90 If Embankment Points Upstream

$(\theta/90)^{0.4}$

Specify θ Value; degrees: 0.00

(Equation 718) $Z_s = 2.27K_1K_2(L')^{0.43}Y_a^{0.57}Fr^{0.61} + Y_a$

Where;

K_1 = Correction Factor for Abutment Shape

1.1, for Square Nose

1.0, for Round Nose, Circular Cylinder and Group of Cylinders

0.9, for Sharp Nose (Triangular)

Specify K_1 Value: 1.1

K_2 = Correction Factor for Angle of Attack(θ) of Flow With Abutment, θ = 90 degrees When Abutments are Perpendicular to the Flow, θ < 90 degrees if Embankment Points Downstream, and θ > 90 If Embankment Points Upstream

$(\theta/90)^{0.4}$

Specify θ Value; degrees: 0.00

L' = Length of Abutment (Embankment) Projected Normal to Flow; ft

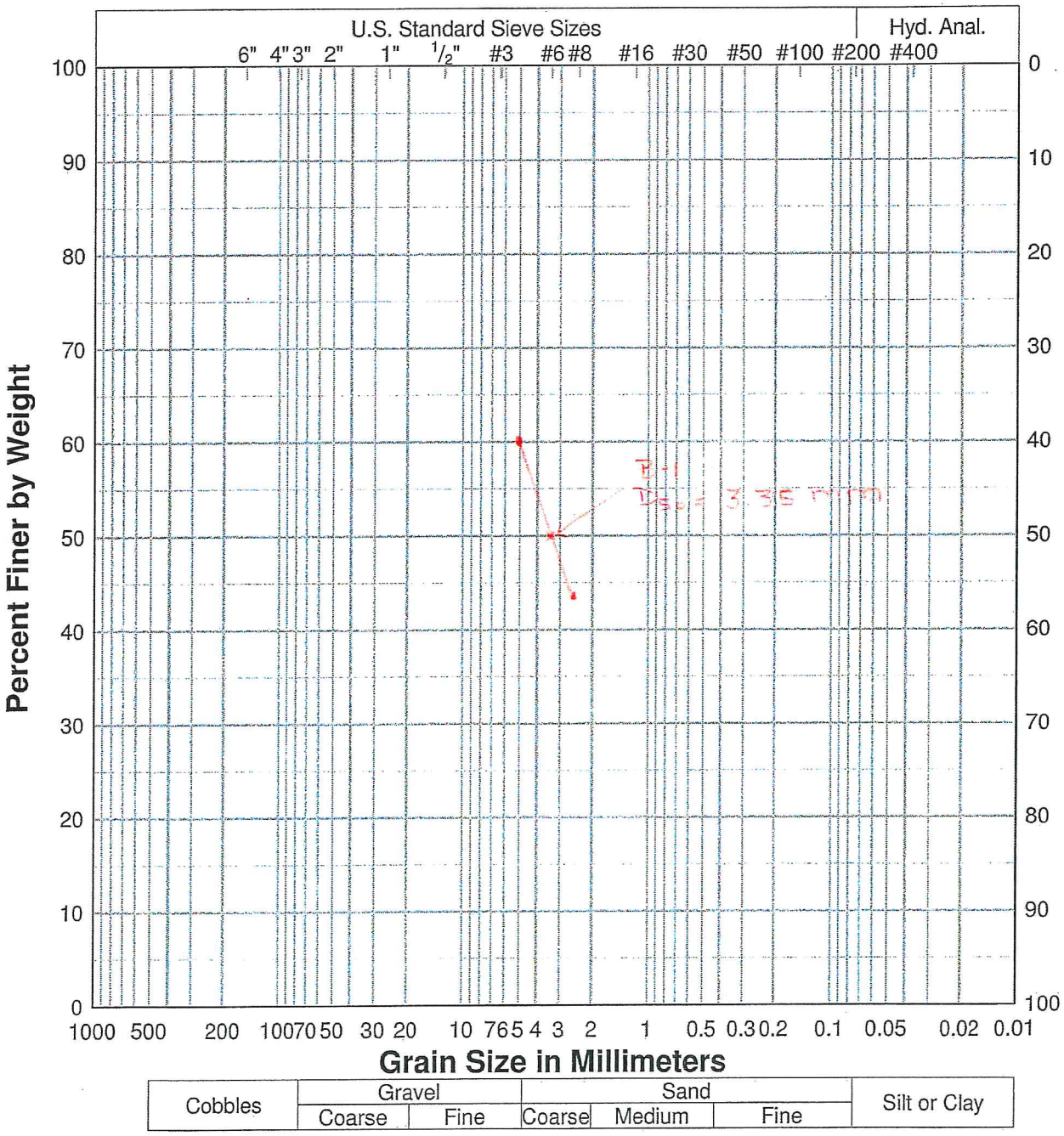
Ya = Average Depth of Flow on the Flow on the Floodplain at the Approach Section (Y_1); ft

Fr = Froude Number of the Floodplain at the Approach Section

Va = Average Velocity of the Approach Flow Va; fps

Aa = Flow Area of the Approach Section Obstructed by the Abutment and Embankment; ft

B-1


U.S. Standard Sieve Sizes
Hyd. Anal.
6" 4" 3" 2" 1" 1/2" #3 #6 #8 #16 #30 #50 #100 #200 #400
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
Percent Finer by Weight
Percent Coarser by Weight
1000 500 200 100 70 50 30 20 10 7 6 5 4 3 2 1 0.5 0.3 0.2 0.1 0.05 0.02 0.01
Grain Size in Millimeters
Cobbles
Gravel
Coarse
Fine
Sand
Coarse
Medium
Fine
Silt or Clay

POWER EQUATIONS FOR TOTAL BED MATERIAL DISCHARGE IN SAND- AND FINE-GRAVEL-BED STREAMS

$$q_s = C_1 (Y)^{C_2} (V)^{C_3}$$

	d_{50}							
(mm)	0.1	0.25	0.5	1.0	2.0	3.0	4.0	5.0
(inches)	0.00394	0.00984	0.0197	0.0394	0.0787	0.118	0.157	0.197
G_r=1.0								
C_1	3.30×10^{-5}	1.42×10^{-6}	7.6×10^{-6}	5.62×10^{-6}	5.64×10^{-6}	6.32×10^{-6}	7.10×10^{-6}	7.78×10^{-6}
C_2	0.715	0.495	0.28	0.06	-0.14	-0.24	-0.30	-0.34
C_3	3.30	3.61	3.82	3.93	3.95	3.92	3.89	3.87
G_r=2.0								
C_1		1.59×10^{-5}	9.8×10^{-6}	6.94×10^{-6}	6.32×10^{-6}	6.62×10^{-6}	6.94×10^{-6}	
C_2		0.51	0.33	0.12	-0.09	-0.196	-0.27	
C_3		3.55	3.73	3.86	3.91	3.91	3.90	
G_r=3.0								
C_1			1.21×10^{-5}	9.14×10^{-6}	7.44×10^{-6}			
C_2			0.36	0.18	-0.02			
C_3			3.66	3.76	3.86			
G_r=4.0								
C_1				1.0510^{-5}				
C_2				0.21				
C_3				3.71				

3.35 mm

Definitions: q_s=Unit sediment transport rate in ft²/s (unbulked); V=Velocity in ft/s; Y=Depth in ft; G_r=Gradation coefficient = $(d_{84}/d_{50} + d_{50}/d_{16})/2$.

$G_r = \left(\frac{11.2}{3.35} + \frac{3.35}{0.075}\right)/2 = 24.0$

$D_{50} = 3.35\,mm$

→ $C_1 = 6.73\times10^{-6}$, $C_2 = -0.22$, $C_3 = 3.91$

Revision	Date

REFERENCE:

TABLE 703A

Determination of Long Term Bed Elevation Changes, Zlt: (Section 72-50)

Long term bed elevation changes consist of either a general degradation or aggradation of the bed level over a long period of time. Determination of the long term bed elevation changes consists of determining the sediment transport rate of the upstream channel and then computing the equilibrium slope in the downstream channel that gives an equivalent sediment transport rate. The following procedure can be used to determine the depth of either degradation or aggradation that may occur within the stream channel.

Known/Input:

Yh = hydraulic depth in upstream channel, (in ft)	1.16	ft
V = flow velocity in upstream channel, (in fps)	11.49	fps
C1 = sand material constant	0.00000673	
C2 = sand material constant	-0.22	
C3 = sand material constant	3.91	
TW = top width of upstream channel, (in ft)	89.69	ft
So = upstream channel slope, (in ft/ft)	0.063	ft/ft
L = entire upstream channel length, (in ft)	332.3	ft

Sediment Transport Rate, qs in Upstream Channel Calculation:

qs = sediment transport rate = C1*(Yh^C2)*(V^C3)	0.1	cfs/ft
Qs = total sediment transport rate = qs*TW	8.2	cfs

Equilibrium Slope, Se in Downstream Channel Calculation:

The equilibrium slope is computed using a trial and error procedure by which a given slope is chosen to compute the flow conditions in the downstream channel and from the flow conditions the sediment transport rate is calculated. When the computed rate is equal to the sediment transport rate in the upstream channel, the equilibrium slope has been found.

Flow conditions for each trial slope can be computed using normal depth. The following table can be used for data entry of flow conditions related to the equilibrium slope.

Trial Slope (ft/ft)	Area (ft^2)	Velocity (fps)	Top Width (ft)	Flow Depth (ft)	Hydraulic Depth (ft)	Qs (cfs) from below	
0.0730	89.41	11.53	86.94	1.81	1.03	8.2	«Compare to Qs Computed Above

8Equilibrium slope

Sediment Transport Rate, qs in Downstream Channel Calculation:

qs = sediment transport rate = C1*(Yh^C2)*(V^C3)	0.1	cfs/ft
Qs = total sediment transport rate = qs*TW	8.2	cfs

Zlt Calculation:

Zlt = long term bed elevation changes = (Se - So)*L	3.2	ft

if: Se > So then aggradation occurs
Se < So then degradation occurs

Worksheet for Section 50 Equilibrium Channel

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	7.30	%
Discharge	1031.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	3349.91
0+00	3349.91
0+00	3349.91
0+01	3349.87
0+03	3349.81
0+05	3349.74
0+07	3349.68
0+07	3349.67
0+09	3349.62
0+14	3349.46
0+19	3346.88
0+29	3341.92
0+37	3342.00
0+73	3343.00
0+81	3343.00
1+06	3343.00
1+11	3343.22
1+13	3344.21
1+20	3347.71
1+21	3348.05
1+26	3348.05
1+38	3348.07
1+43	3348.08

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient

Worksheet for Section 50 Equilibrium Channel

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+00, 3349.91)	(0+29, 3341.92)	0.040
(0+29, 3341.92)	(1+11, 3343.22)	0.035
(1+11, 3343.22)	(1+43, 3348.08)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		1.81	ft
Elevation Range	3341.92 to 3349.91 ft		
Flow Area		89.41	ft²
Wetted Perimeter		87.50	ft
Hydraulic Radius		1.02	ft
Top Width		86.94	ft
Normal Depth		1.81	ft
Critical Depth		2.42	ft
Critical Slope		0.01572	ft/ft
Velocity		11.53	ft/s
Velocity Head		2.07	ft
Specific Energy		3.87	ft
Froude Number		2.00	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.81	ft

Worksheet for Section 50 Equilibrium Channel

GVF Output Data

Critical Depth	2.42	ft
Channel Slope	7.30	%
Critical Slope	0.01572	ft/ft

Cross Section for Section 50 Equilibrium Channel

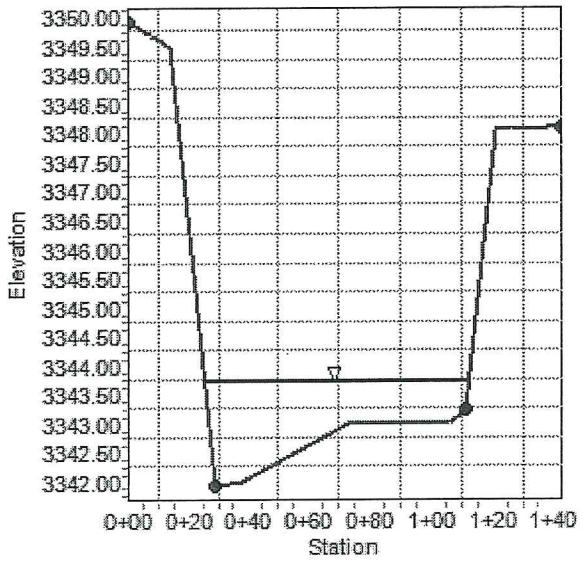
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	7.30	%
Normal Depth	1.81	ft
Discharge	1031.00	ft³/s

Cross Section Image



Determination of Long Term Bed Elevation Changes, Zlt: (Section 50-35)

Long term bed elevation changes consist of either a general degradation or aggradation of the bed level over a long period of time. Determination of the long term bed elevation changes consists of determining the sediment transport rate of the upstream channel and then computing the equilibrium slope in the downstream channel that gives an equivalent sediment transport rate. The following procedure can be used to determine the depth of either degradation or aggradation that may occur within the stream channel.

Known/Input:

Yh = hydraulic depth in upstream channel, (in ft)	1.15	ft
V = flow velocity in upstream channel, (in fps)	10.28	fps
C1 = sand material constant	0.00000673	
C2 = sand material constant	-0.220	
C3 = sand material constant	3.91	
TW = top width of upstream channel, (in ft)	87.46	ft
So = upstream channel slope, (in ft/ft)	0.062	ft/ft
L = entire upstream channel length, (in ft)	207.4	ft

Sediment Transport Rate, qs in Upstream Channel Calculation:

qs = sediment transport rate = C1*(Yh^C2)*(V^C3)	0.1	cfs/ft
Qs = total sediment transport rate = qs*TW	5.2	cfs

Equilibrium Slope, Se in Downstream Channel Calculation:

The equilibrium slope is computed using a trial and error procedure by which a given slope is chosen to compute the flow conditions in the downstream channel and from the flow conditions the sediment transport rate is calculated. When the computed rate is equal to the sediment transport rate in the upstream channel, the equilibrium slope has been found.

Flow conditions for each trial slope can be computed using normal depth. The following table can be used for data entry of flow conditions related to the equilibrium slope.

Trial Slope (ft/ft)	Area (ft^2)	Velocity (fps)	Top Width (ft)	Flow Depth (ft)	Hydraulic Depth (ft)	Qs (cfs) from below	
0.0459	108.85	10.29	88.50	2.04	1.23	5.2	«Compare to Qs Computed Above

8Equilibrium slope

Sediment Transport Rate, qs in Downstream Channel Calculation:

qs = sediment transport rate = C1*(Yh^C2)*(V^C3)	0.1	cfs/ft
Qs = total sediment transport rate = qs*TW	5.2	cfs

Zlt Calculation:

Zlt = long term bed elevation changes = (Se - So)*L	-3.4	ft

if: Se > So then aggradation occurs
Se < So then degradation occurs

Worksheet for Section 35 Equilibrium Channel

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.59	%
Discharge	1120.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	3336.93
0+00	3336.93
0+01	3336.92
0+02	3336.84
0+04	3336.77
0+06	3336.70
0+08	3336.62
0+13	3336.43
0+26	3333.23
0+32	3330.35
0+32	3330.33
0+47	3330.00
0+55	3329.00
0+63	3330.00
0+75	3330.00
1+15	3329.36
1+21	3332.10
1+26	3334.12

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 3336.93)	(0+32, 3330.33)	0.040
(0+32, 3330.33)	(1+15, 3329.36)	0.035
(1+15, 3329.36)	(1+26, 3334.12)	0.040

Worksheet for Section 35 Equilibrium Channel

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		2.04	ft
Elevation Range	3329.00 to 3336.93 ft		
Flow Area		108.85	ft²
Wetted Perimeter		89.17	ft
Hydraulic Radius		1.22	ft
Top Width		88.50	ft
Normal Depth		2.04	ft
Critical Depth		2.52	ft
Critical Slope		0.01550	ft/ft
Velocity		10.29	ft/s
Velocity Head		1.65	ft
Specific Energy		3.68	ft
Froude Number		1.64	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.04	ft
Critical Depth	2.52	ft
Channel Slope	4.59	%
Critical Slope	0.01550	ft/ft

Cross Section for Section 35 Equilibrium Channel

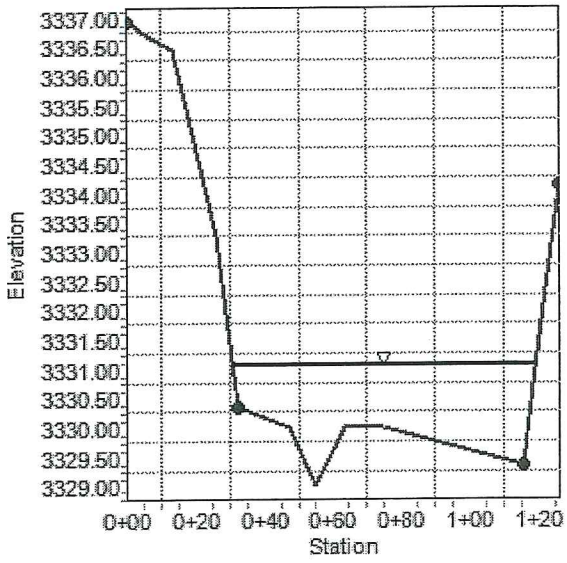
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.59	%
Normal Depth	2.04	ft
Discharge	1120.00	ft³/s

Cross Section Image



Determination of Long Term Bed Elevation Changes, Zlt: (Cross Sections 35-10)

Long term bed elevation changes consist of either a general degradation or aggradation of the bed level over a long period of time. Determination of the long term bed elevation changes consists of determining the sediment transport rate of the upstream channel and then computing the equilibrium slope in the downstream channel that gives an equivalent sediment transport rate. The following procedure can be used to determine the depth of either degradation or aggradation that may occur within the stream channel.

Known/Input:

Yh = hydraulic depth in upstream channel, (in ft)	1.10	ft
V = flow velocity in upstream channel, (in fps)	11.61	fps
C1 = sand material constant	0.00000673	
C2 = sand material constant	-0.22	
C3 = sand material constant	3.91	
TW = top width of upstream channel, (in ft)	87.91	ft
So = upstream channel slope, (in ft/ft)	0.083	ft/ft
L = entire upstream channel length, (in ft)	156.1	ft

Sediment Transport Rate, qs in Upstream Channel Calculation:

qs = sediment transport rate = C1*(Yh^C2)*(V^C3)	0.1	cfs/ft
Qs = total sediment transport rate = qs*TW	8.4	cfs

Equilibrium Slope, Se in Downstream Channel Calculation:

The equilibrium slope is computed using a trial and error procedure by which a given slope is chosen to compute the flow conditions in the downstream channel and from the flow conditions the sediment transport rate is calculated. When the computed rate is equal to the sediment transport rate in the upstream channel, the equilibrium slope has been found.

Flow conditions for each trial slope can be computed using normal depth. The following table can be used for data entry of flow conditions related to the equilibrium slope.

Trial Slope (ft/ft)	Area (ft^2)	Velocity (fps)	Top Width (ft)	Flow Depth (ft)	Hydraulic Depth (ft)	Qs (cfs) from below	
0.0633	90.03	12.44	69.12	2.75	1.30	8.4	«Compare to Qs Computed Above

8Equilibrium slope

Sediment Transport Rate, qs in Downstream Channel Calculation:

qs = sediment transport rate = C1*(Yh^C2)*(V^C3)	0.1	cfs/ft
Qs = total sediment transport rate = qs*TW	8.4	cfs

Zlt Calculation:

Zlt = long term bed elevation changes = (Se - So)*L	-3.1	ft

if: Se > So then aggradation occurs
Se < So then degradation occurs

Worksheet for Section 10 Equlibrium Channel

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	6.33	%
Discharge	1120.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	3323.00
0+01	3322.00
0+08	3321.46
0+08	3321.34
0+11	3320.54
0+12	3320.53
0+15	3320.49
0+16	3320.47
0+20	3320.42
0+22	3320.40
0+24	3320.38
0+24	3320.37
0+26	3320.35
0+41	3315.37
0+61	3316.00
0+73	3317.00
0+88	3318.00
1+22	3318.29
1+25	3319.82
1+32	3323.42
1+35	3323.49
1+44	3323.79
1+60	3324.30
1+62	3324.32
1+63	3324.33

Roughness Segment Definitions

Worksheet for Section 10 Equlibrium Channel

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+00, 3323.00)	(0+41, 3315.37)	0.040
(0+41, 3315.37)	(1+22, 3318.29)	0.035
(1+22, 3318.29)	(1+63, 3324.33)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		2.75	ft
Elevation Range	3315.37 to 3324.33 ft		
Flow Area		90.03	ft²
Wetted Perimeter		69.66	ft
Hydraulic Radius		1.29	ft
Top Width		69.12	ft
Normal Depth		2.75	ft
Critical Depth		3.46	ft
Critical Slope		0.01583	ft/ft
Velocity		12.44	ft/s
Velocity Head		2.41	ft
Specific Energy		5.15	ft
Froude Number		1.92	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s

Worksheet for Section 10 Equlibrium Channel

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.75	ft
Critical Depth	3.46	ft
Channel Slope	6.33	%
Critical Slope	0.01583	ft/ft

Cross Section for Section 10 Equlibrium Channel

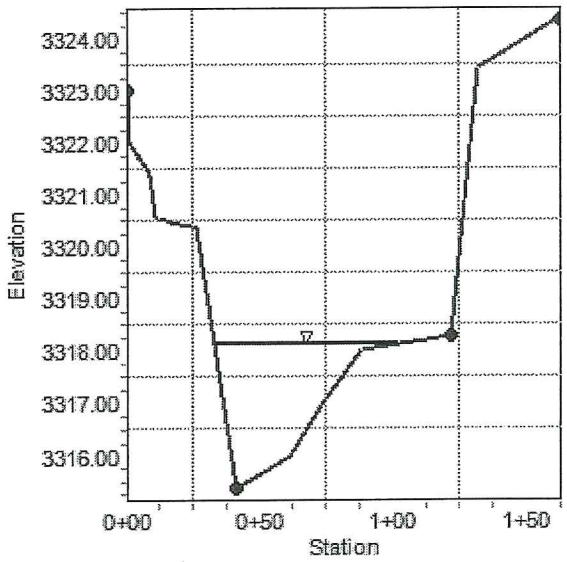
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

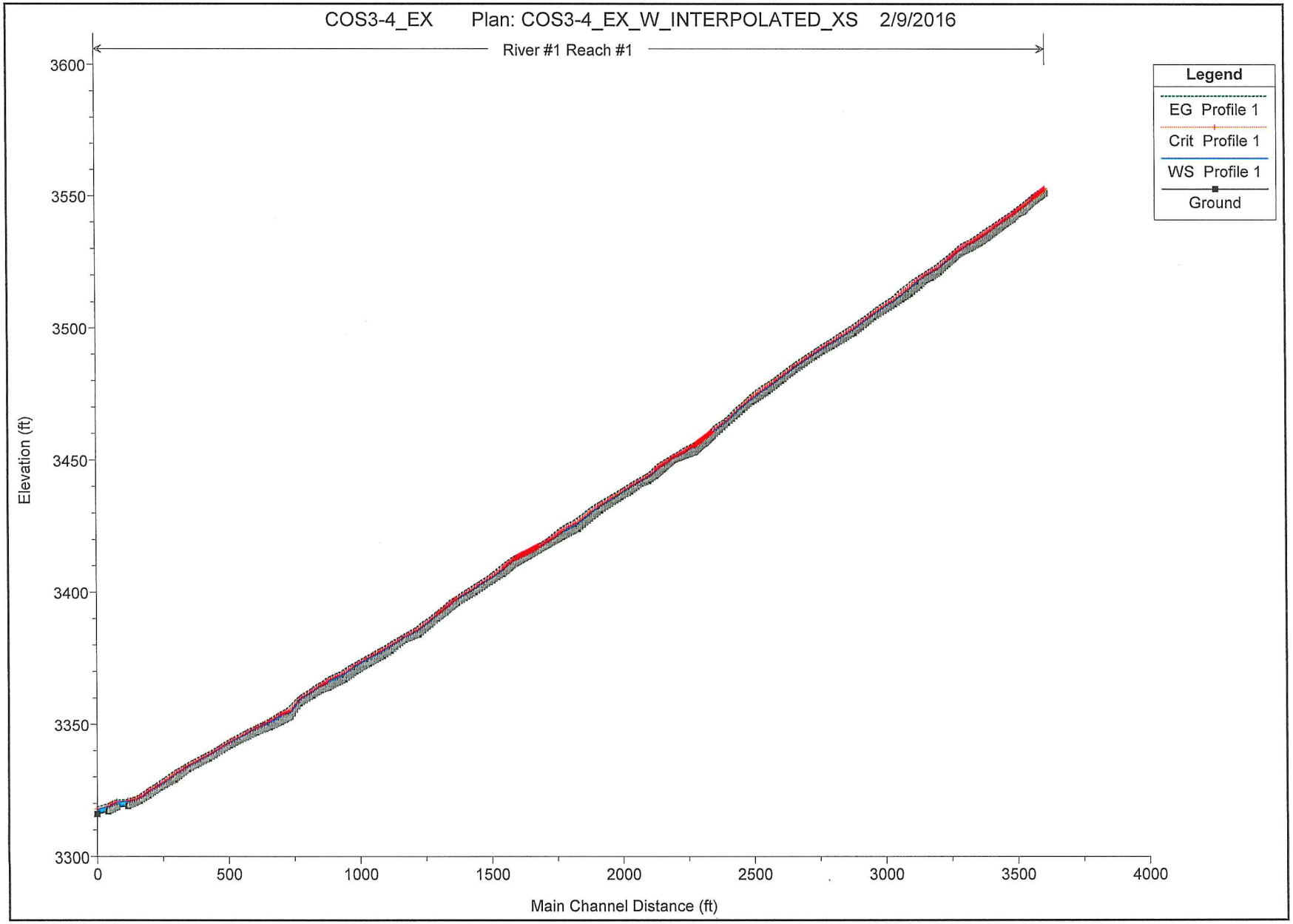
Channel Slope	6.33	%
Normal Depth	2.75	ft
Discharge	1120.00	ft³/s

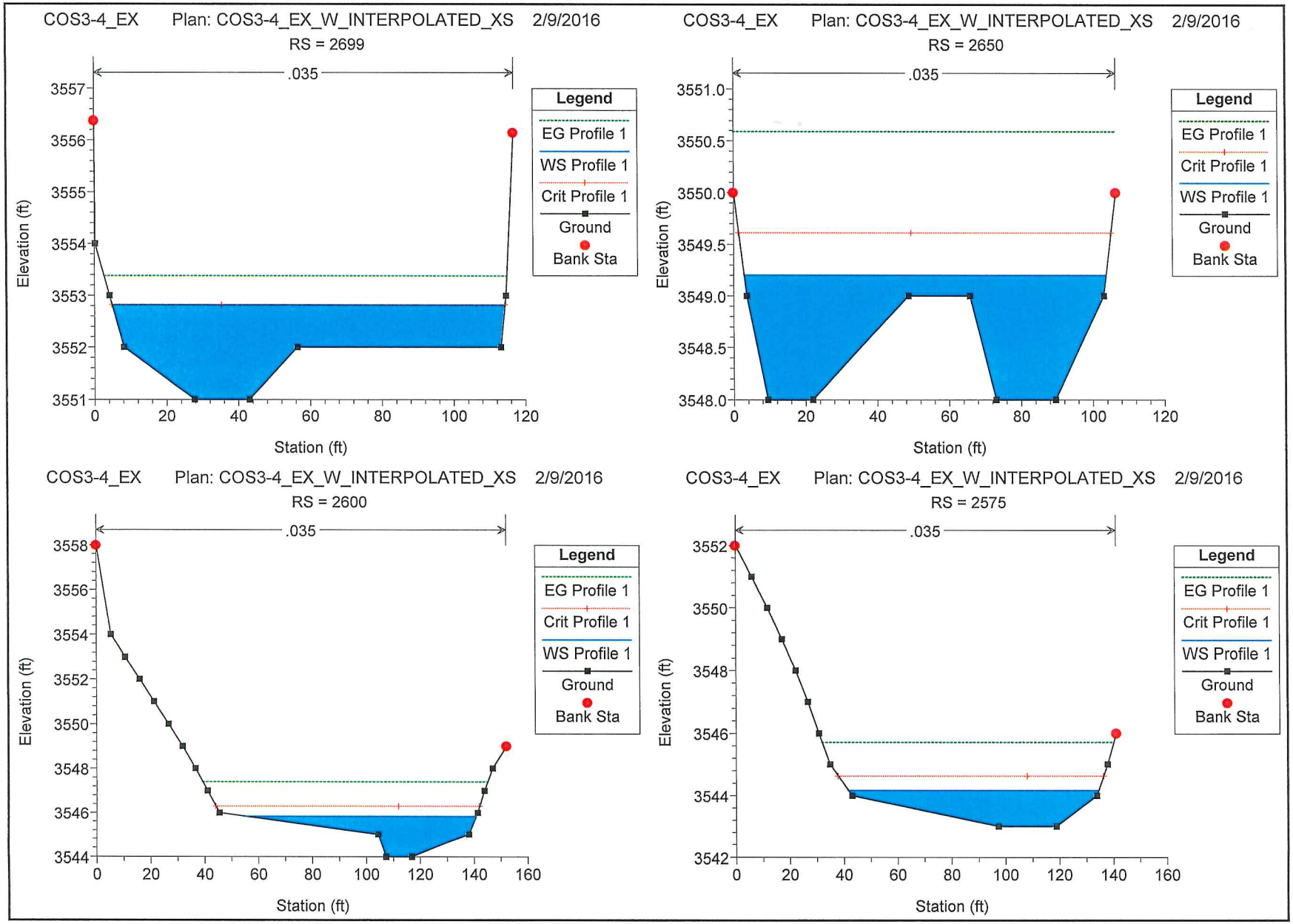
Cross Section Image



HEC-RAS Plan: COS-3-4_EX_W_XS River: River #1 Reach: Reach #1 Profile: Profile 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	2699	Profile 1	720.00	3551.00	3552.82	3552.82	3553.38	0.017799	6.00	119.94	109.51	1.01
Reach #1	2650	Profile 1	720.00	3548.00	3549.20	3549.61	3550.59	0.072287	9.45	76.18	100.86	1.92
Reach #1	2600	Profile 1	720.00	3544.00	3545.84	3546.30	3547.40	0.071074	10.03	71.82	85.83	1.93
Reach #1	2575	Profile 1	720.00	3543.00	3544.18	3544.63	3545.72	0.076902	9.96	72.30	92.87	1.99
Reach #1	2550	Profile 1	720.00	3541.00	3542.52	3543.00	3544.13	0.077894	10.20	70.59	88.23	2.01
Reach #1	2500	Profile 1	720.00	3538.00	3539.68	3540.11	3541.08	0.067884	9.49	75.84	95.24	1.87
Reach #1	2450	Profile 1	720.00	3534.00	3535.70	3536.32	3537.62	0.068506	11.13	64.66	64.11	1.95
Reach #1	2425	Profile 1	720.00	3532.00	3533.80	3534.30	3535.52	0.073815	10.54	68.29	77.79	1.98
Reach #1	2400	Profile 1	720.00	3530.00	3531.68	3532.14	3533.20	0.061837	9.87	72.97	80.44	1.83
Reach #1	2350	Profile 1	720.00	3528.00	3528.98	3529.50	3530.76	0.068865	10.71	67.22	70.94	1.94
Reach #1	2300	Profile 1	720.00	3526.00	3527.19	3527.69	3528.94	0.099165	10.62	67.81	95.54	2.22
Reach #1	2250	Profile 1	720.00	3524.00	3525.40	3525.90	3527.04	0.076026	10.30	69.94	84.34	1.99
Reach #1	2225	Profile 1	720.00	3521.00	3522.53	3523.15	3524.45	0.086411	11.12	64.76	76.43	2.13
Reach #1	2200	Profile 1	720.00	3519.00	3520.98	3521.40	3522.41	0.057514	9.60	74.98	81.45	1.76
Reach #1	2175	Profile 1	720.00	3518.00	3519.63	3520.01	3520.94	0.061270	9.21	78.19	94.98	1.79
Reach #1	2150	Profile 1	720.00	3516.00	3518.28	3518.68	3519.64	0.063912	9.37	76.84	93.77	1.82
Reach #1	2125	Profile 1	720.00	3513.00	3514.99	3515.62	3517.14	0.080117	11.77	61.18	62.68	2.10
Reach #1	2100	Profile 1	720.00	3511.00	3512.57	3513.26	3514.80	0.079511	11.96	60.19	60.12	2.11
Reach #1	2050	Profile 1	720.00	3509.00	3510.18	3510.75	3512.16	0.094947	11.29	63.80	79.56	2.22
Reach #1	1975	Profile 1	720.00	3504.00	3505.10	3505.56	3506.69	0.079593	10.11	71.23	91.38	2.02
Reach #1	1900	Profile 1	720.00	3498.00	3499.43	3499.99	3501.25	0.071531	10.82	66.51	71.21	1.97
Reach #1	1825	Profile 1	720.00	3493.00	3494.04	3494.51	3495.61	0.069458	10.06	71.57	83.87	1.92
Reach #1	1800	Profile 1	720.00	3491.00	3491.97	3492.40	3493.42	0.063356	9.67	74.49	86.38	1.83
Reach #1	1750	Profile 1	720.00	3489.00	3489.95	3490.40	3491.44	0.068938	9.78	73.63	89.41	1.90
Reach #1	1650	Profile 1	720.00	3484.00	3485.08	3485.50	3486.50	0.066724	9.57	75.27	91.97	1.86
Reach #1	1600	Profile 1	720.00	3480.00	3481.08	3481.57	3482.77	0.092844	10.43	69.00	94.43	2.15
Reach #1	1545	Profile 1	720.00	3476.00	3477.41	3478.09	3479.22	0.062879	10.82	66.54	63.53	1.86
Reach #1	1500	Profile 1	720.00	3472.00	3473.16	3473.65	3474.78	0.072471	10.20	70.58	83.39	1.95
Reach #1	1450	Profile 1	720.00	3469.00	3470.08	3470.49	3471.52	0.097735	9.63	74.76	120.81	2.16
Reach #1	1375	Profile 1	720.00	3464.00	3464.65	3465.09	3466.19	0.100405	9.95	72.34	113.47	2.20
Reach #1	1300	Profile 1	720.00	3459.00	3460.36	3460.81	3462.10	0.142321	10.60	67.95	125.87	2.54
Reach #1	1225	Profile 1	720.00	3453.00	3455.14	3455.51	3456.42	0.076467	9.08	79.32	116.12	1.94
Reach #1	1150	Profile 1	720.00	3450.00	3450.83	3451.15	3451.91	0.052570	8.35	86.22	108.32	1.65
Reach #1	1075	Profile 1	720.00	3444.00	3445.70	3446.23	3447.44	0.094723	10.60	67.95	92.07	2.17
Reach #1	1050	Profile 1	720.00	3442.00	3443.67	3444.07	3445.06	0.080435	9.46	76.09	108.82	1.99
Reach #1	1000	Profile 1	720.00	3441.00	3442.09	3442.45	3443.29	0.056540	8.82	81.62	99.78	1.72
Reach #1	960	Profile 1	720.00	3438.00	3439.74	3440.09	3440.93	0.059547	8.77	82.13	104.98	1.75
Reach #1	925	Profile 1	720.00	3436.00	3437.31	3437.73	3438.66	0.064827	9.33	77.15	95.87	1.83
Reach #1	850	Profile 1	799.00	3431.00	3432.83	3433.29	3434.17	0.045544	9.30	85.95	81.97	1.60
Reach #1	775	Profile 1	799.00	3424.00	3426.14	3426.71	3428.12	0.079717	11.29	70.76	77.14	2.08
Reach #1	700	Profile 1	799.00	3421.00	3422.65	3423.36	3424.72	0.064545	11.54	69.23	62.06	1.93
Reach #1	550	Profile 1	1031.00	3416.00	3417.29	3417.55	3418.22	0.036358	7.76	132.88	141.19	1.41
Reach #1	500	Profile 1	1031.00	3411.00	3412.66	3413.03	3413.92	0.053879	9.01	114.47	130.68	1.70
Reach #1	400	Profile 1	1031.00	3407.00	3408.30	3408.97	3410.35	0.084846	11.50	89.62	99.52	2.14
Reach #1	300	Profile 1	1031.00	3400.00	3401.40	3401.86	3402.83	0.063179	9.59	107.50	125.74	1.83
Reach #1	250	Profile 1	1031.00	3396.00	3397.38	3397.69	3398.41	0.067690	8.16	126.40	198.80	1.80
Reach #1	175	Profile 1	1031.00	3390.00	3391.31	3391.69	3392.58	0.079609	9.05	113.98	173.01	1.96
Reach #1	100	Profile 1	1031.00	3384.00	3385.58	3386.14	3387.30	0.102350	10.51	98.09	143.53	2.24
Reach #1	95	Profile 1	1031.00	3382.00	3383.09	3383.34	3383.99	0.048773	7.63	135.04	183.29	1.57
Reach #1	90	Profile 1	1031.00	3378.00	3379.45	3379.86	3380.84	0.072417	9.47	108.82	143.56	1.92
Reach #1	87	Profile 1	1031.00	3376.00	3377.79	3378.20	3379.03	0.051795	8.96	115.10	128.13	1.67
Reach #1	85	Profile 1	1031.00	3373.00	3375.16	3375.46	3376.23	0.052897	8.30	124.22	157.51	1.65
Reach #1	83	Profile 1	1031.00	3370.00	3372.04	3372.41	3373.23	0.061077	8.74	117.99	154.57	1.76
Reach #1	80	Profile 1	1031.00	3367.00	3368.98	3369.49	3370.71	0.067169	10.55	97.70	103.43	1.91
Reach #1	75	Profile 1	1031.00	3364.00	3366.31	3366.72	3367.62	0.051678	9.18	112.31	120.60	1.68
Reach #1	72	Profile 1	1031.00	3363.00	3364.38	3364.77	3365.67	0.050730	9.11	113.17	121.21	1.66
Reach #1	70	Profile 1	1031.00	3361.00	3362.26	3362.65	3363.61	0.076356	9.33	110.46	155.26	1.95
Reach #1	65	Profile 1	1031.00	3358.00	3359.21	3359.59	3360.52	0.076475	9.18	112.33	162.11	1.94
Reach #1	63	Profile 1	1031.00	3353.00	3354.38	3355.20	3357.05	0.102591	13.12	78.61	82.53	2.37
Reach #1	60	Profile 1	1031.00	3351.00	3353.47	3353.82	3354.56	0.053247	8.36	123.31	155.99	1.66
Reach #1	58	Profile 1	1031.00	3349.00	3351.07	3351.33	3351.96	0.064573	7.57	136.26	231.48	1.74
Reach #1	55	Profile 1	1031.00	3347.00	3348.53	3348.75	3349.34	0.046956	7.22	142.77	204.89	1.52
Reach #1	50	Profile 1	1031.00	3342.00	3343.30	3343.54	3344.16	0.051214	7.48	137.84	199.62	1.59
Reach #1	45	Profile 1	1120.00	3337.00	3338.29	3338.58	3339.32	0.053436	8.13	137.76	181.87	1.65
Reach #1	40	Profile 1	1120.00	3333.00	3333.93	3334.28	3335.12	0.057949	8.74	128.07	161.55	1.73
Reach #1	35	Profile 1	1120.00	3329.00	3330.87	3331.26	3332.18	0.061176	9.20	121.71	148.09	1.79
Reach #1	30	Profile 1	1120.00	3326.00	3326.85	3327.28	3328.28	0.069965	9.58	116.92	148.33	1.90
Reach #1	28	Profile 1	1120.00	3323.00	3324.61	3324.92	3325.67	0.060613	8.26	135.53	192.57	1.74
Reach #1	25	Profile 1	1120.00	3321.00	3322.13	3322.44	3323.16	0.072381	8.14	137.57	228.23	1.85
Reach #1	23	Profile 1	1120.00	3319.00	3320.89	3321.04	3321.54	0.022247	6.49	172.48	165.43	1.12
Reach #1	20	Profile 1	1120.00	3317.00	3318.72	3319.13	3319.85	0.049265	8.53	131.34	152.12	1.62
Reach #1	10	Profile 1	1120.00	3316.00	3317.86	3317.97	3318.53	0.020788	6.59	169.93	151.31	1.10


COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
River #1 Reach #1
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Elevation (ft)
3600
3550
3500
3450
3400
3350
3300
0
500
1000
1500
2000
2500
3000
3500
4000
Main Channel Distance (ft)


COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2699
.035
Legend
EG Profile 1
WS Profile 1
Crit Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2650
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2600
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
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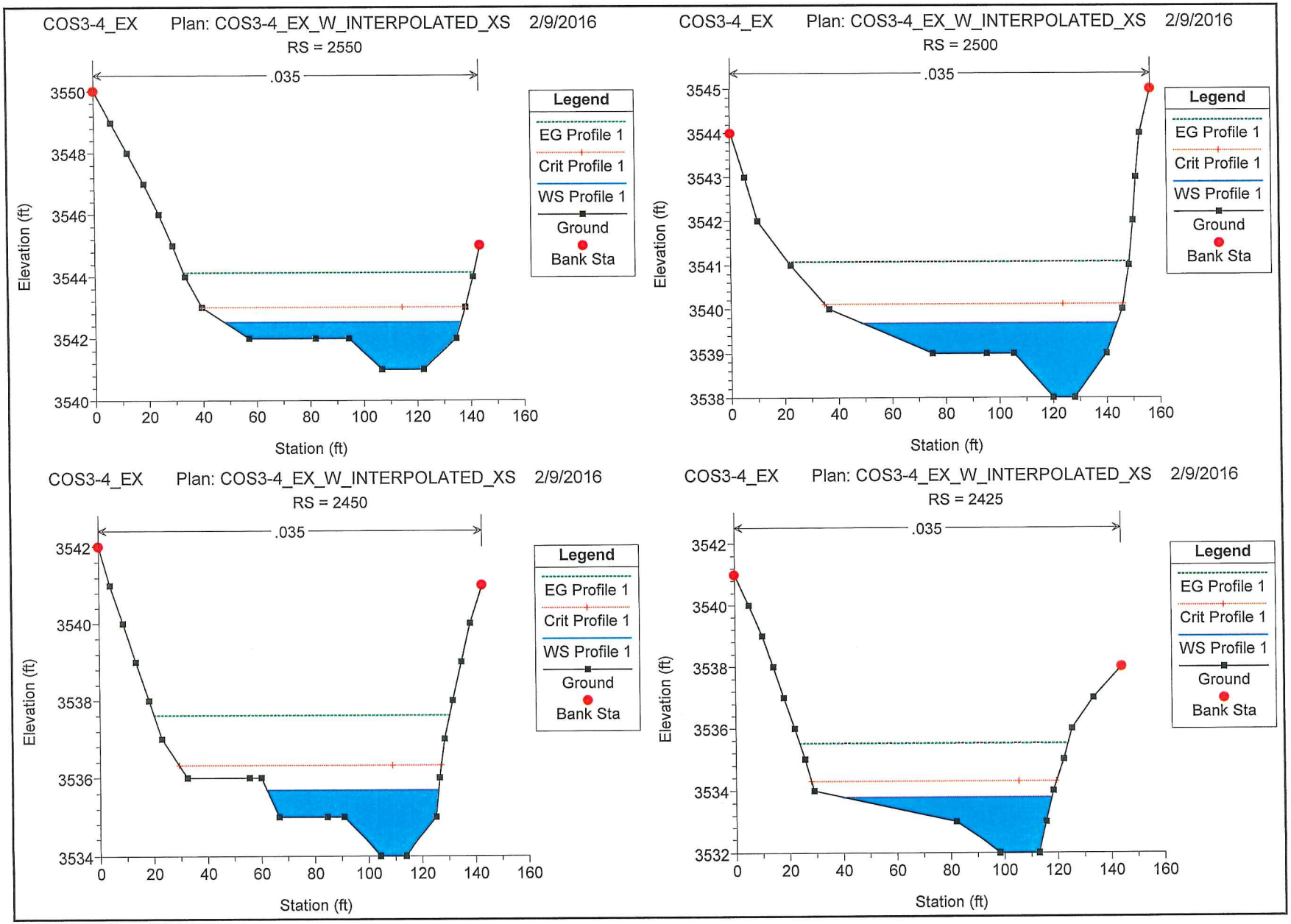
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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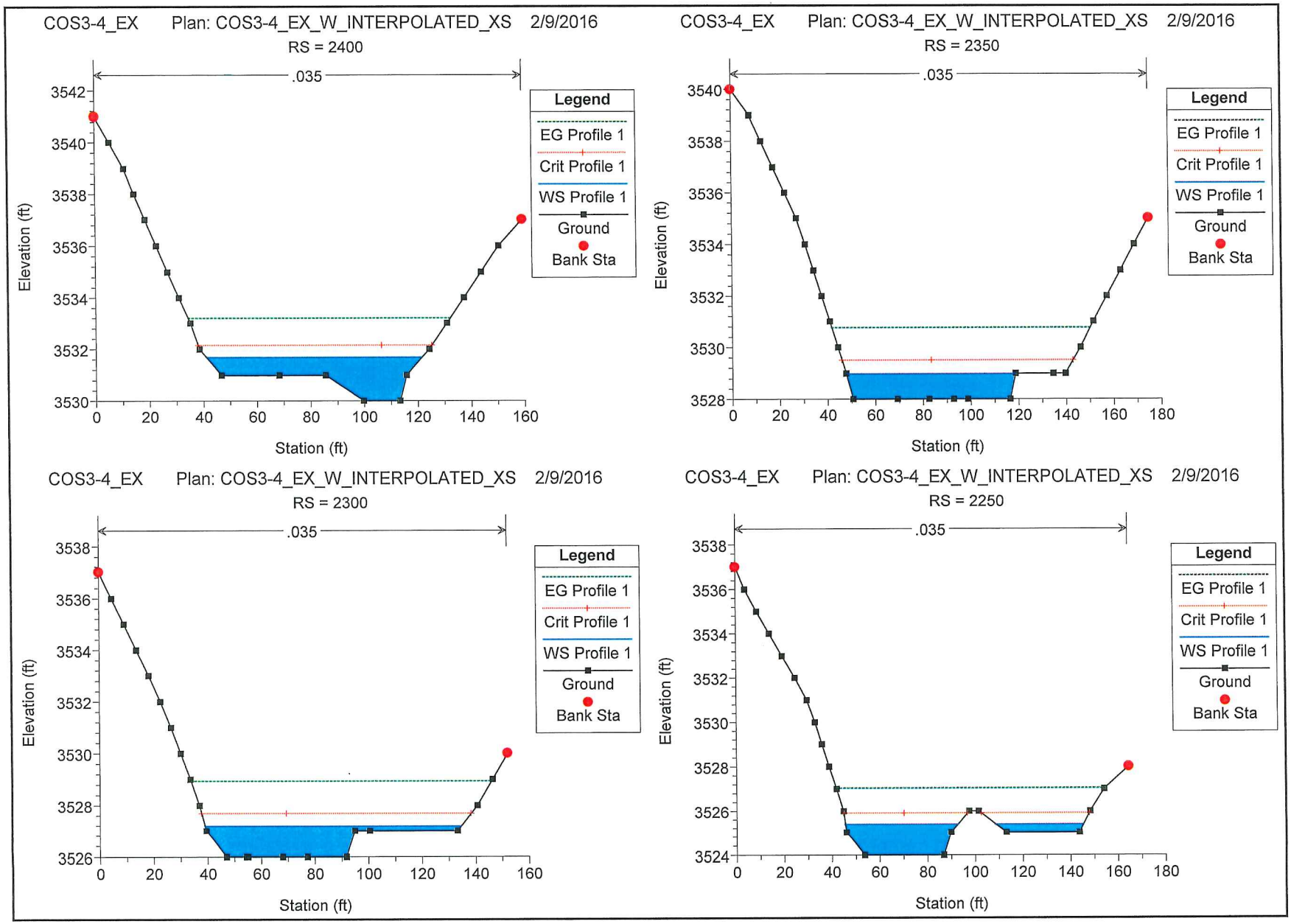
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2500
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2450
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2425
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2350
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2300
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2250
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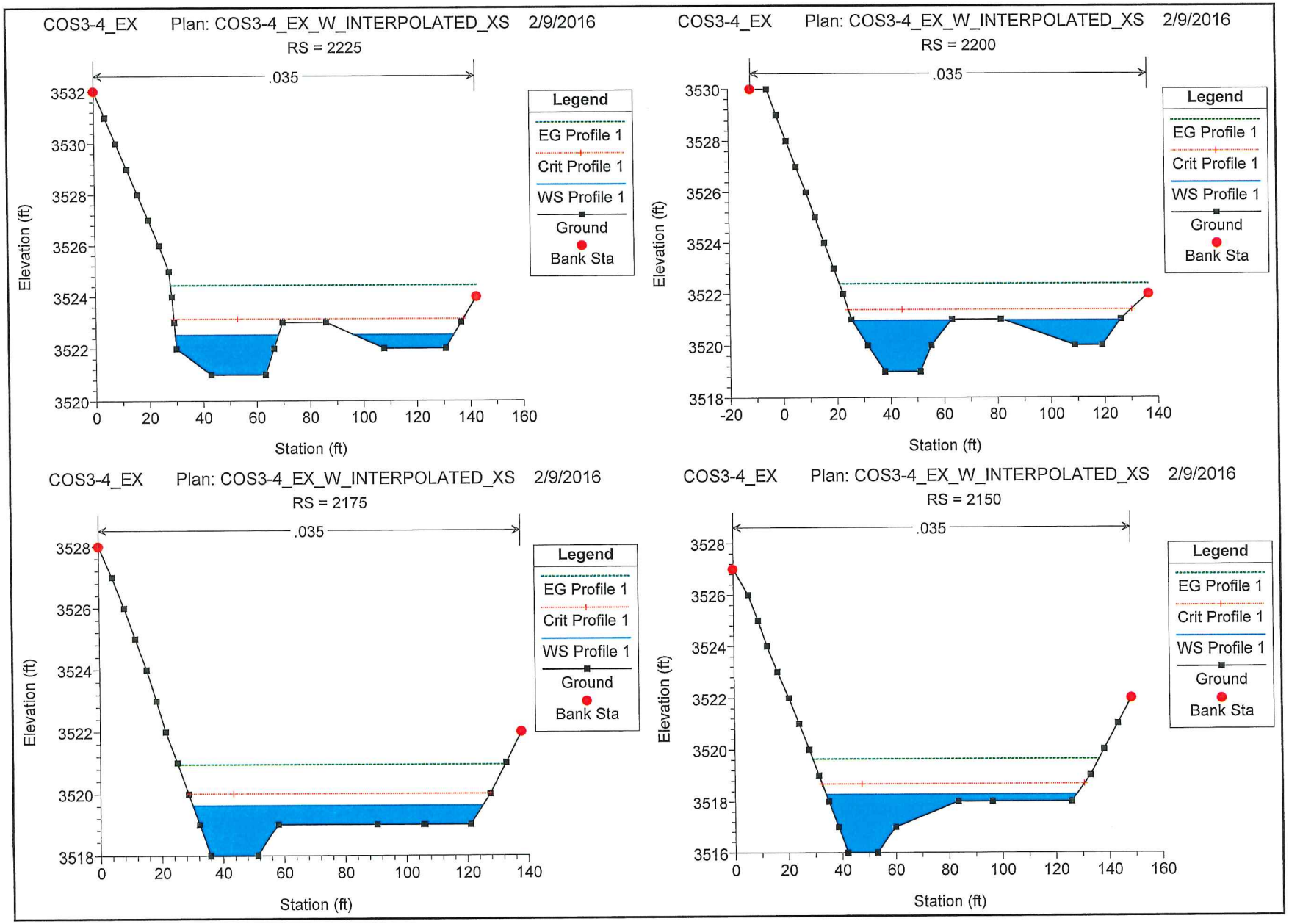
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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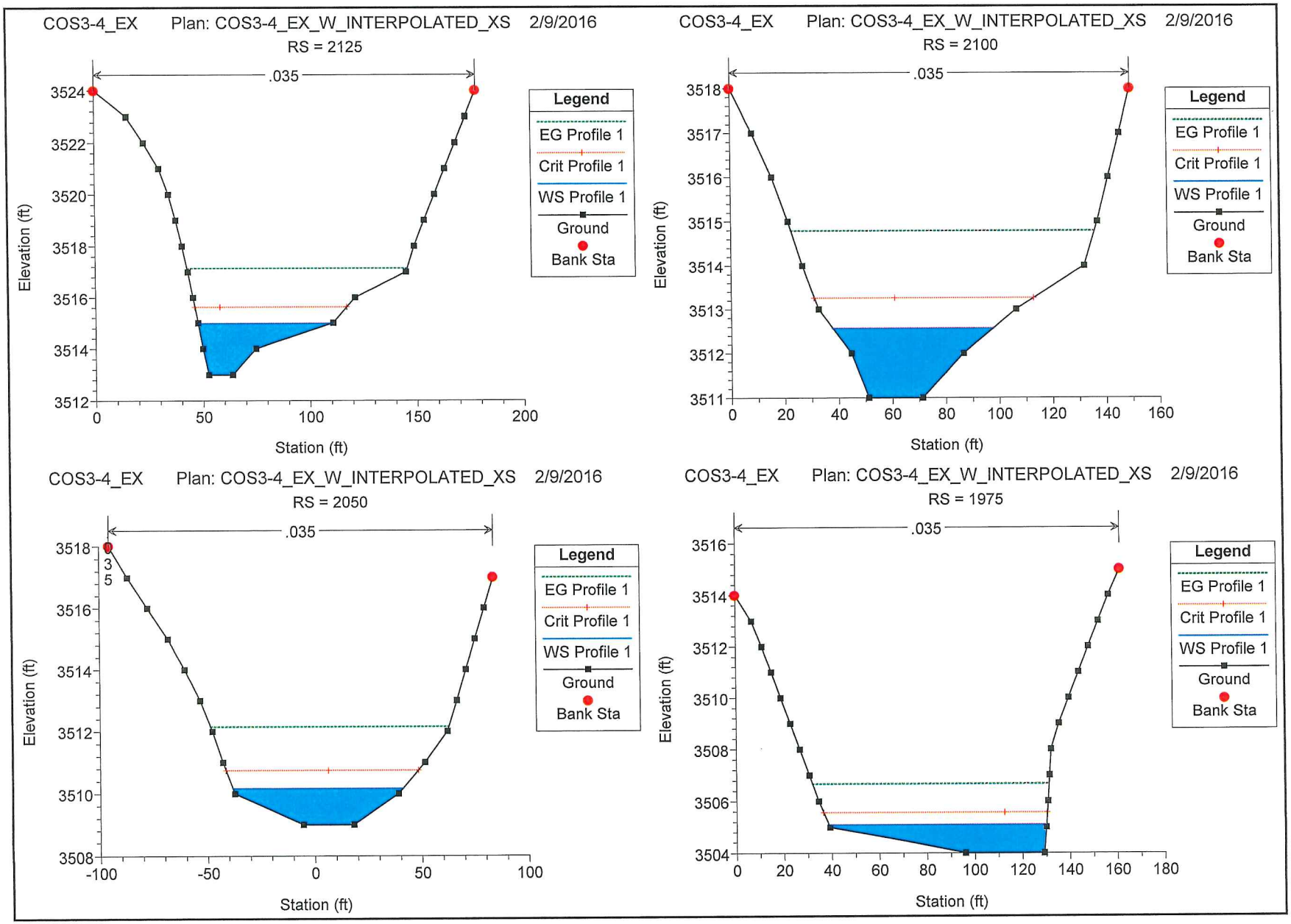
RS = 2225
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2200
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2175
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2150
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2125
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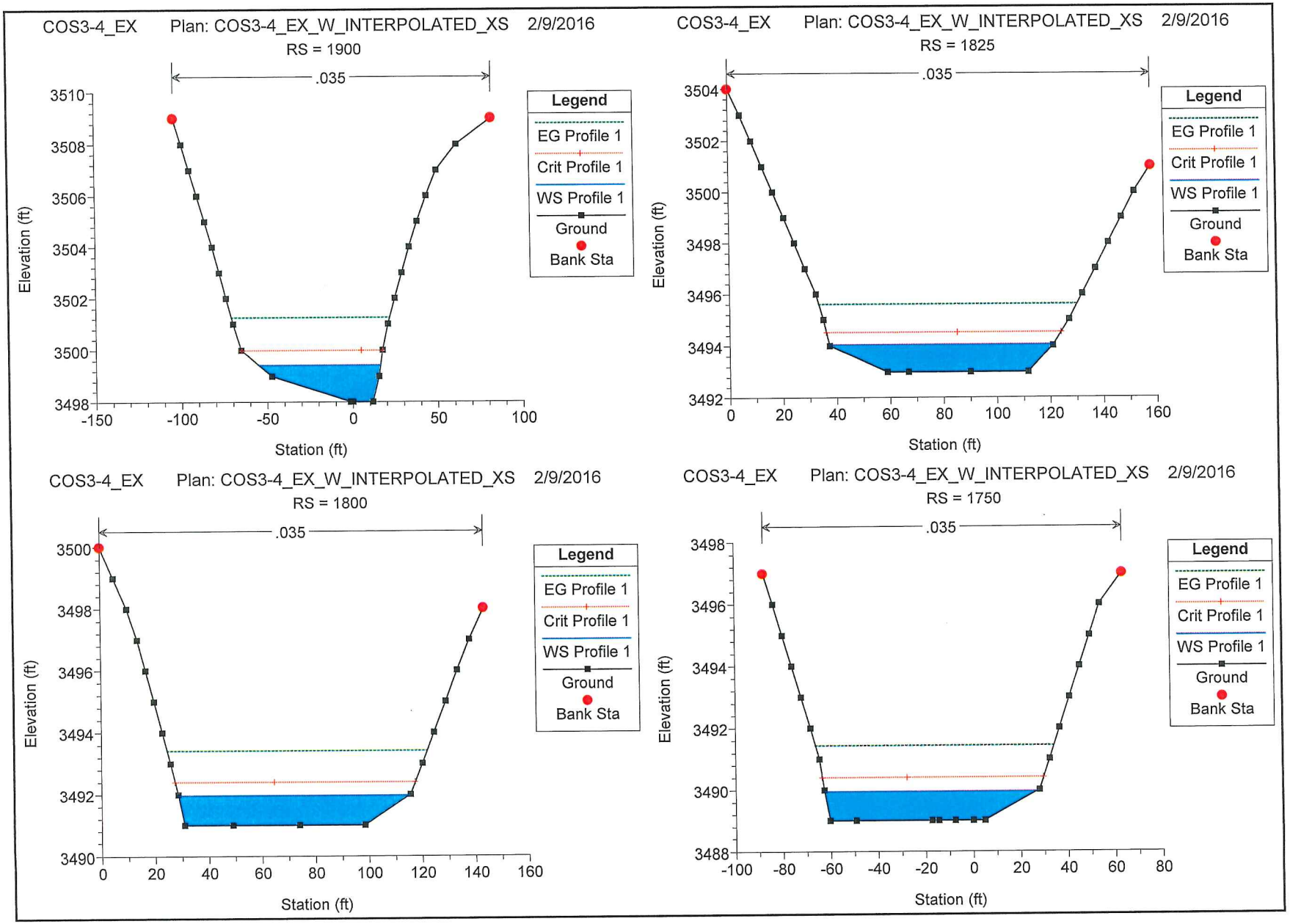
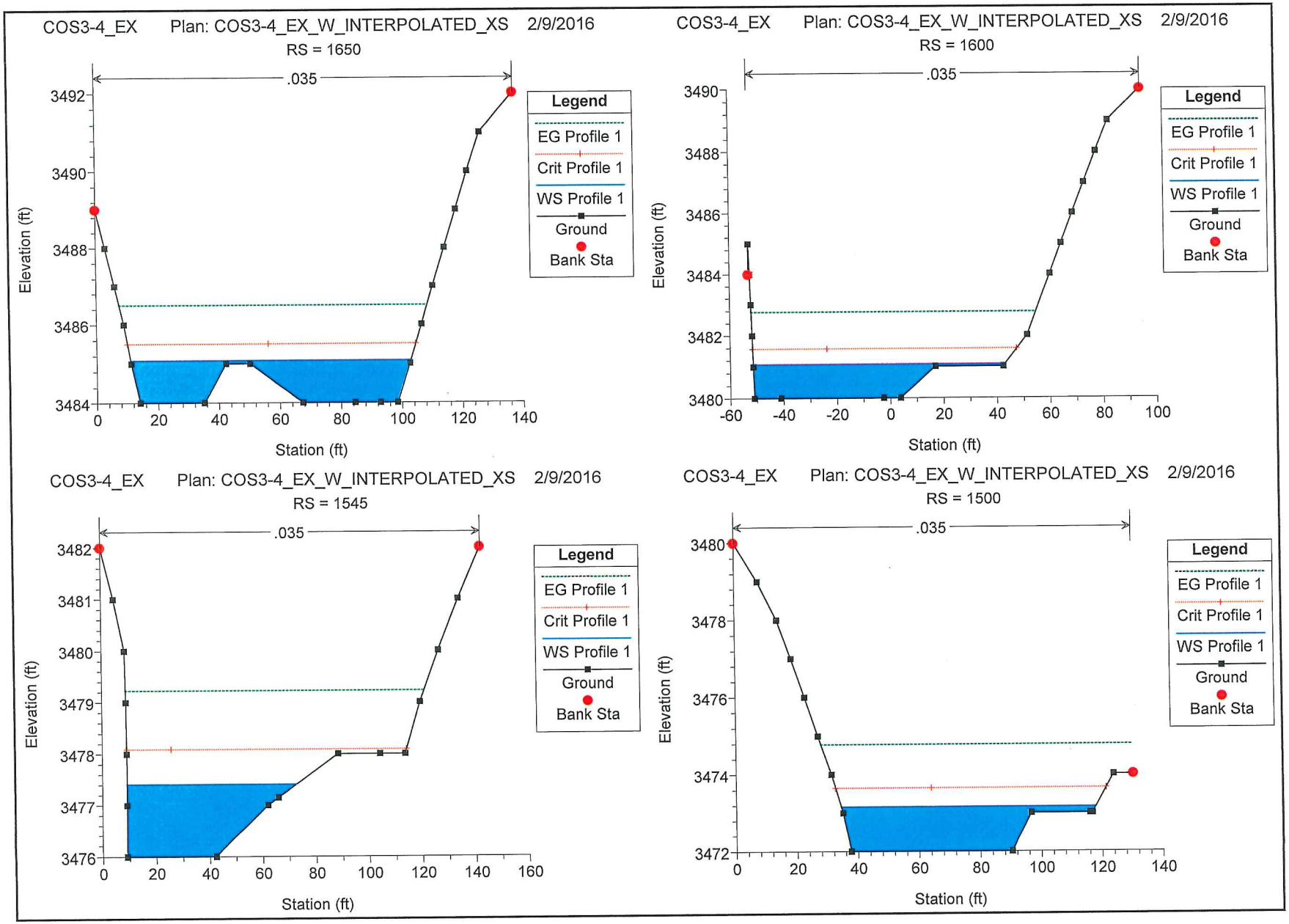
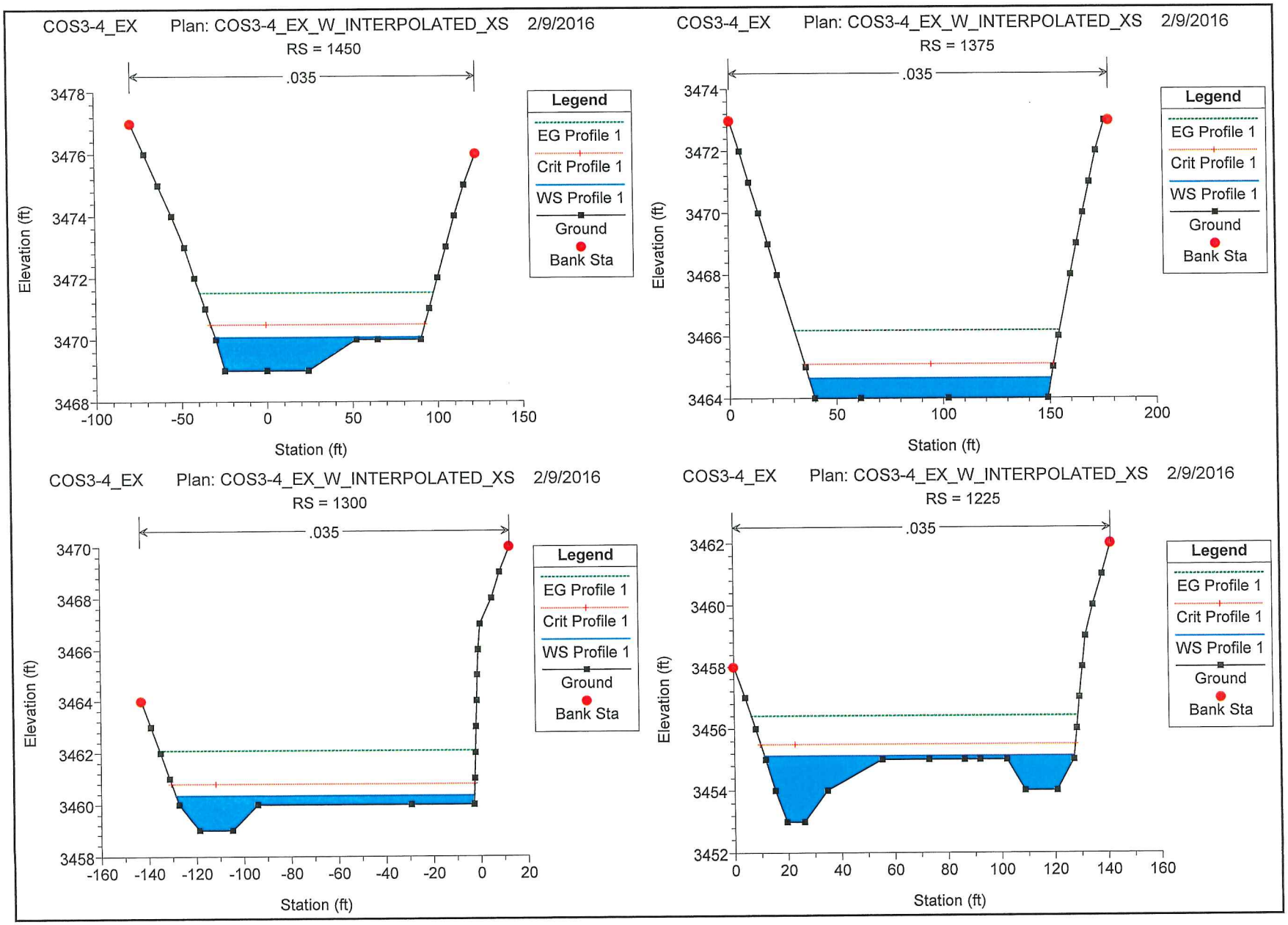
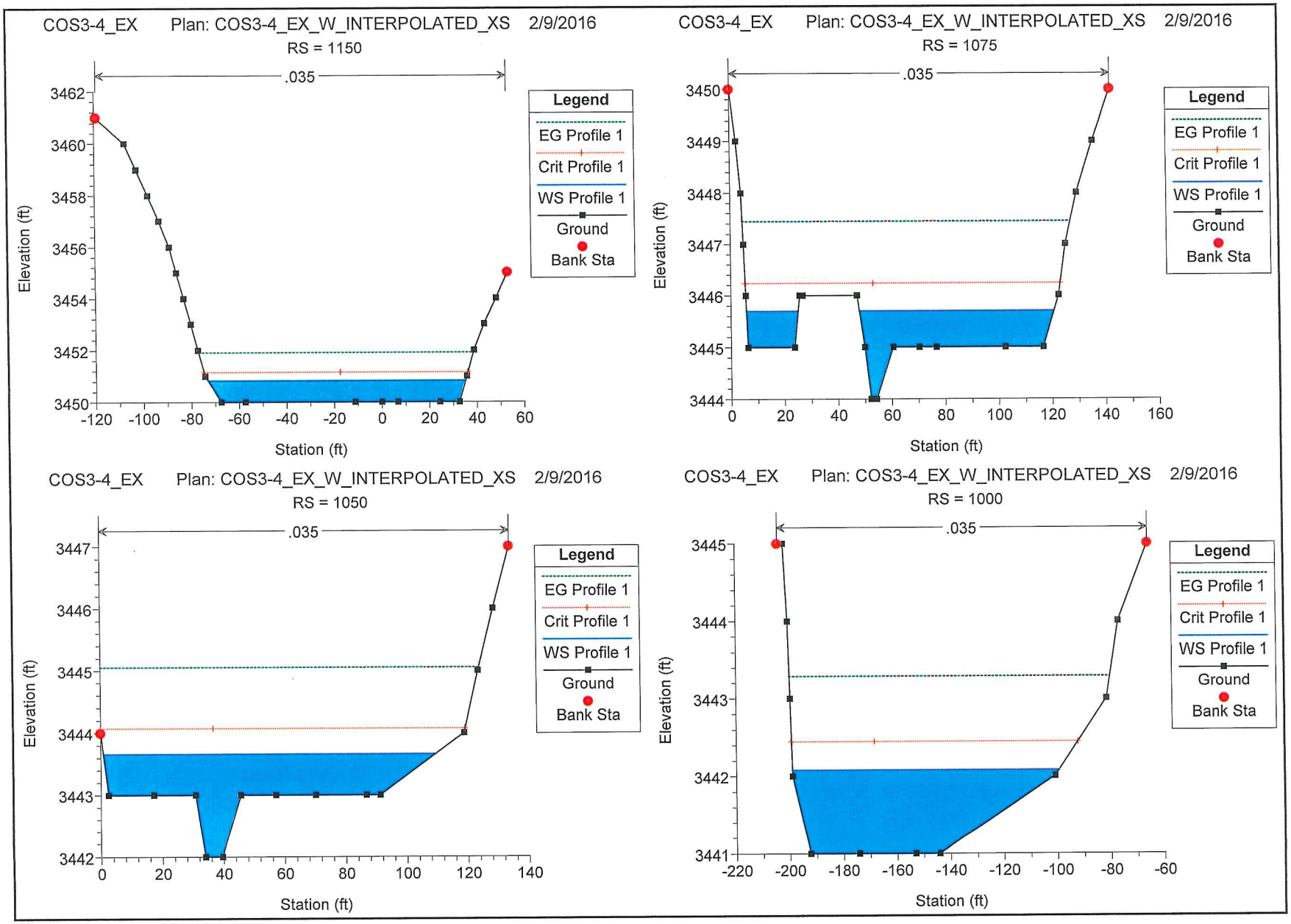
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2100
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 2050
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1975
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta


COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1900
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1825
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1800
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1750
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1650
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1600
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1545
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1500
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1450
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1375
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1300
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1225
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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RS = 1150
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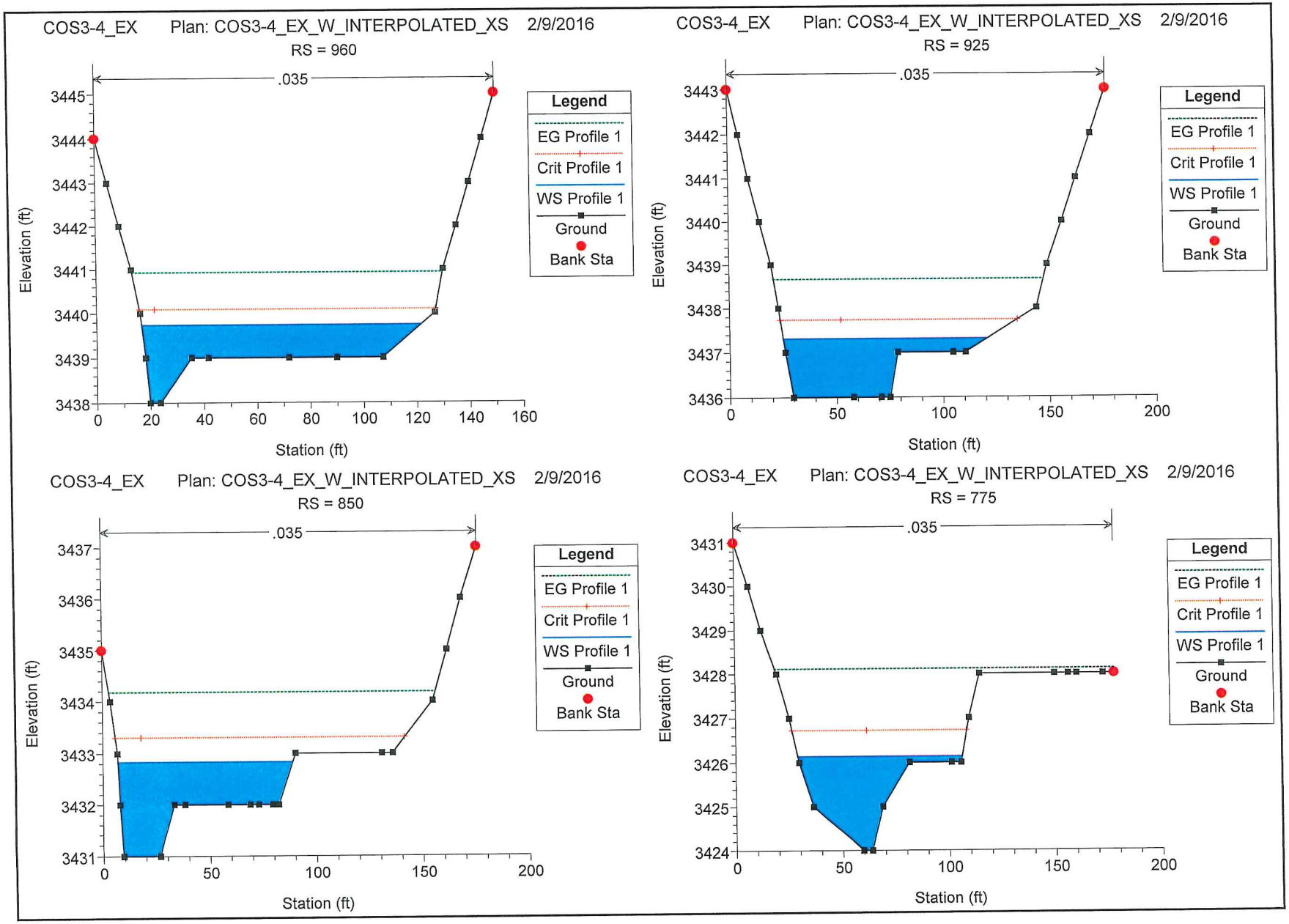
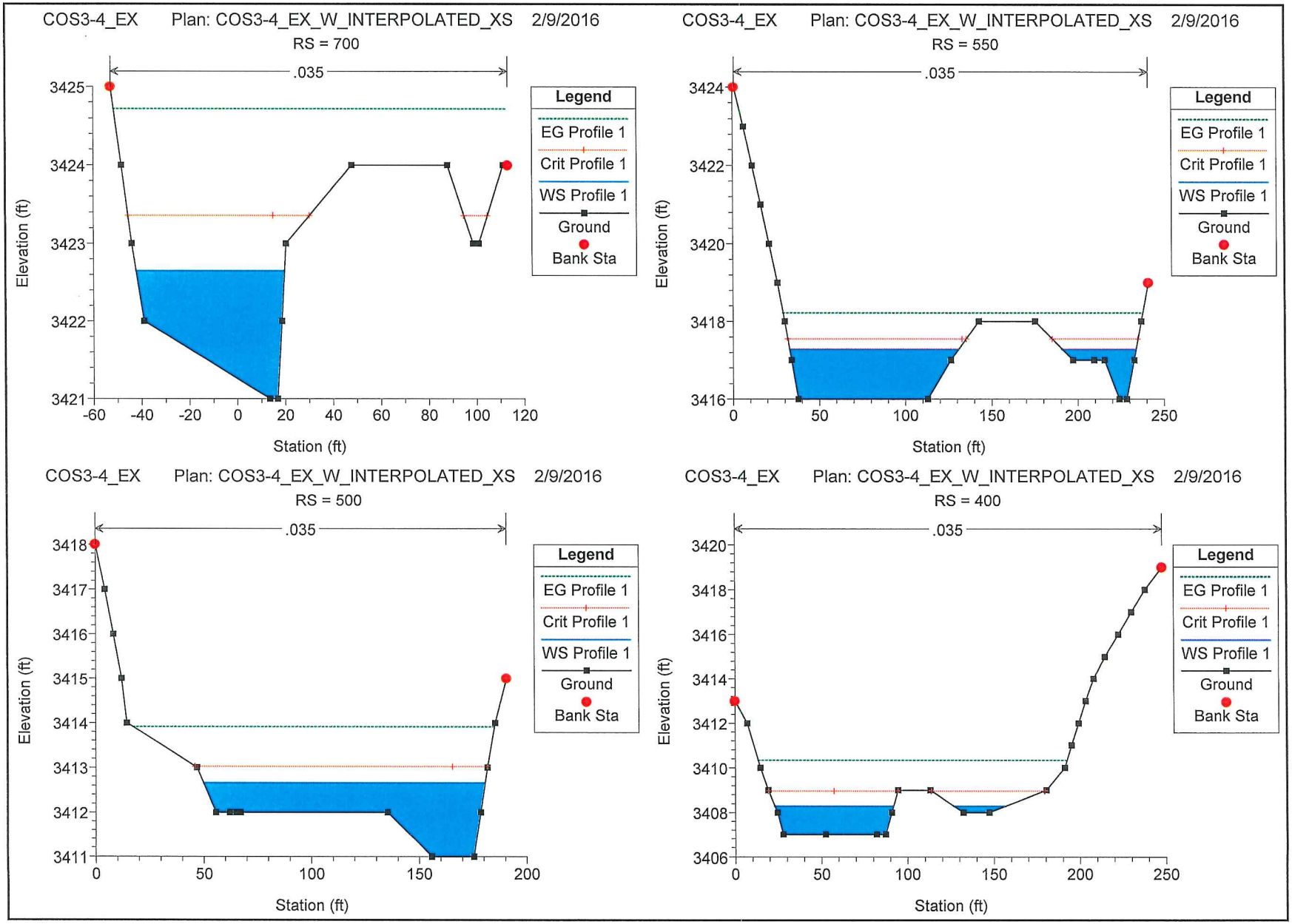
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1075
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1050
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 1000
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 960
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 925
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 850
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 775
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta


COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 700
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Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 550
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 500
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 400
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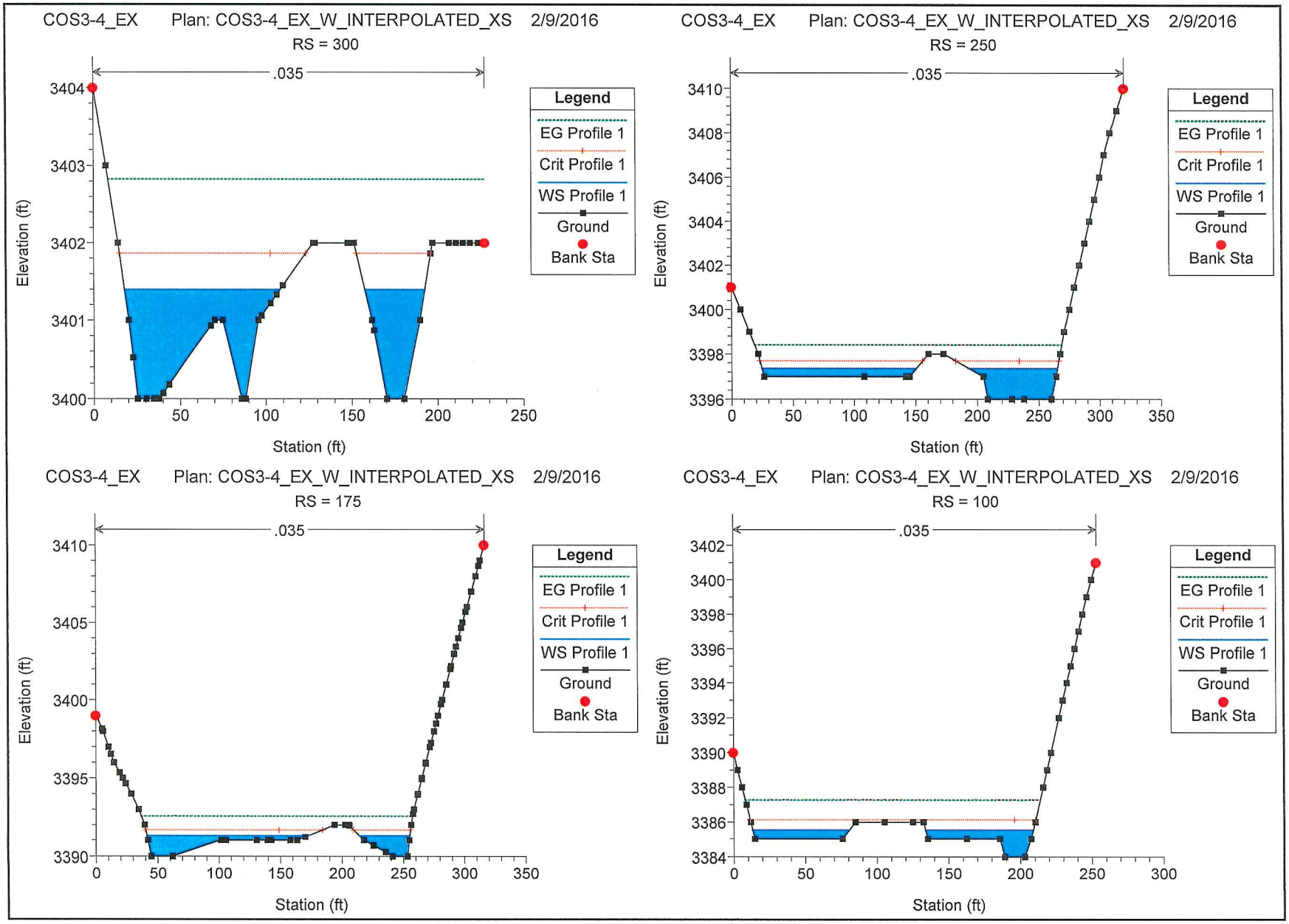
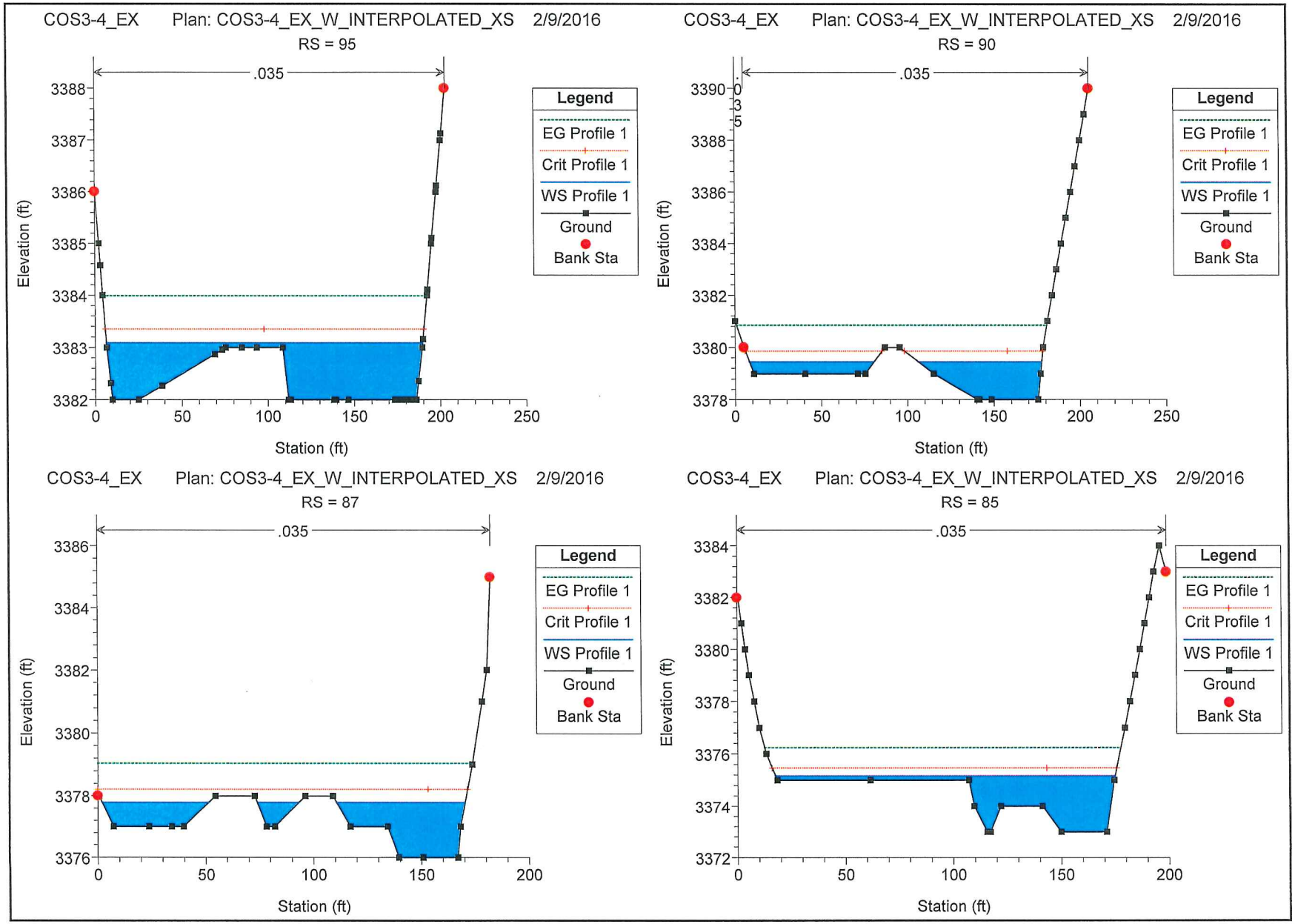
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta


COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 300
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 250
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 175
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 100
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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RS = 95
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 90
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 87
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 85
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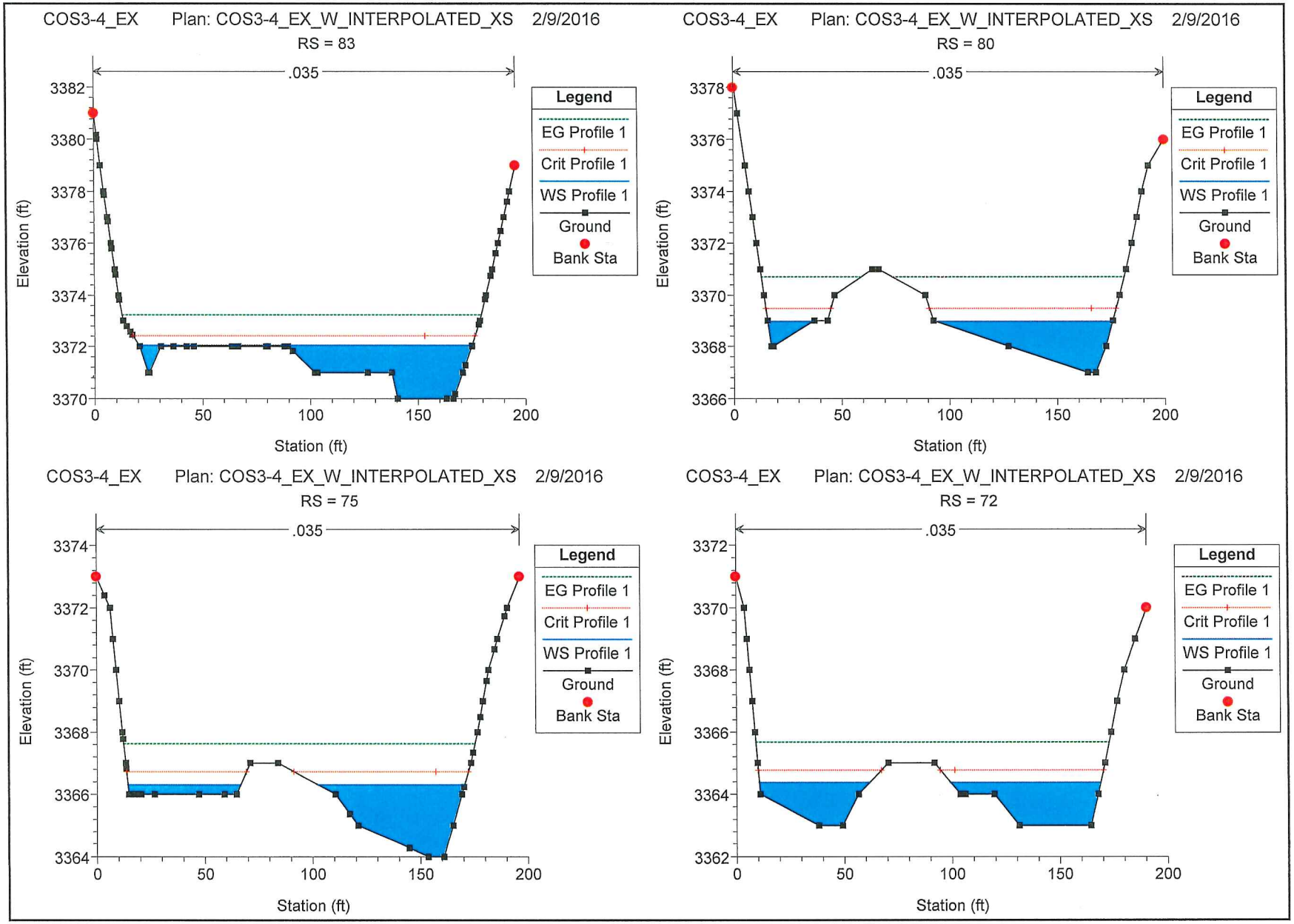
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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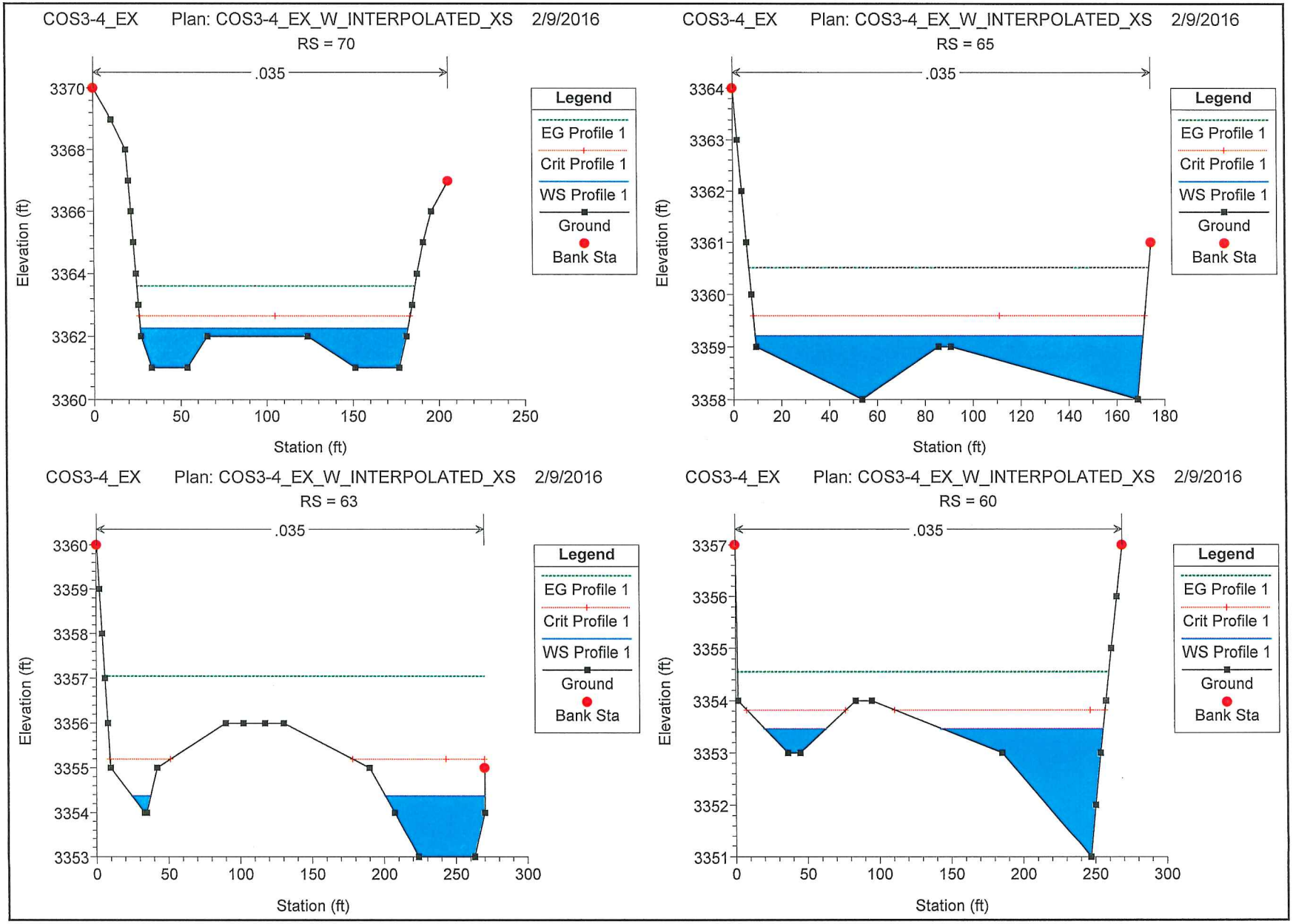
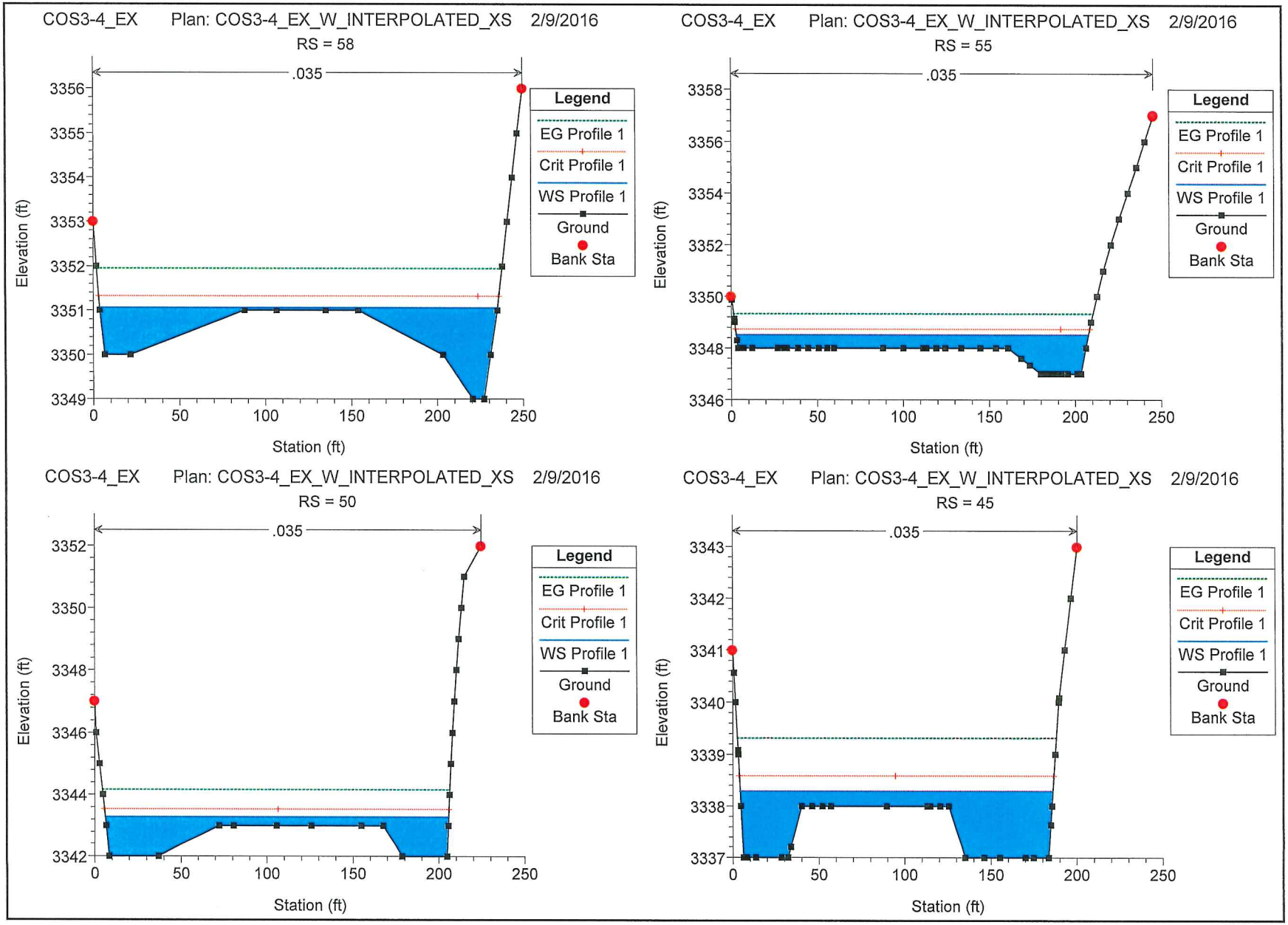
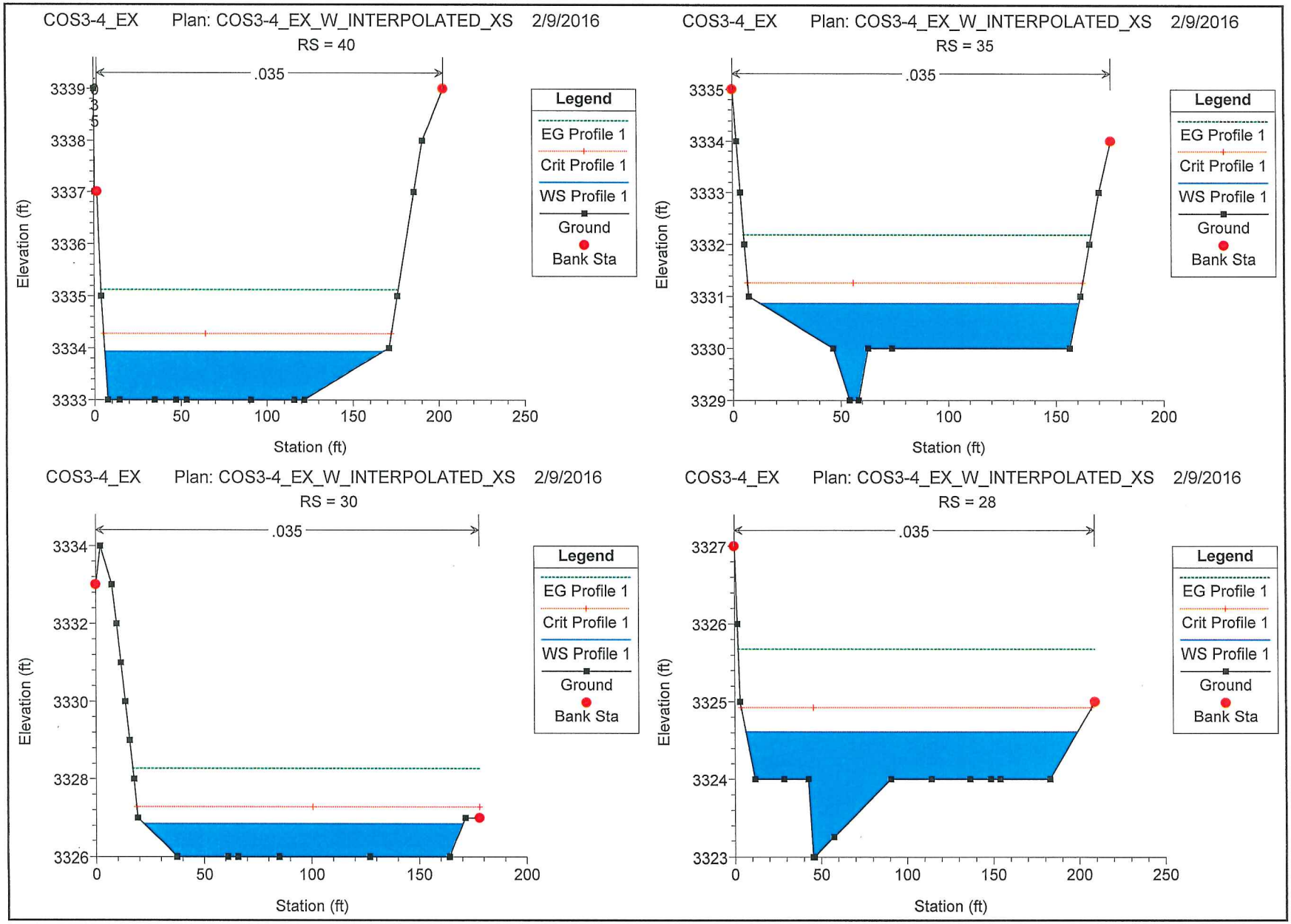
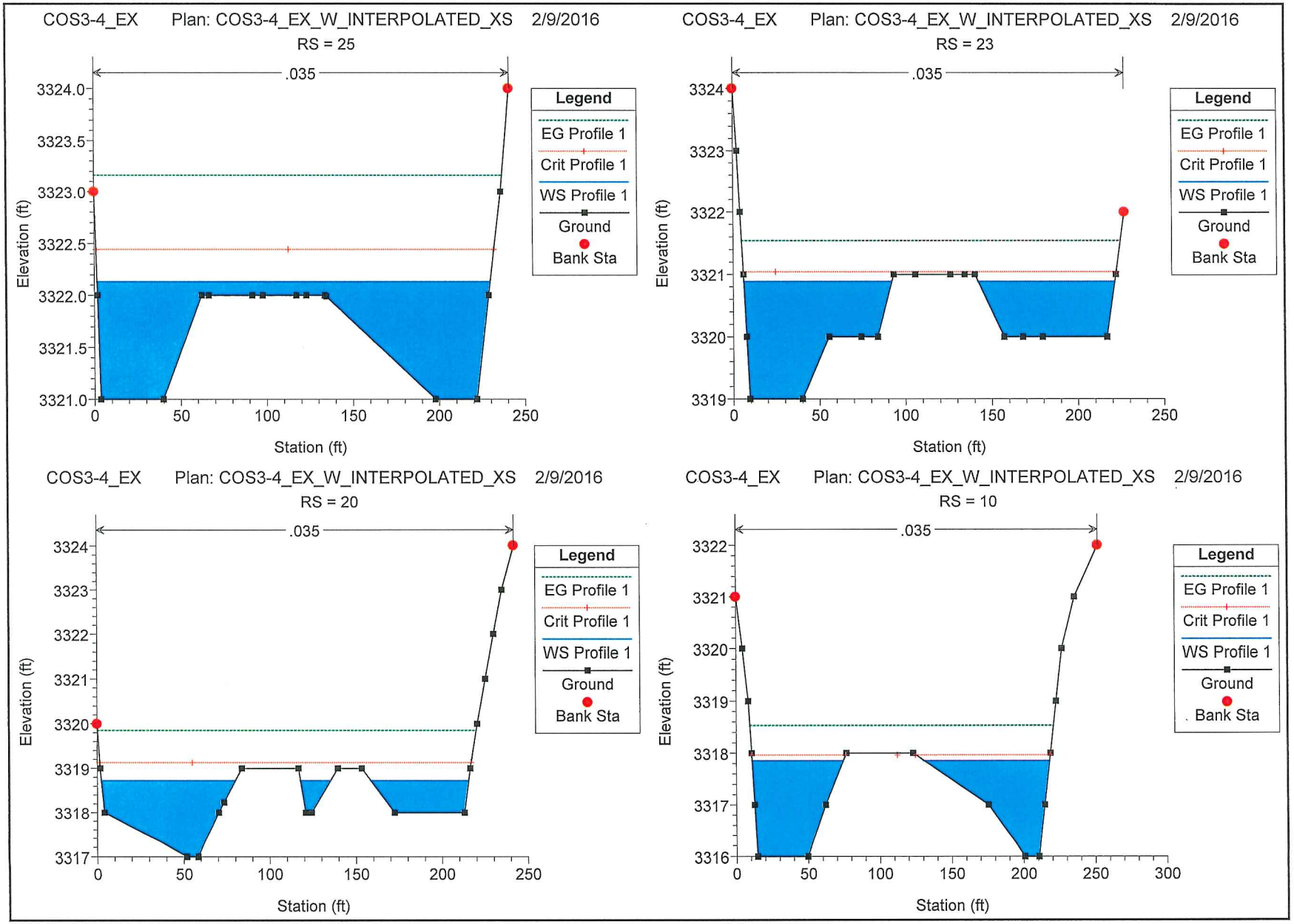
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 80
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 75
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 72
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 70
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 65
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 63
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 60
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

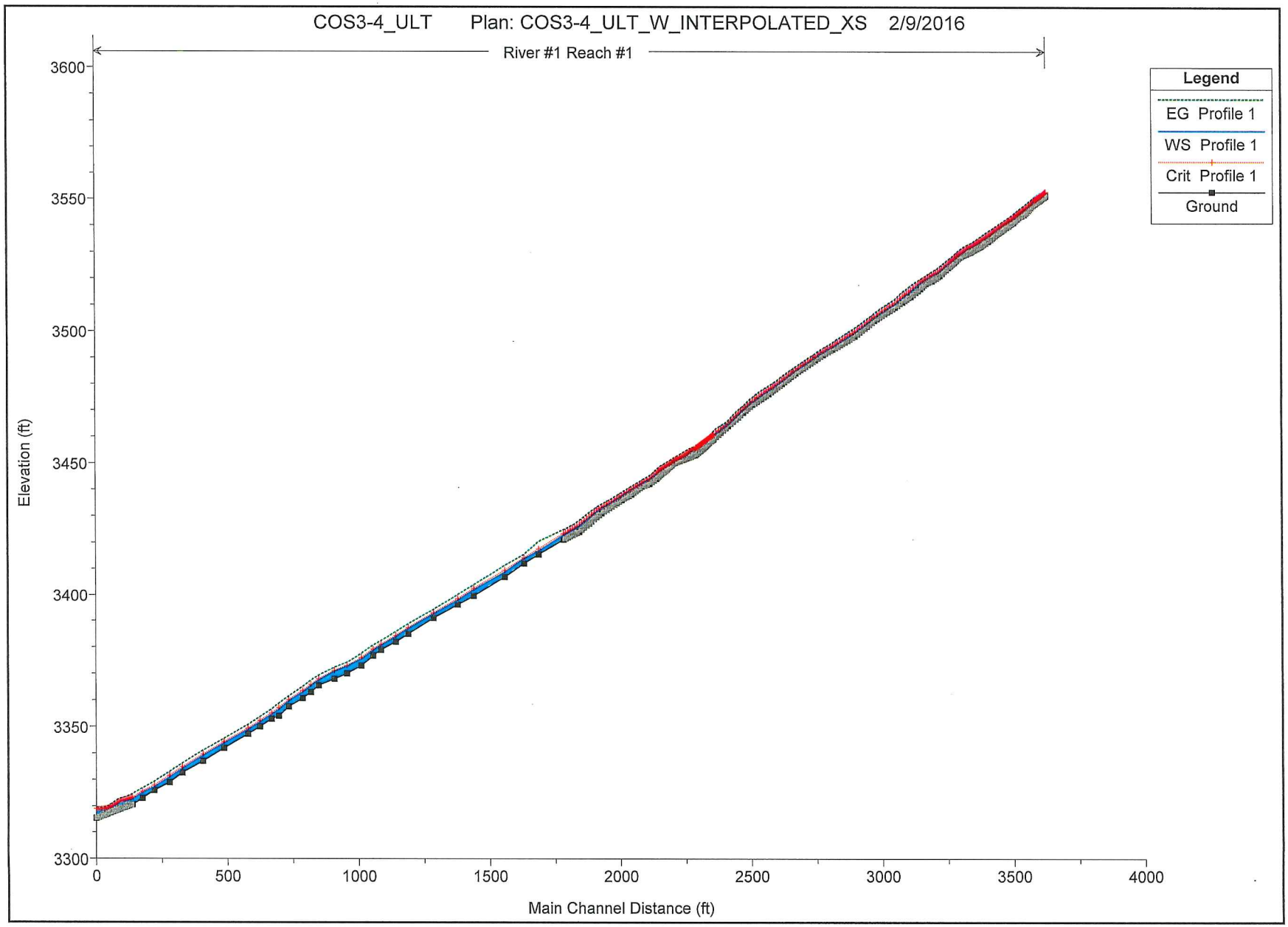

COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 58
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 55
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 50
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 45
.035
Elevation (ft)
Station (ft)
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta

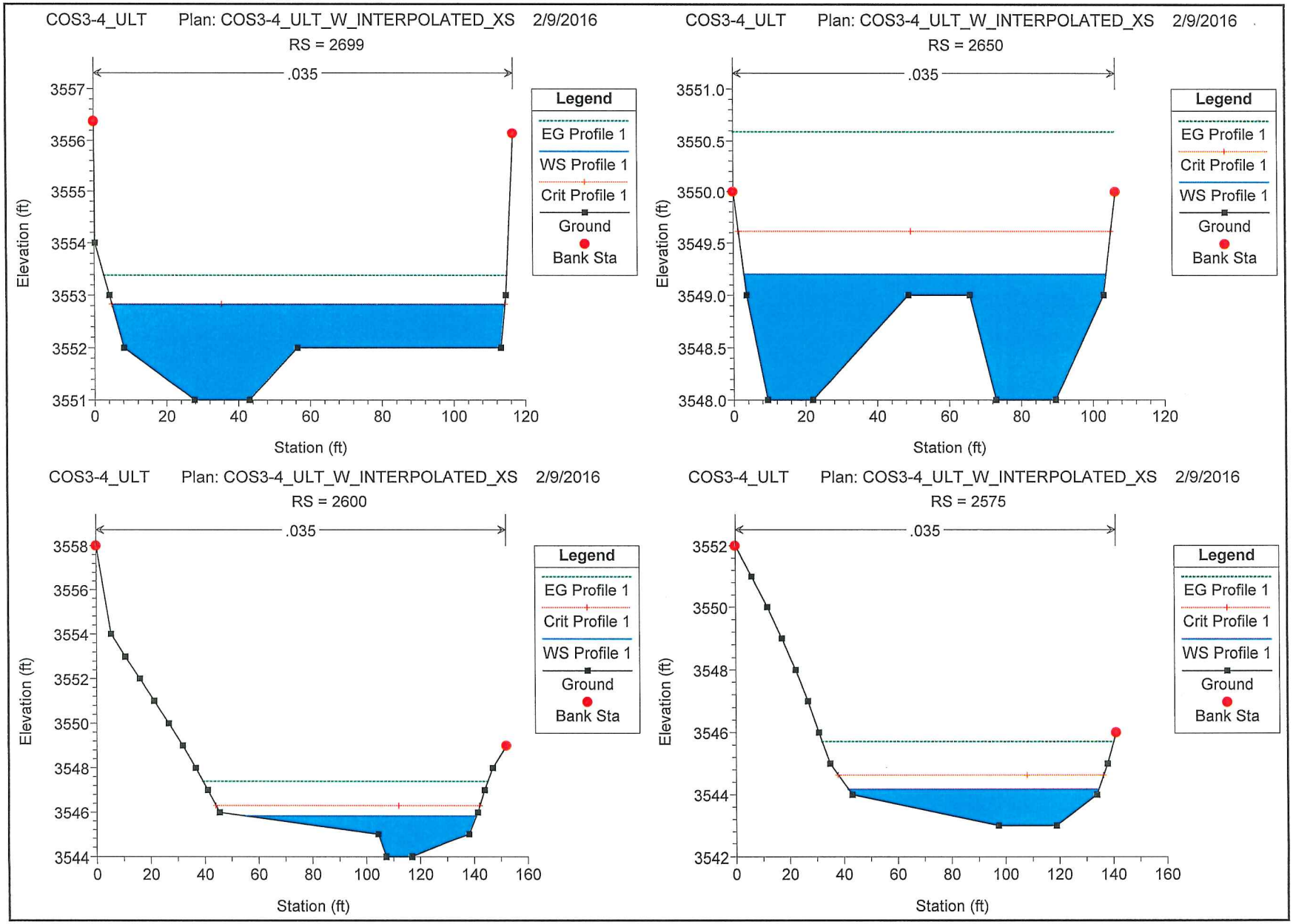

COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 40
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 35
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 30
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 28
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

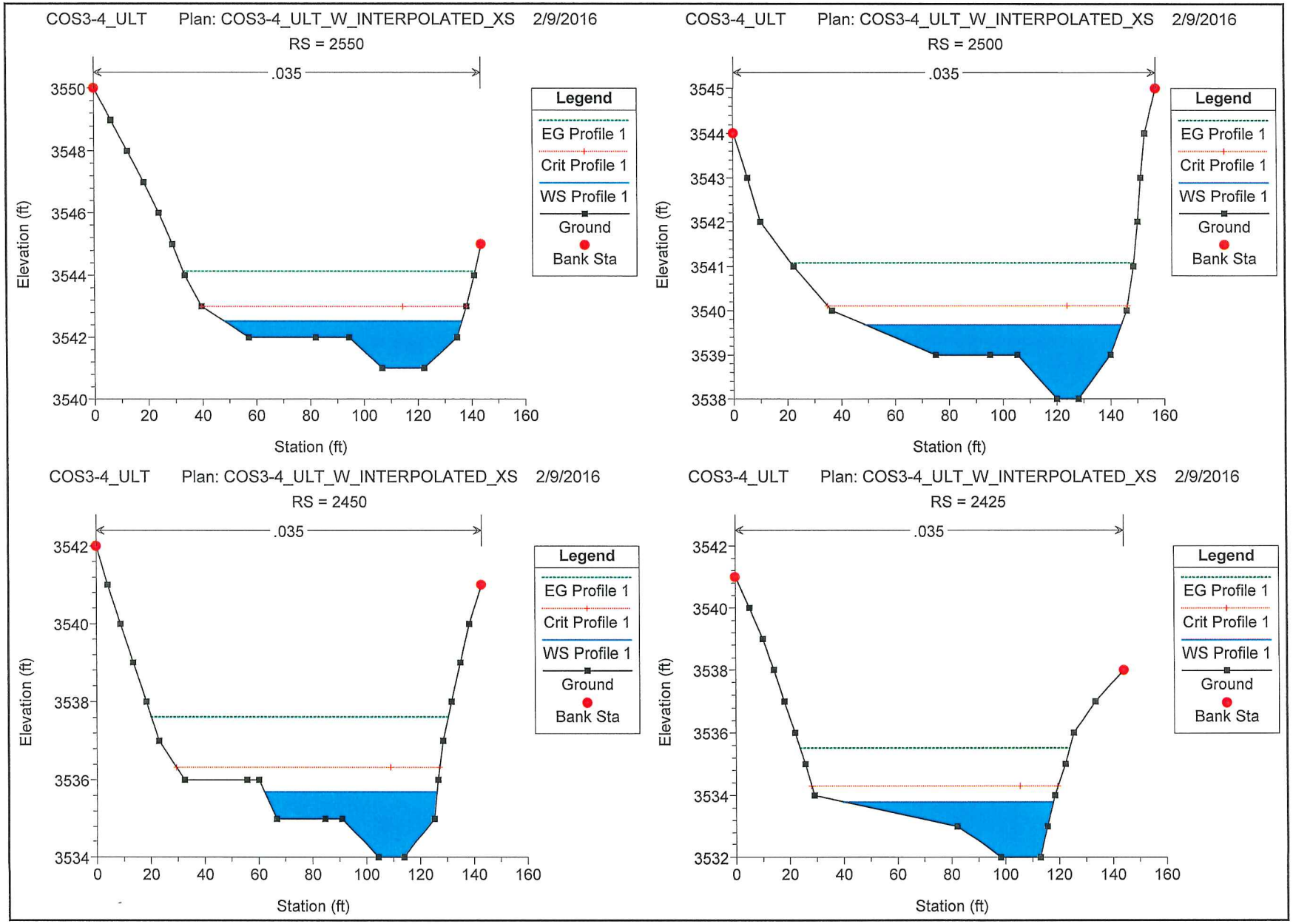

COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 25
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 23
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 20
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_EX Plan: COS3-4_EX_W_INTERPOLATED_XS 2/9/2016
RS = 10
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

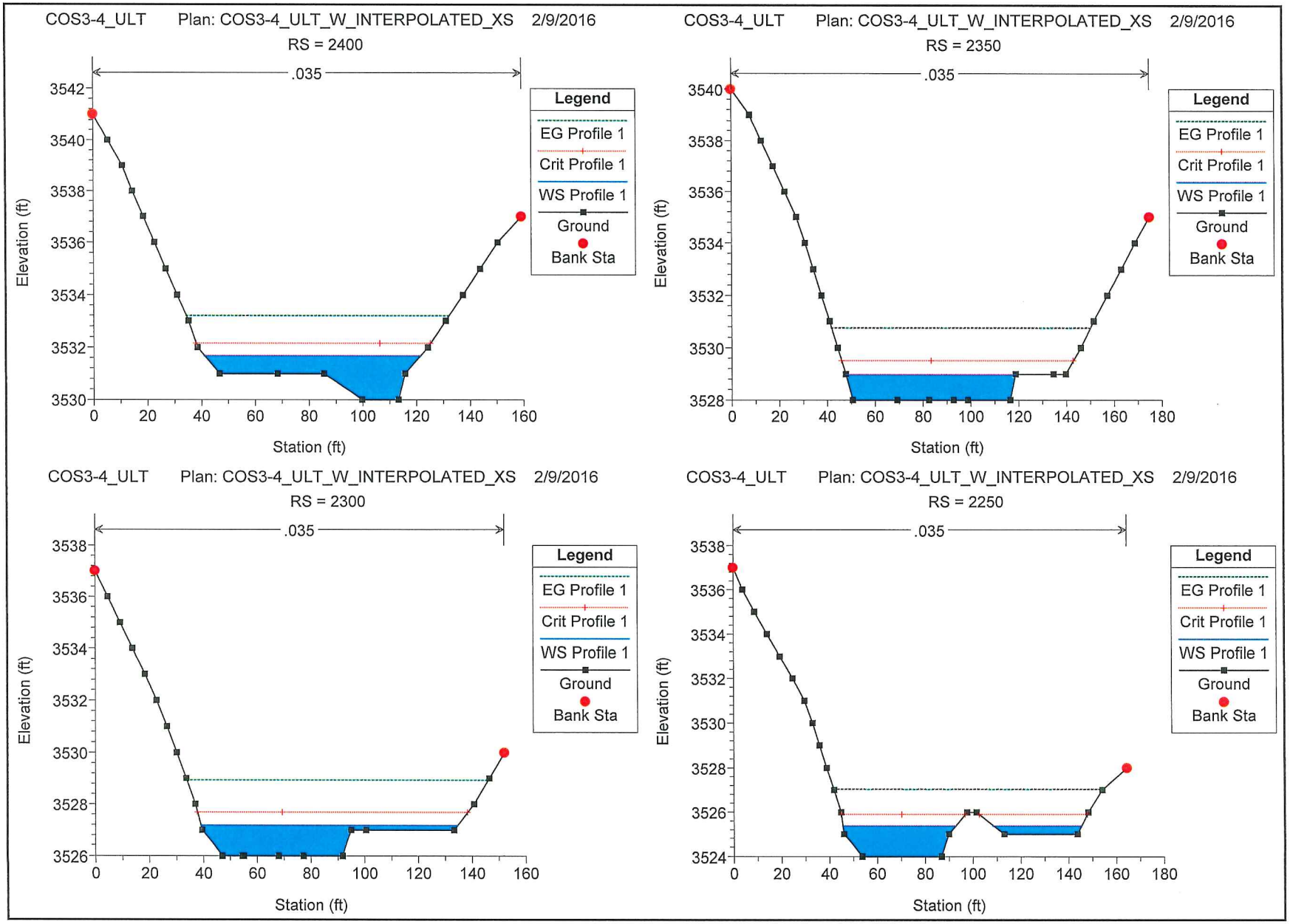
HEC-RAS Plan: COS-3-4_ULT_W_XS River: River #1 Reach: Reach #1 Profile: Profile 1

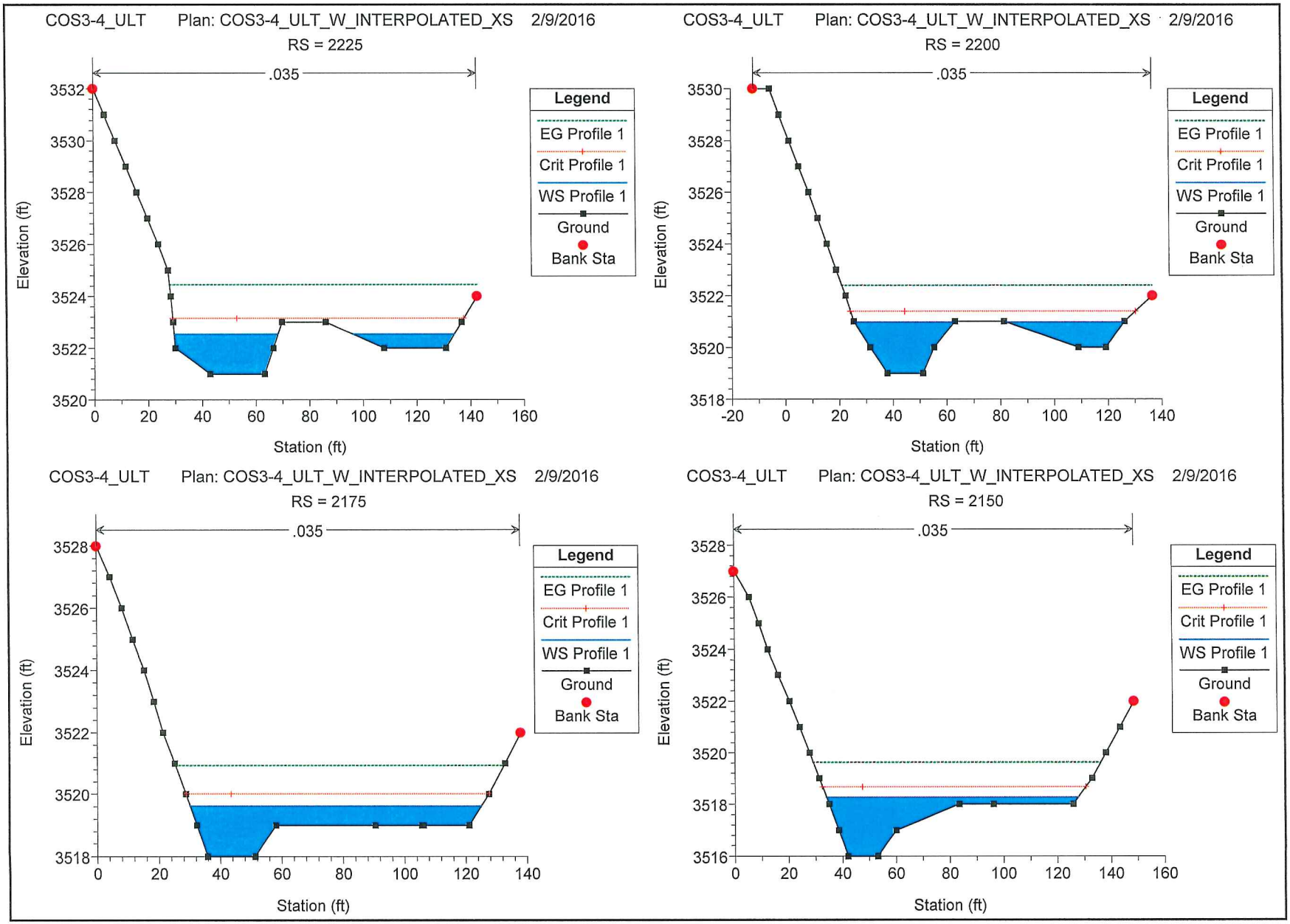
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach #1	2699	Profile 1	720.00	3551.00	3552.82	3552.82	3553.38	0.017799	6.00	119.94	109.51	1.01
Reach #1	2650	Profile 1	720.00	3548.00	3549.20	3549.61	3550.59	0.072287	9.45	76.18	100.86	1.92
Reach #1	2600	Profile 1	720.00	3544.00	3545.84	3546.30	3547.40	0.071074	10.03	71.82	85.83	1.93
Reach #1	2575	Profile 1	720.00	3543.00	3544.18	3544.63	3545.72	0.076902	9.96	72.30	92.87	1.99
Reach #1	2550	Profile 1	720.00	3541.00	3542.52	3543.00	3544.13	0.077894	10.20	70.59	88.23	2.01
Reach #1	2500	Profile 1	720.00	3538.00	3539.68	3540.11	3541.08	0.067884	9.49	75.84	95.24	1.87
Reach #1	2450	Profile 1	720.00	3534.00	3535.70	3536.32	3537.62	0.068506	11.13	64.66	64.11	1.95
Reach #1	2425	Profile 1	720.00	3532.00	3533.80	3534.30	3535.52	0.073815	10.54	68.29	77.79	1.98
Reach #1	2400	Profile 1	720.00	3530.00	3531.68	3532.14	3533.20	0.061837	9.87	72.97	80.44	1.83
Reach #1	2350	Profile 1	720.00	3528.00	3528.98	3529.50	3530.76	0.068865	10.71	67.22	70.94	1.94
Reach #1	2300	Profile 1	720.00	3526.00	3527.19	3527.69	3528.94	0.099165	10.62	67.81	95.54	2.22
Reach #1	2250	Profile 1	720.00	3524.00	3525.40	3525.90	3527.04	0.076026	10.30	69.94	84.34	1.99
Reach #1	2225	Profile 1	720.00	3521.00	3522.53	3523.15	3524.45	0.086411	11.12	64.76	76.43	2.13
Reach #1	2200	Profile 1	720.00	3519.00	3520.98	3521.40	3522.41	0.057514	9.60	74.98	81.45	1.76
Reach #1	2175	Profile 1	720.00	3518.00	3519.63	3520.01	3520.94	0.061270	9.21	78.19	94.98	1.79
Reach #1	2150	Profile 1	720.00	3516.00	3518.28	3518.68	3519.64	0.063912	9.37	76.84	93.77	1.82
Reach #1	2125	Profile 1	720.00	3513.00	3514.99	3515.62	3517.14	0.080117	11.77	61.18	62.68	2.10
Reach #1	2100	Profile 1	720.00	3511.00	3512.57	3513.26	3514.80	0.079511	11.96	60.19	60.12	2.11
Reach #1	2050	Profile 1	720.00	3509.00	3510.18	3510.75	3512.16	0.094947	11.29	63.80	79.56	2.22
Reach #1	1975	Profile 1	720.00	3504.00	3505.10	3505.56	3506.69	0.079593	10.11	71.23	91.38	2.02
Reach #1	1900	Profile 1	720.00	3498.00	3499.43	3499.99	3501.25	0.071531	10.82	66.51	71.21	1.97
Reach #1	1825	Profile 1	720.00	3493.00	3494.04	3494.51	3495.61	0.069458	10.06	71.57	83.87	1.92
Reach #1	1800	Profile 1	720.00	3491.00	3491.97	3492.40	3493.42	0.063356	9.67	74.49	86.38	1.83
Reach #1	1750	Profile 1	720.00	3489.00	3489.95	3490.40	3491.44	0.068938	9.78	73.63	89.41	1.90
Reach #1	1650	Profile 1	720.00	3484.00	3485.08	3485.50	3486.50	0.066724	9.57	75.27	91.97	1.86
Reach #1	1600	Profile 1	720.00	3480.00	3481.08	3481.57	3482.77	0.092844	10.43	69.00	94.43	2.15
Reach #1	1545	Profile 1	720.00	3476.00	3477.41	3478.09	3479.22	0.062879	10.82	66.54	63.53	1.86
Reach #1	1500	Profile 1	720.00	3472.00	3473.16	3473.65	3474.78	0.072471	10.20	70.58	83.39	1.95
Reach #1	1450	Profile 1	720.00	3469.00	3470.08	3470.49	3471.52	0.097735	9.63	74.76	120.81	2.16
Reach #1	1375	Profile 1	720.00	3464.00	3464.65	3465.09	3466.19	0.100405	9.95	72.34	113.47	2.20
Reach #1	1300	Profile 1	720.00	3459.00	3460.36	3460.81	3462.10	0.142321	10.60	67.95	125.87	2.54
Reach #1	1225	Profile 1	720.00	3453.00	3455.14	3455.51	3456.42	0.076467	9.08	79.32	116.12	1.94
Reach #1	1150	Profile 1	720.00	3450.00	3450.83	3451.15	3451.91	0.052570	8.35	86.22	108.32	1.65
Reach #1	1075	Profile 1	720.00	3444.00	3445.70	3446.23	3447.44	0.094723	10.60	67.95	92.07	2.17
Reach #1	1050	Profile 1	720.00	3442.00	3443.67	3444.07	3445.06	0.080435	9.46	76.09	108.82	1.99
Reach #1	1000	Profile 1	720.00	3441.00	3442.09	3442.45	3443.29	0.056540	8.82	81.62	99.78	1.72
Reach #1	960	Profile 1	720.00	3438.00	3439.74	3440.09	3440.93	0.059547	8.77	82.13	104.98	1.75
Reach #1	925	Profile 1	720.00	3436.00	3437.31	3437.73	3438.66	0.064827	9.33	77.15	95.87	1.83
Reach #1	850	Profile 1	799.00	3431.00	3432.83	3433.29	3434.17	0.045544	9.30	85.95	81.97	1.60
Reach #1	775	Profile 1	799.00	3424.00	3426.14	3426.71	3428.12	0.079717	11.29	70.76	77.14	2.08
Reach #1	700	Profile 1	799.00	3421.00	3422.63	3423.31	3424.76	0.017883	11.72	68.18	61.95	1.97
Reach #1	550	Profile 1	1031.00	3415.41	3416.57	3417.45	3420.20	0.177489	15.31	67.34	84.94	3.03
Reach #1	500	Profile 1	1031.00	3412.00	3413.63	3414.13	3415.34	0.048751	10.50	98.19	81.79	1.69
Reach #1	400	Profile 1	1031.00	3406.78	3408.46	3409.33	3411.10	0.067625	13.05	79.00	59.63	2.00
Reach #1	300	Profile 1	1031.00	3399.62	3401.75	3402.34	3403.74	0.055802	11.32	91.05	73.33	1.79
Reach #1	250	Profile 1	1031.00	3396.22	3397.86	3398.47	3399.94	0.069659	11.58	89.06	83.52	1.98
Reach #1	175	Profile 1	1031.00	3390.96	3392.49	3393.03	3394.31	0.052872	10.80	95.42	80.80	1.75
Reach #1	100	Profile 1	1031.00	3384.96	3386.83	3387.38	3388.71	0.063903	11.00	93.74	88.25	1.88
Reach #1	95	Profile 1	1031.00	3381.93	3383.76	3384.32	3385.67	0.063279	11.08	93.05	85.80	1.87
Reach #1	90	Profile 1	1031.00	3378.92	3380.53	3381.06	3382.31	0.055828	10.70	96.40	85.68	1.78
Reach #1	87	Profile 1	1031.00	3376.89	3378.73	3379.27	3380.56	0.060414	10.86	94.92	87.03	1.83
Reach #1	85	Profile 1	1031.00	3373.00	3375.53	3376.13	3377.61	0.072293	11.58	89.02	85.09	2.00
Reach #1	83	Profile 1	1031.00	3370.00	3372.59	3373.07	3374.22	0.051683	10.24	100.69	89.58	1.70
Reach #1	80	Profile 1	1031.00	3368.00	3370.81	3371.22	3372.21	0.034825	9.51	108.36	79.19	1.43
Reach #1	75	Profile 1	1031.00	3365.45	3367.41	3367.97	3369.34	0.066435	11.15	92.44	87.16	1.91
Reach #1	72	Profile 1	1031.00	3363.00	3365.27	3365.87	3367.32	0.072189	11.49	89.69	86.27	1.99
Reach #1	70	Profile 1	1031.00	3360.73	3362.89	3363.51	3364.98	0.074165	11.59	88.92	86.24	2.01
Reach #1	65	Profile 1	1031.00	3357.57	3359.59	3360.13	3361.44	0.059753	10.91	94.46	85.53	1.83
Reach #1	63	Profile 1	1031.00	3354.00	3356.45	3357.10	3358.71	0.089445	12.07	85.45	89.79	2.18
Reach #1	60	Profile 1	1031.00	3353.00	3354.59	3355.16	3356.54	0.066028	11.22	91.92	86.41	1.92
Reach #1	58	Profile 1	1031.00	3350.05	3351.73	3352.30	3353.66	0.064511	11.16	92.40	86.13	1.90
Reach #1	55	Profile 1	1031.00	3347.25	3348.89	3349.42	3350.71	0.064104	10.82	95.27	92.32	1.88
Reach #1	50	Profile 1	1031.00	3341.92	3343.85	3344.33	3345.49	0.050192	10.28	100.34	87.46	1.69
Reach #1	45	Profile 1	1120.00	3337.00	3339.06	3339.64	3341.03	0.060595	11.24	99.64	87.31	1.85
Reach #1	40	Profile 1	1120.00	3332.62	3334.11	3334.71	3336.12	0.063364	11.39	98.36	87.53	1.89
Reach #1	35	Profile 1	1120.00	3329.00	3330.90	3331.52	3332.99	0.067550	11.61	96.45	87.91	1.95
Reach #1	30	Profile 1	1120.00	3325.94	3327.22	3327.82	3329.21	0.060616	11.33	98.82	86.29	1.87
Reach #1	28	Profile 1	1120.00	3323.00	3325.04	3325.54	3326.77	0.047744	10.57	105.99	85.88	1.68
Reach #1	25	Profile 1	1120.00	3320.66	3322.57	3323.20	3324.66	0.065007	11.59	96.60	85.19	1.92
Reach #1	23	Profile 1	1120.00	3319.00	3321.67	3321.93	3322.86	0.025710	8.77	127.70	86.71	1.27
Reach #1	20	Profile 1	1120.00	3317.00	3318.72	3319.13	3319.87	0.049295	8.62	130.79	151.91	1.62
Reach #1	10	Profile 1	1120.00	3315.37	3318.83	3318.83	3319.67	0.015766	7.46	152.66	92.55	1.02


COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
River #1 Reach #1
Legend
EG Profile 1
WS Profile 1
Crit Profile 1
Ground
Elevation (ft)
3600
3550
3500
3450
3400
3350
3300
0
500
1000
1500
2000
2500
3000
3500
4000
Main Channel Distance (ft)


COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2699
.035
Legend
EG Profile 1
WS Profile 1
Crit Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2650
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2600
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2575
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2550
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2500
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2450
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2425
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2400
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2350
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2300
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2250
.035
Legend
EG Profile 1
Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
RS = 2225
.035
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WS Profile 1
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Bank Sta
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Station (ft)
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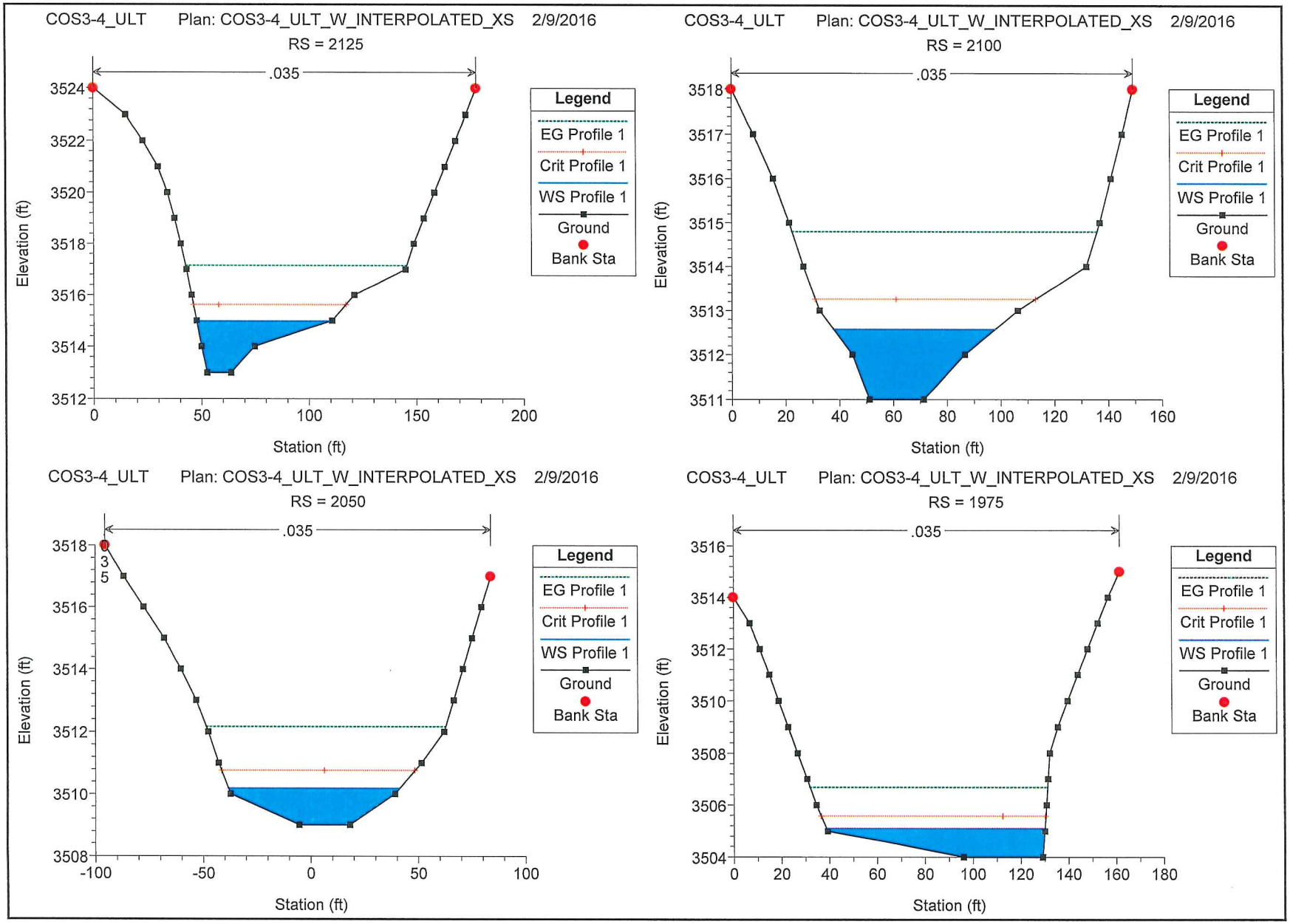
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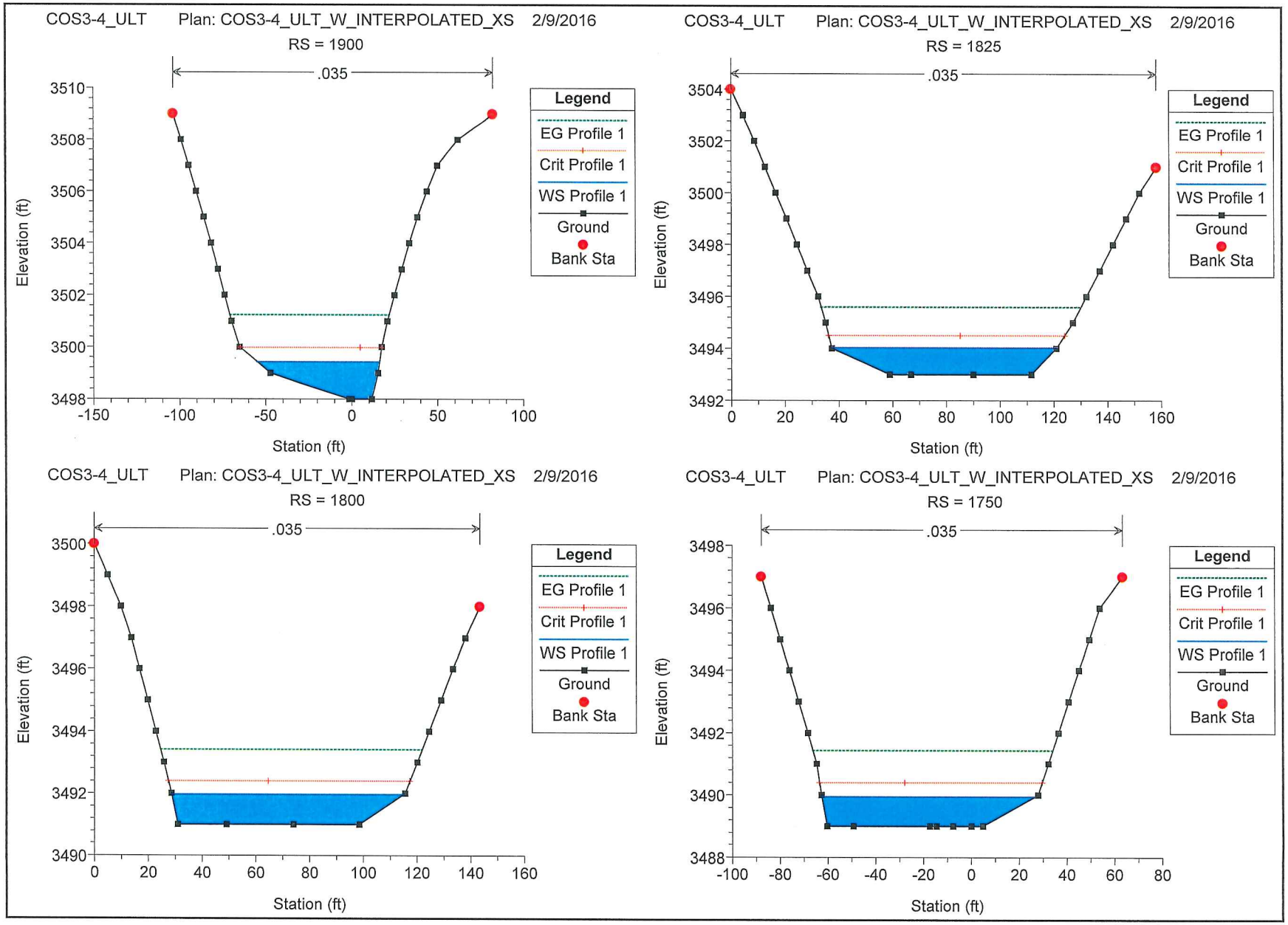
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Ground
Bank Sta
COS3-4_ULT Plan: COS3-4_ULT_W_INTERPOLATED_XS 2/9/2016
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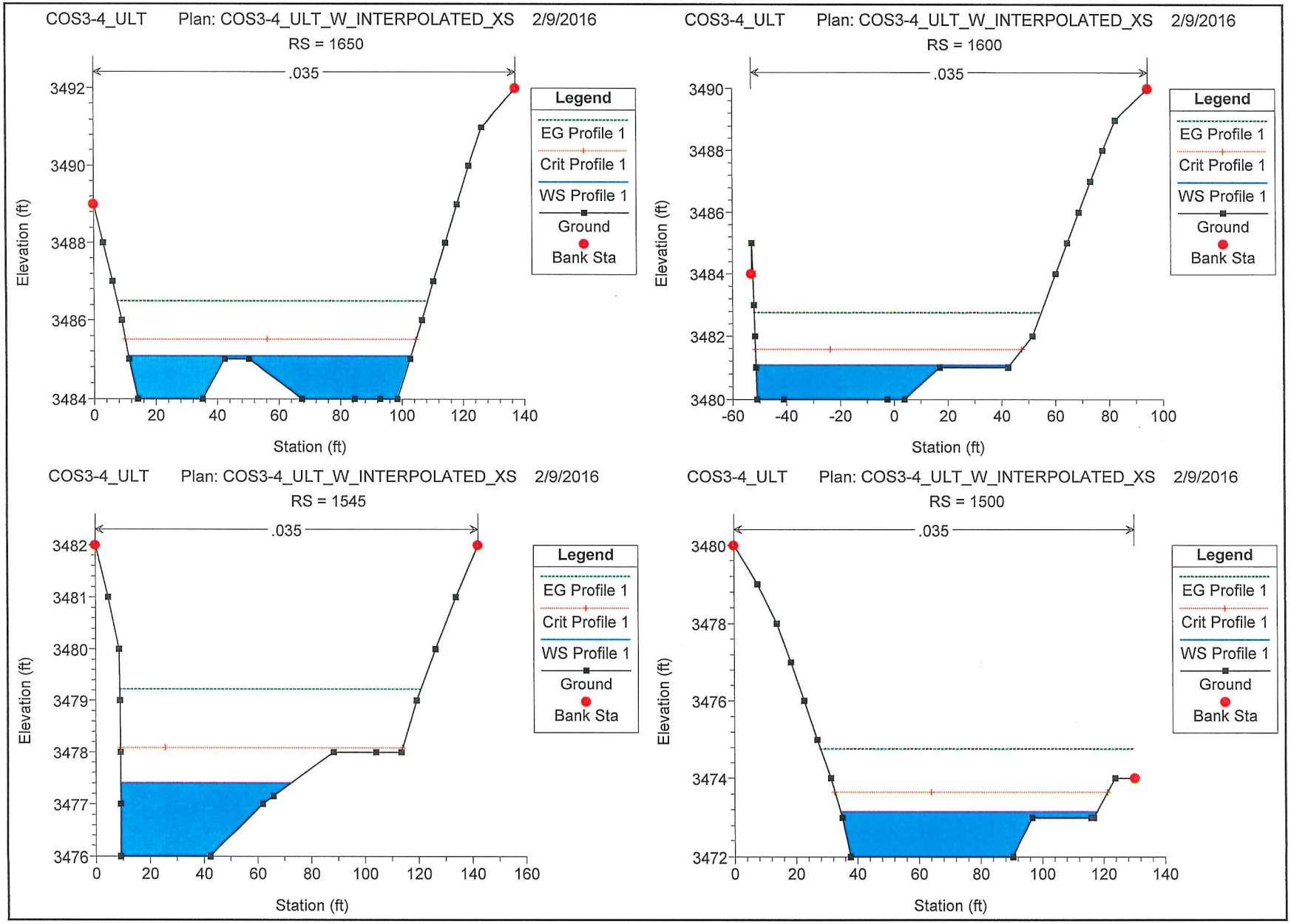
WS Profile 1
Ground
Bank Sta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Station (ft)
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WS Profile 1
Ground
Bank Sta
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WS Profile 1
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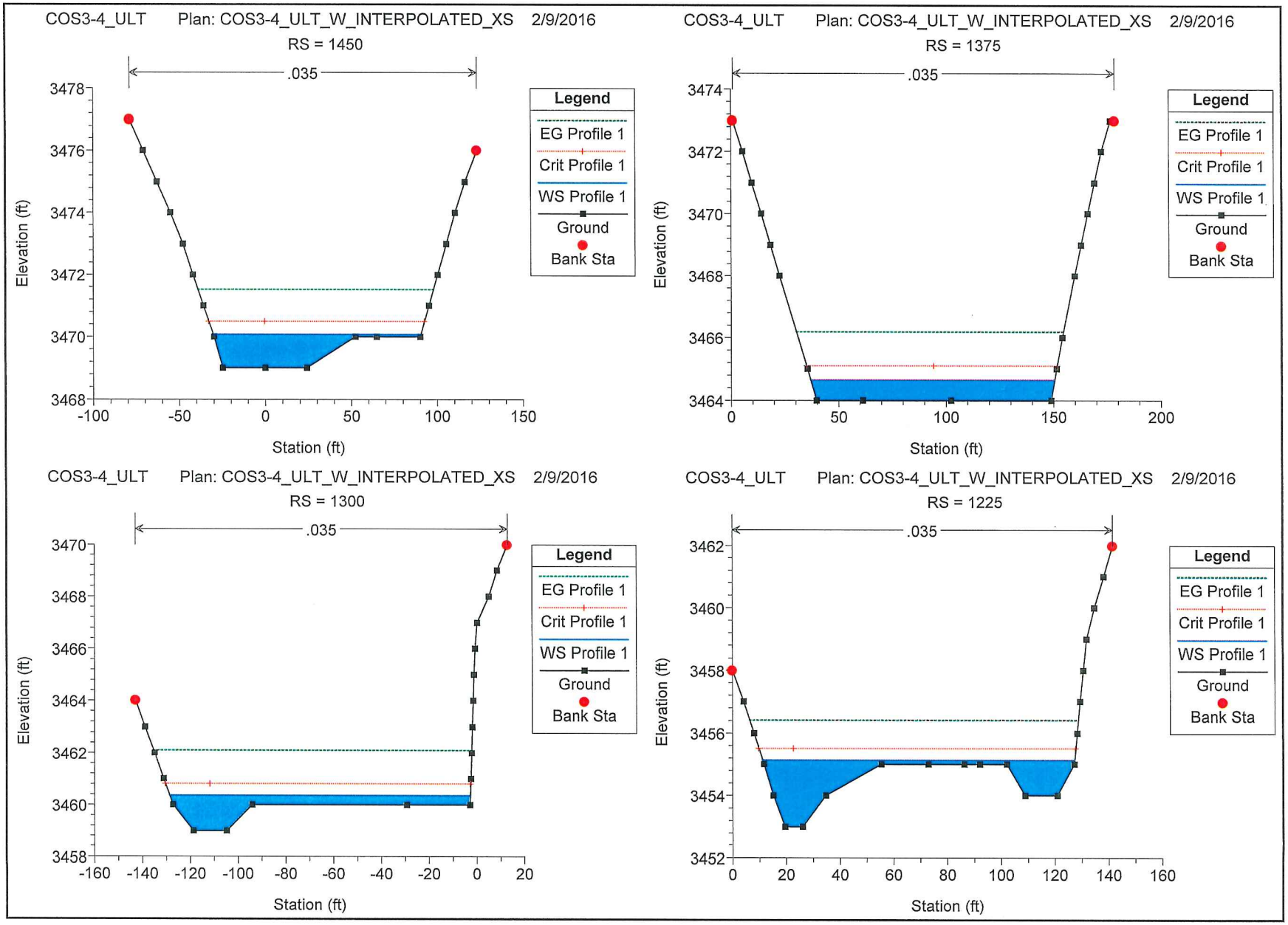
Station (ft)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Ground
Bank Sta
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Station (ft)
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WS Profile 1
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RS = 1300
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Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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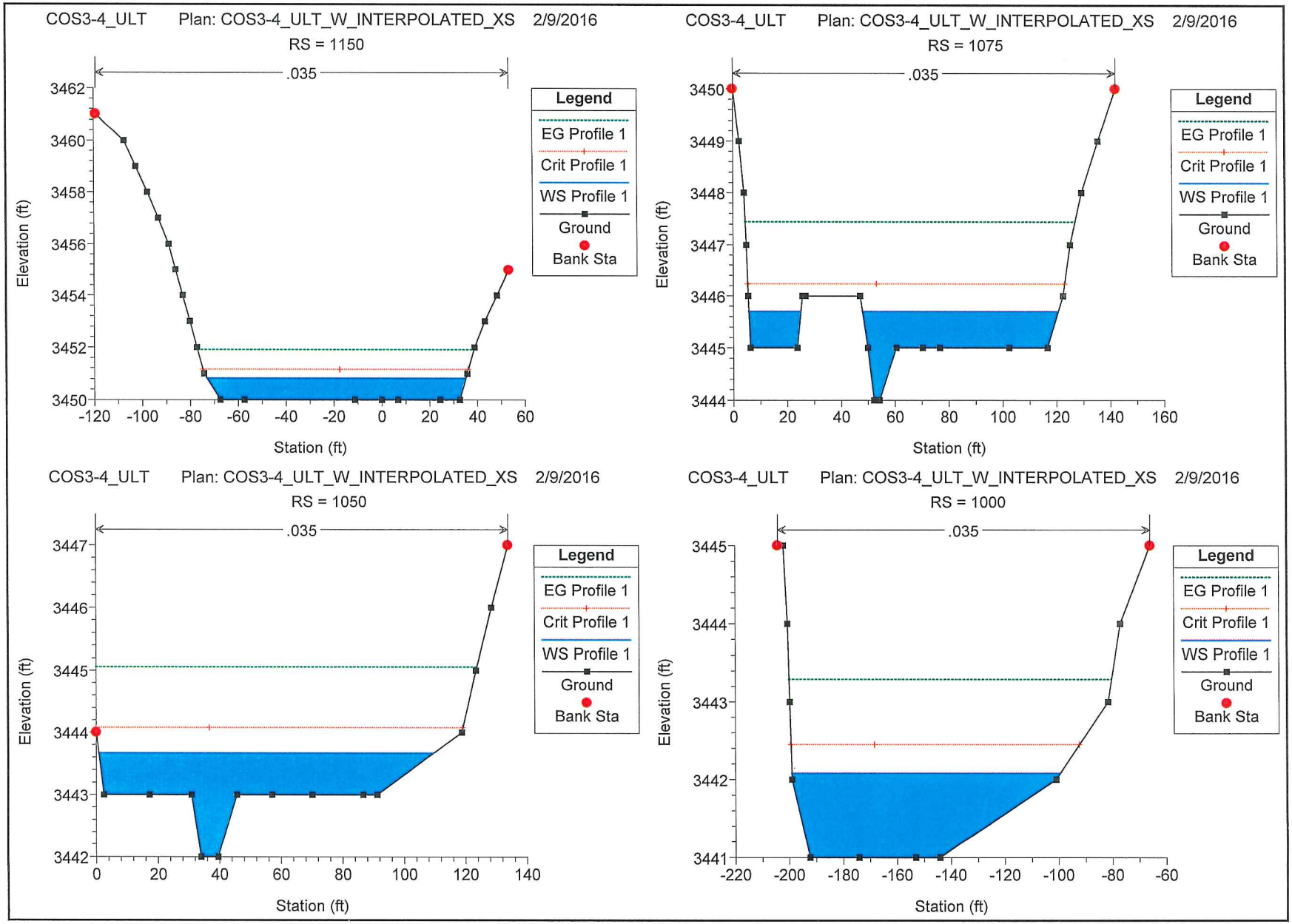
Station (ft)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Bank Sta
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Station (ft)
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WS Profile 1
Ground
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Crit Profile 1
WS Profile 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Bank Sta
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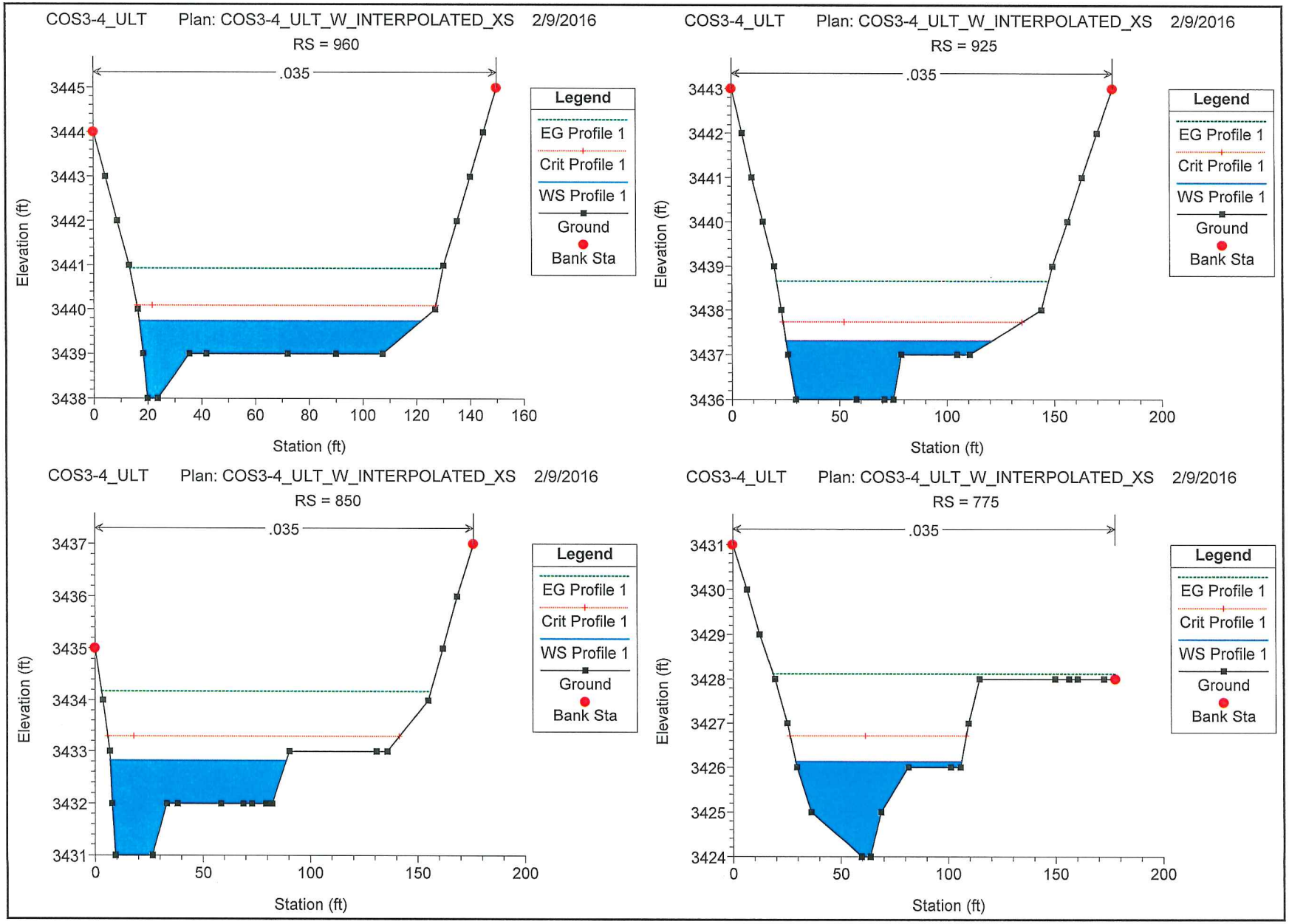
Station (ft)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WS Profile 1
Ground
Bank Sta
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Station (ft)
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WS Profile 1
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WS Profile 1
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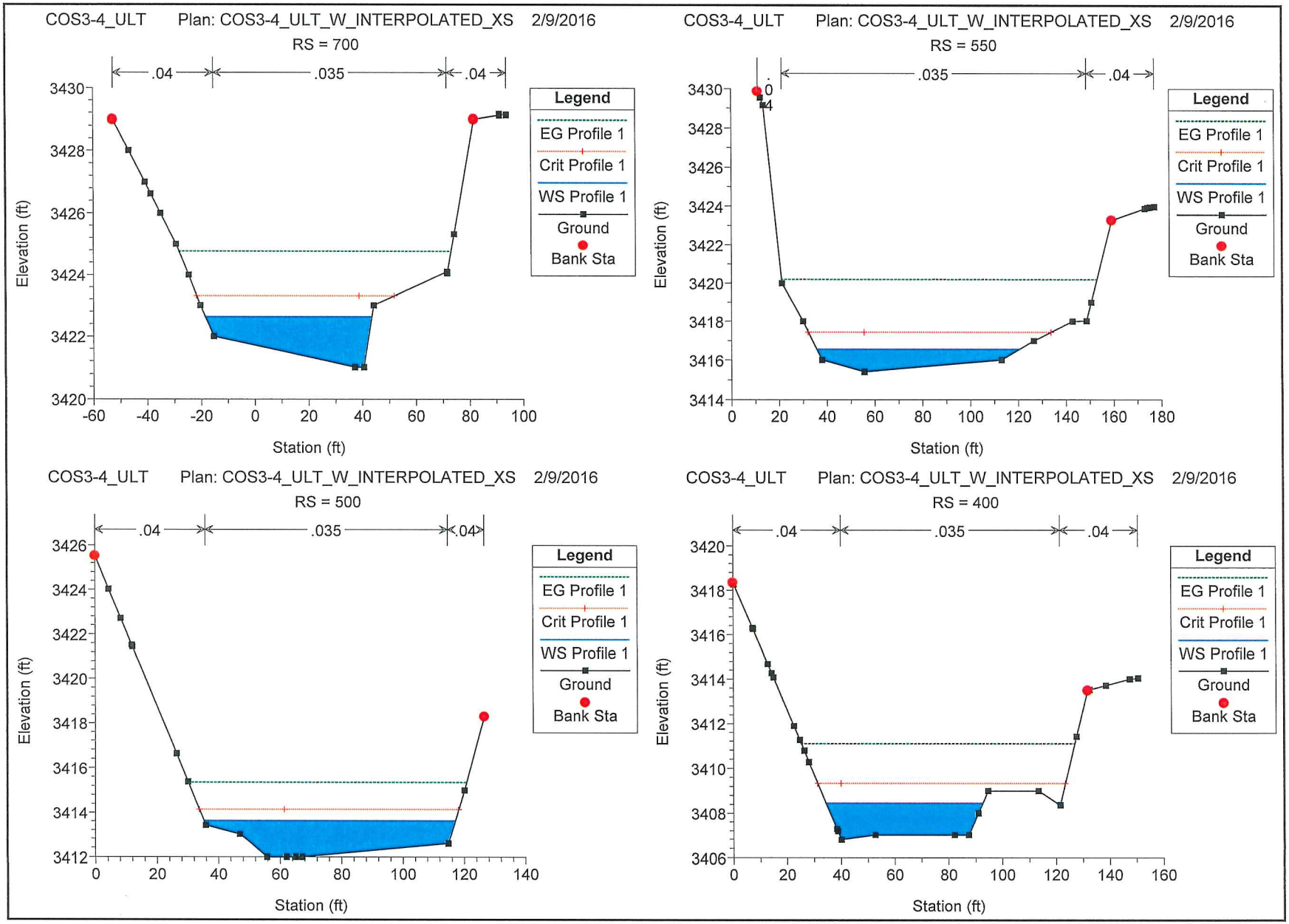
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WS Profile 1
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WS Profile 1
Ground
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Crit Profile 1
WS Profile 1
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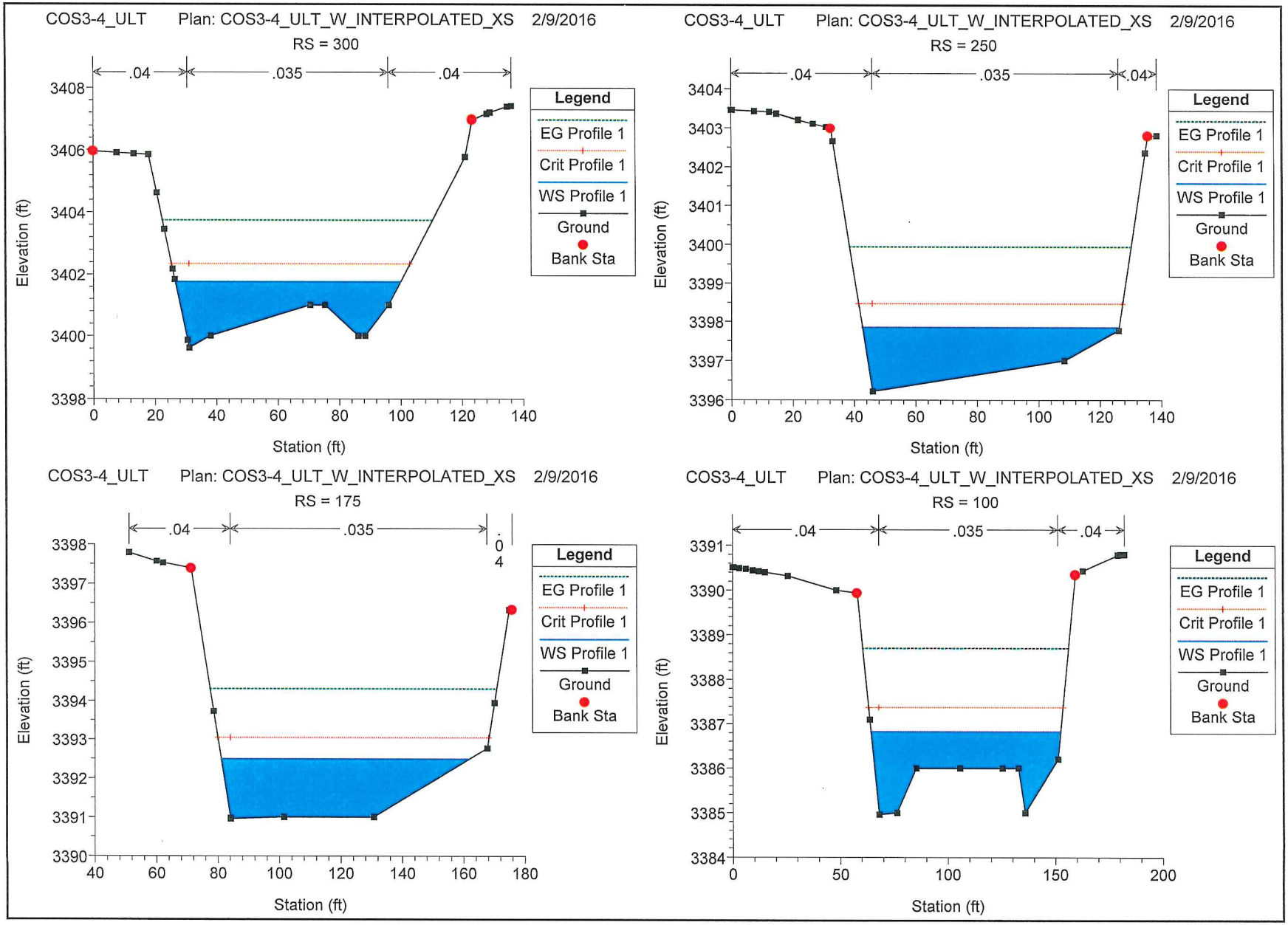
Bank Sta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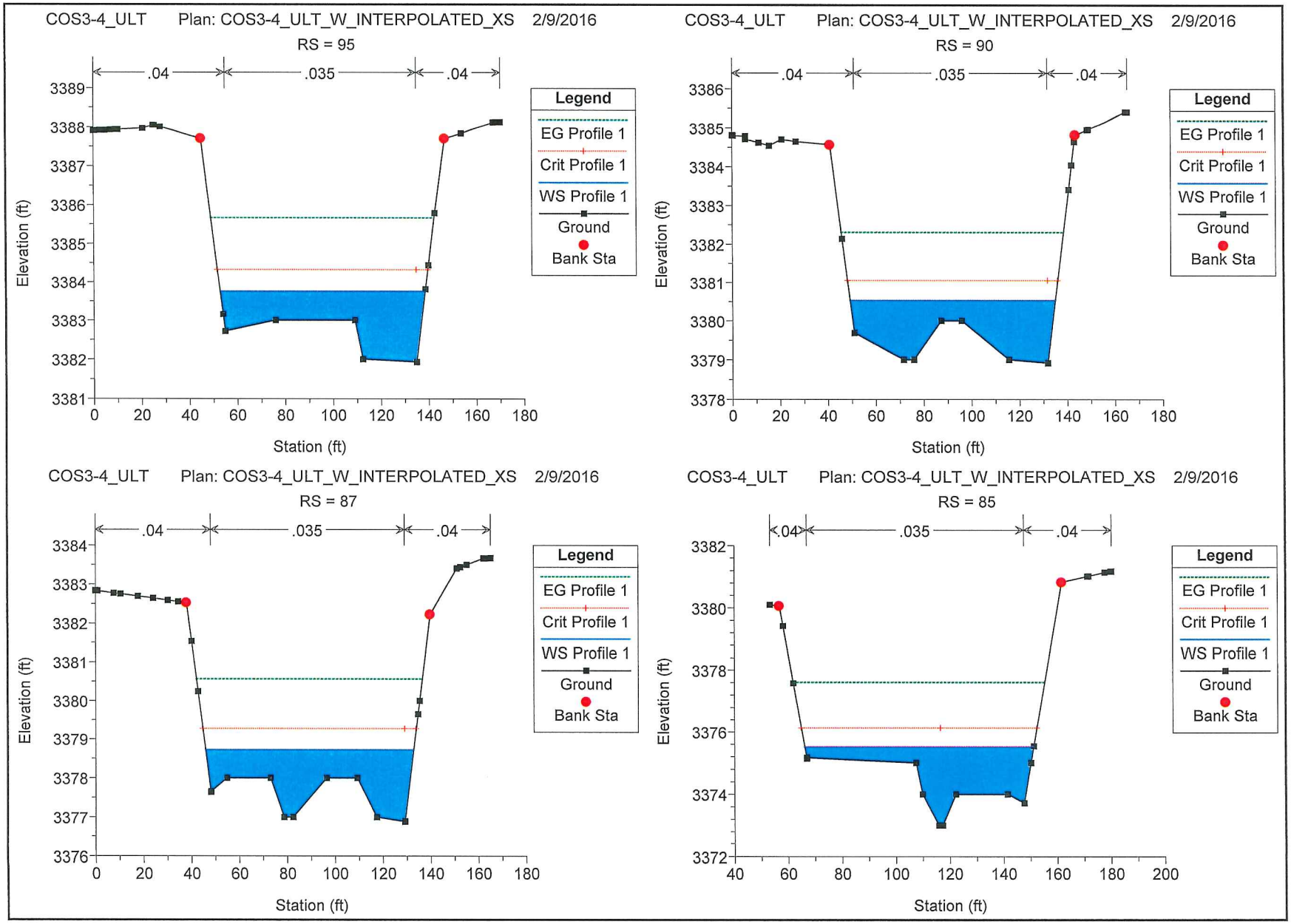
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Station (ft)
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Ground
Bank Sta
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Ground
Bank Sta
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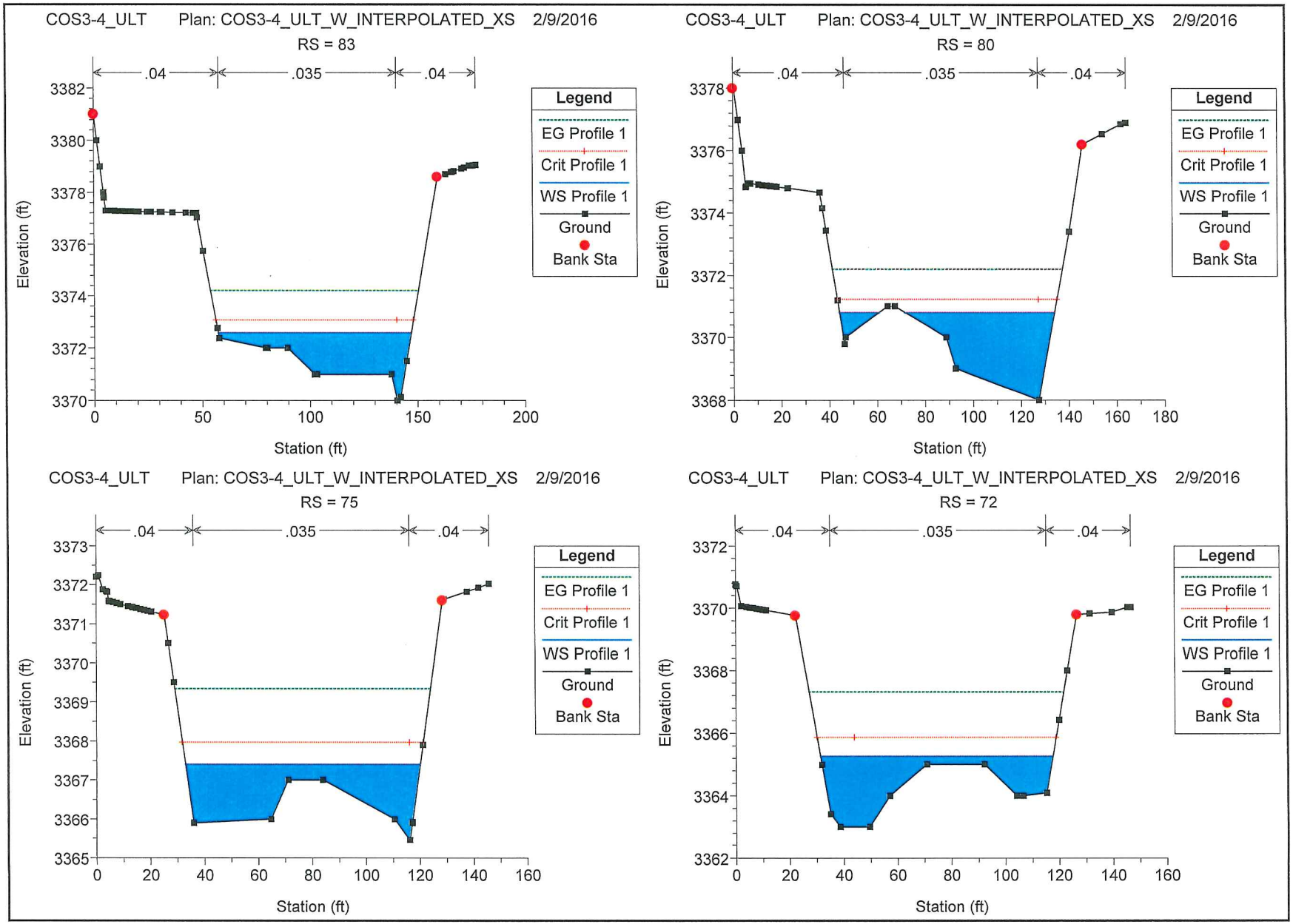
Bank Sta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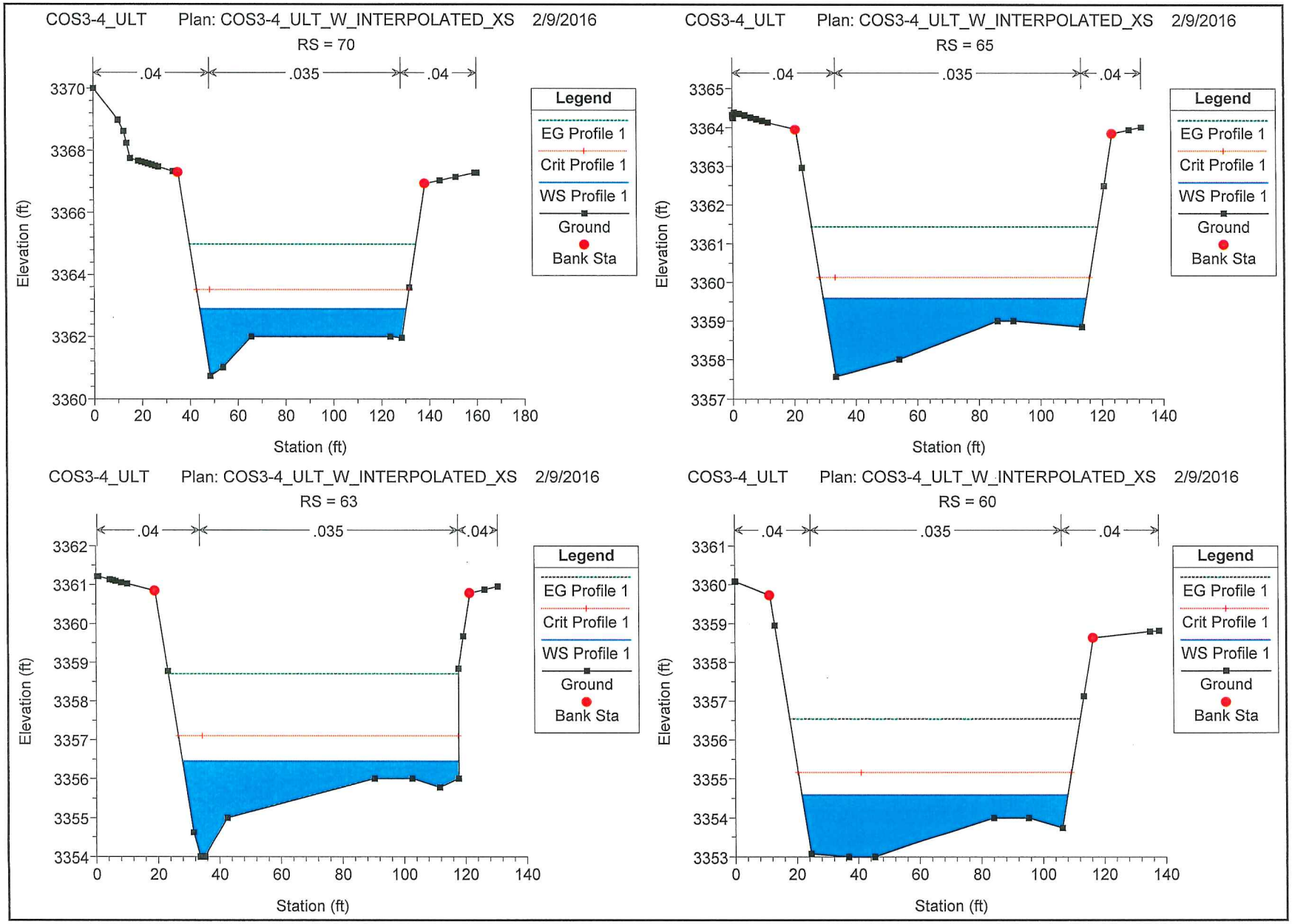
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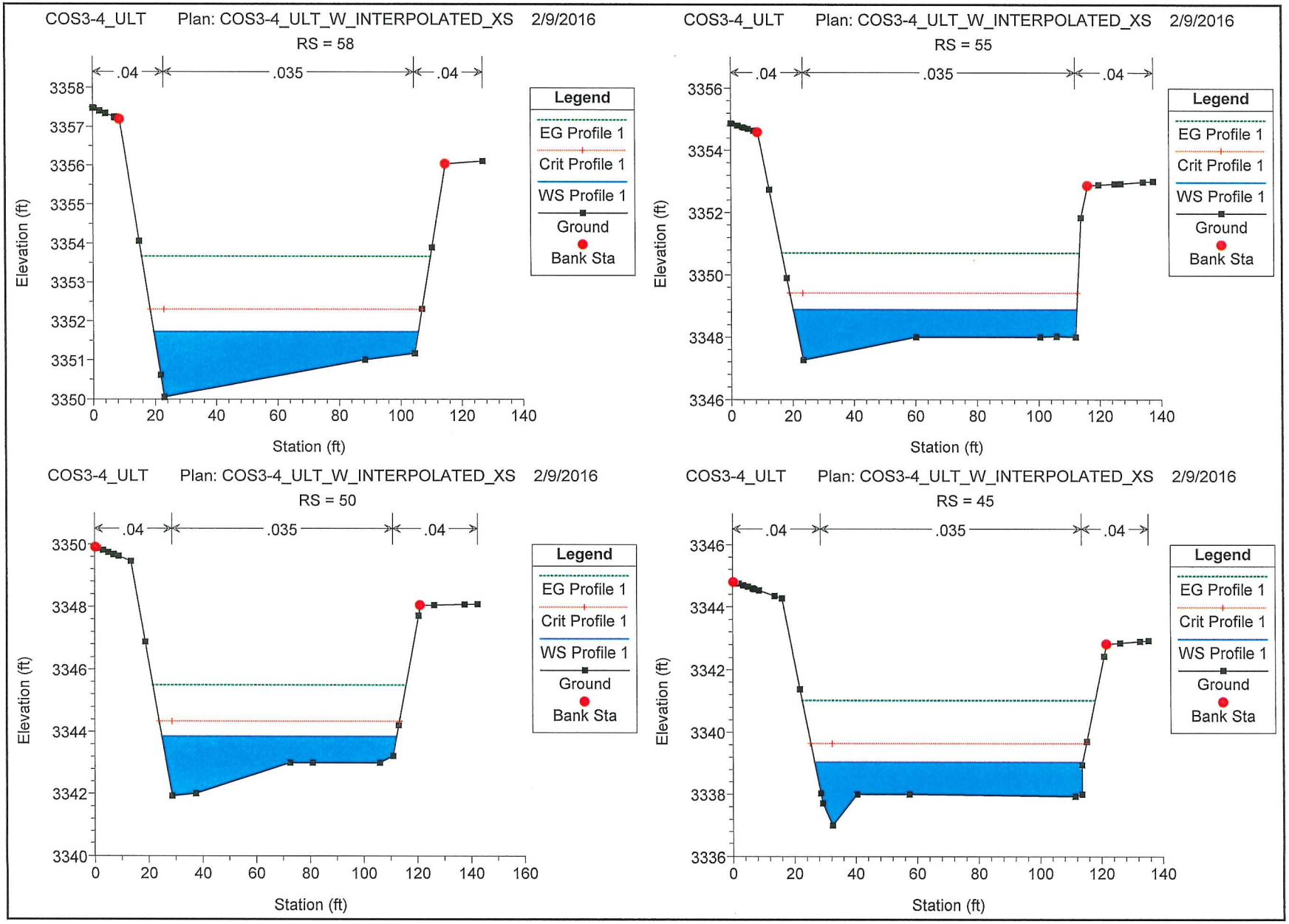
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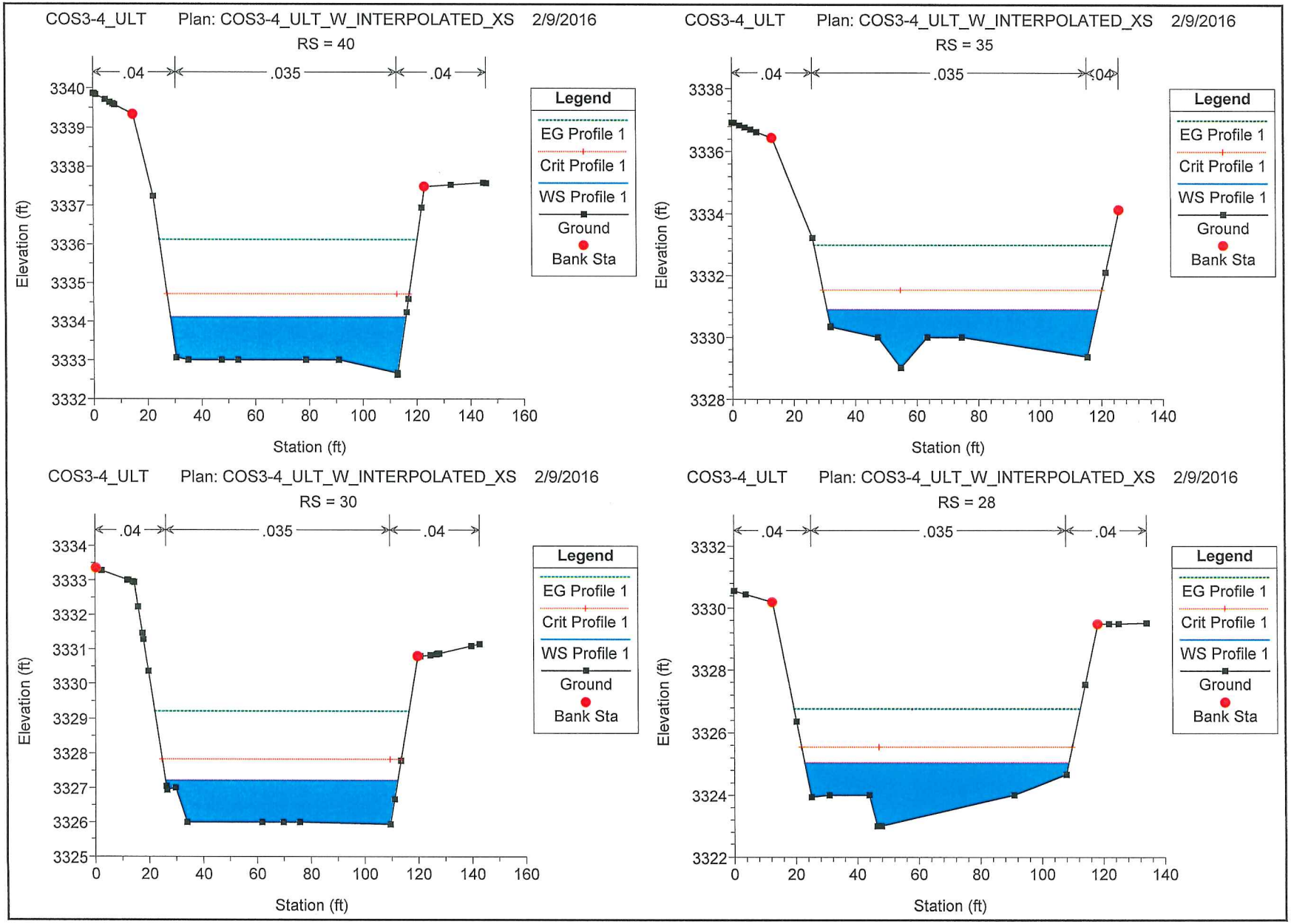
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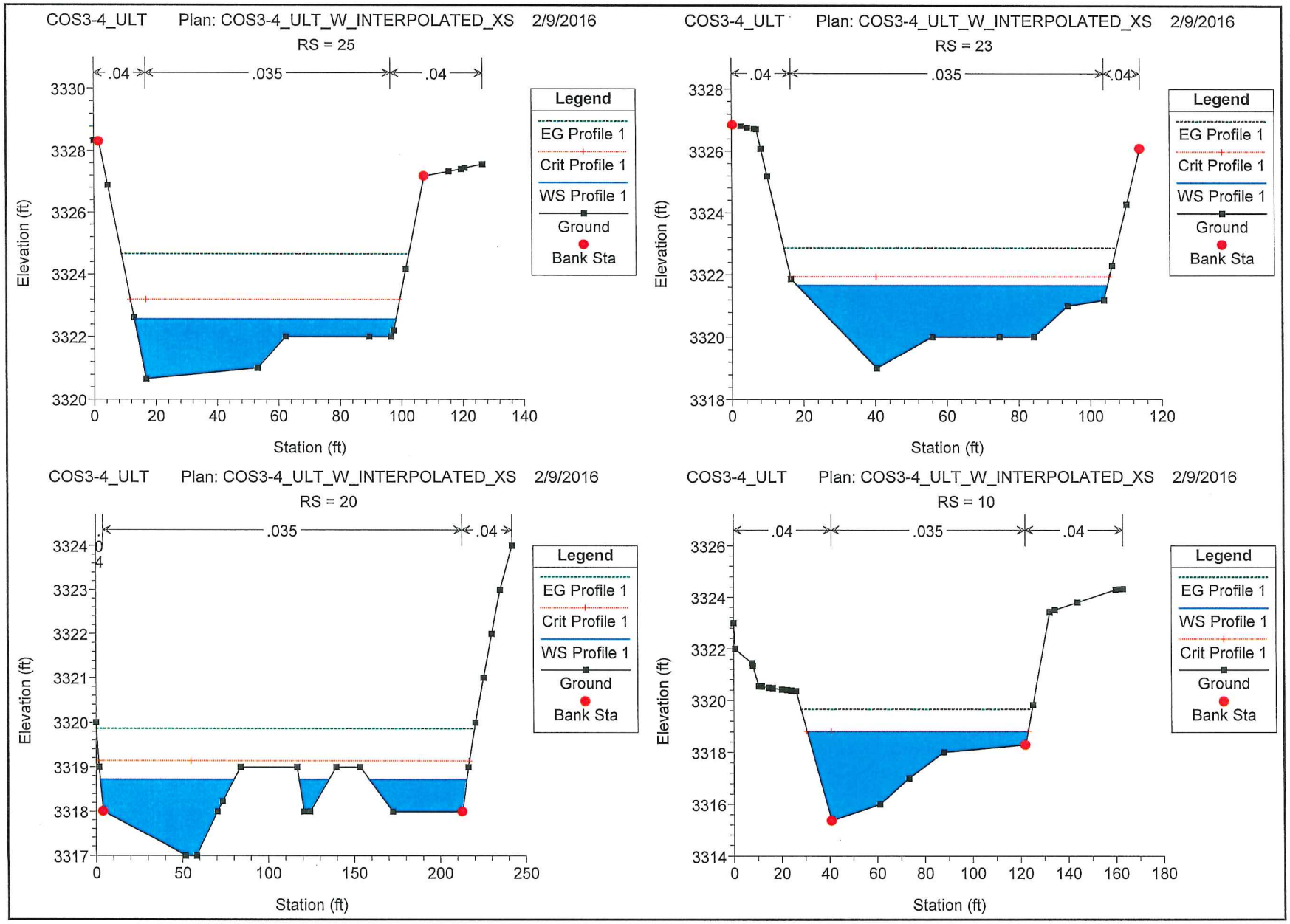
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.035
.04
Elevation (ft)
Station (ft)
Legend
EG Profile 1
WS Profile 1
Crit Profile 1
Ground
Bank Sta

APPENDIX C

Reference Materials

Rachael Dennis

From: Lucien Paet [lpaet@LasVegasNevada.GOV]
Sent: Monday, February 22, 2016 11:13 AM
To: Vicki Marjerrison
Cc: Oh-Sang Kwon; Ryan Belsick; Rachael Dennis; Josh Johnson; Donna Bullard; Albert Sung
Subject: RE: Summerlin Village 24 COS-2 and COS-4 TDS Comments (DS4774A& DS4775A)

Hi Vicki,

I don't know if Flood Control got back to you on this already. The new Title 20 requirements do not apply to the Summerlin West Development agreement area.

Thanks,
Lucien Paet, Engineering Project Manager
City of Las Vegas | Dept. of Public Works
Transportation Engineering Division
Development Services Center (DSC) 8th Floor
333 N Rancho Drive | Las Vegas, Nevada 89106
Work: 702-229-6145 | Fax: (702) 382-3901Link: www.lasvegasnevada.gov
"Building Community to Make Life Better"
Your opinion is important! Click here to take a short survey.

From: Vicki Marjerrison [mailto:VMarjerrison@gcwengineering.com]
Sent: Thursday, February 18, 2016 9:57 AM
To: Lucien Paet
Cc: Oh-Sang Kwon; Ryan Belsick; Rachael Dennis; Josh Johnson; Donna Bullard; Albert Sung
Subject: Summerlin Village 24 COS-2 and COS-4 TDS Comments (DS4774A& DS4775A)

Lucien,

Have you had a chance to look into the Summerlin Development Agreement in regards to comment #1 on both of these TDS Comment Letters?

Thanks,

GCW ENGINEERS \ SURVEYORS

Vicki Marjerrison
Vice President

O 702.804.2000 **D** 702.804.2238
F 702.804.2299

1555 South Rainbow Boulevard
Las Vegas, Nevada 89146

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SUMMERLIN

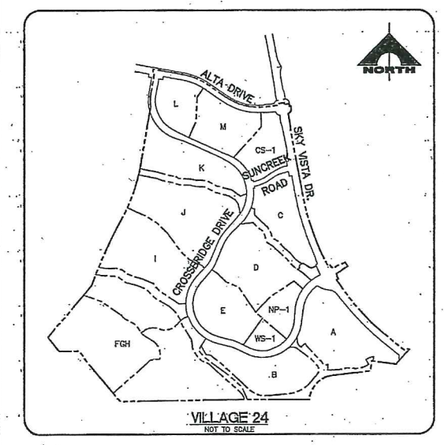
SM

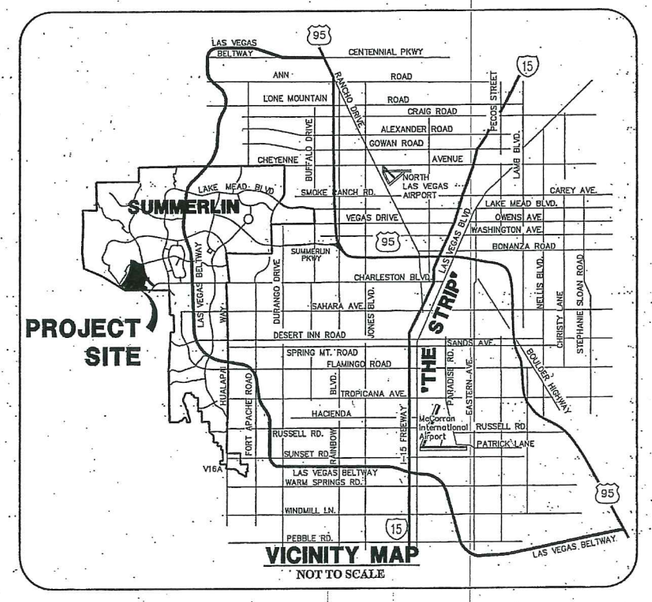
VILLAGE 24
CROSSBRIDGE DRIVE UNIT 2
IMPROVEMENT PLANS

FROM CROSSBRIDGE UNIT 1 TO SUNCREEK ROAD

SID #812 PROJECT 9A, 9B & 10A
2015

A.P.N. 137-33-801-002





SHEET INDEX	
SHT #	DESCRIPTION
1	COVER SHEET
2	PROJECT DATA SHEET
3	NOTE SHEET
4	HORIZONTAL CONTROL PLAN
5	MASTER UTILITY PLAN – WATER
6	MASTER UTILITY PLAN – STORM DRAIN
7	MASTER UTILITY PLAN – SEWER
8	ROADWAY PLAN AND PROFILE 1
9	ROADWAY PLAN AND PROFILE 2
10	ROADWAY PLAN AND PROFILE 3
11	ROADWAY PLAN AND PROFILE 4
12	ROADWAY PLAN AND PROFILE 5
13	ROADWAY PLAN AND PROFILE 6
14	ROADWAY PLAN AND PROFILE 7
15	ROADWAY PLAN AND PROFILE 8
16	UTILITY PLAN AND PROFILE 1
17	UTILITY PLAN AND PROFILE 2
18	UTILITY PLAN AND PROFILE 3
19	UTILITY PLAN AND PROFILE 4
20	UTILITY PLAN AND PROFILE 5
21	UTILITY PLAN AND PROFILE 6
22	UTILITY PLAN AND PROFILE 7
23	UTILITY PLAN AND PROFILE 8
24	GRADING AT DRAINAGE CORRIDOR CROSSING
25	WESTERN BORDER CHANNEL 1
26	WESTERN BORDER CHANNEL 2
27	WESTERN BORDER CHANNEL 3
28	CROSSBRIDGE DRIVE ROUGH GRADE 1
29	CROSSBRIDGE DRIVE ROUGH GRADE 2
30	CROSSBRIDGE DRIVE ROUGH GRADE 3
31	COS–1 BERM GRADING
32	ADDITONAL LIMITS OF GRADING
33	ROADWAY SECTIONS
34	UTILITY DETAILS 1
35	UTILITY DETAILS 2
36	CONSTRUCTION DETAILS
37	LATERAL DETAILS 1
38	LATERAL DETAILS 2
39	LATERAL DETAILS 3
40	DRAINAGE CORRIDOR CROSSING DETAILS 1
41	DRAINAGE CORRIDOR CROSSING DETAILS 2
42	STRIPING AND SIGNAGE PLAN 1
43	STRIPING AND SIGNAGE PLAN 2
44	STREETLIGHT AND ELECTRICAL NOTES
45	MASTER CONDUIT AND ELECTRICAL PLAN 1
46	MASTER CONDUIT AND ELECTRICAL PLAN 2
47	TYPICAL STRUCTURAL DETAILS AND NOTES
48	DRAINAGE CORRIDOR STRUCTURAL DETAILS 1
49	DRAINAGE CORRIDOR STRUCTURAL DETAILS 2
50	DRAINAGE CORRIDOR STRUCTURAL DETAILS 3
51	DRAINAGE CORRIDOR STRUCTURAL DETAILS 4
52	OUTLET STRUCTURE PLAN AND DETAILS
53	FLOW CONTROL VALVE DETAILS

DRAINAGE CERTIFICATION

I CERTIFY THAT THE GRADING PLANS ARE IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

JOSHUA L. JOHNSON P.E. 15789 — 11/17/15 DATE

ALLEN PAVELKA PE, PE# 9029 — 1-14-16 DATE
CITY ENGINEER
CITY OF LAS VEGAS, NEVADA

APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHTS-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS, EXCEPT THOSE SPECIFICALLY LISTED UNDER "DEVIATIONS FROM STANDARDS". THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN "DEVIATIONS FROM STANDARDS" IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

CLV BUILDING AND SAFETY DEPARTMENT

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE CITY OF LAS VEGAS PLANNING DEPARTMENT

CHRIS KNIGHT, DIRECTOR BUILDING AND SAFETY — 1-13-16 DATE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
PROJECT NO. 123547 — DATE 12/23/15
DRAWINGS: 1–3, 5–7, 16–23, 35, 37–41 & 53

THE HOWARD HUGHES COMPANY, LLC

KEVIN ORRBOCK, VICE PRESIDENT — 11/12/15 DATE

PLAN APPROVAL

NOTE: THIS PROJECT PLAN APPROVAL CONTINGENT ON

LVVWD #123259 VILLAGE 23A/24 SKY VISTA IMPROVEMENT PLANS

UTILITY/AGENCY APPROVALS — 10-30-15

COX COMMUNICATIONS LAS VEGAS, INC. — DATE

CENTRAL TELEPHONE CO., DBA CENTURYLINK — 10/29/15 DATE

THE AFFIXED CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

NV ENERGY — 10/30/15 DATE

NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

NV ENERGY – TRANSMISSION ENGINEERING — 10-30-15 DATE

SOUTHWEST GAS CORP. — 12/10/15 DATE

OWNER/DEVELOPER

THE HOWARD HUGHES COMPANY, LLC
10801 W. CHARLESTON BLVD., 3RD FLOOR
LAS VEGAS, NEVADA 89146
OFFICE PHONE NO. (702) 791-4300

ENGINEER

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

Call before you Dig — Avoid cutting underground utility lines. It's easy. Call 811 or 1-800-227-2600 CLARK COUNTY UTILITY OPERATORS 1-702-455-6000

CALL BEFORE YOU DO OVERHEAD — 1-702-227-2929

FAST — Call before you UnderGround — 1-702-432-5300 — FEDERAL AID INTERSTATE SYSTEM OF TRANSPORTATION

PROFESSIONAL ENGINEER — STATE OF NEVADA — PAUL D. BRENNAN — No. 15115

DATE	DESCRIPTION	REV	DATE	AGEN APP	DATE	GOV APP	DATE

PROJECT NO. 62024-222
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 10-28-15
PLOT TIME: 12:18:10

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
F:\Projects\620\62024-222\GWS\Production\24SB2s01_GV.dwg
Paul Brennan

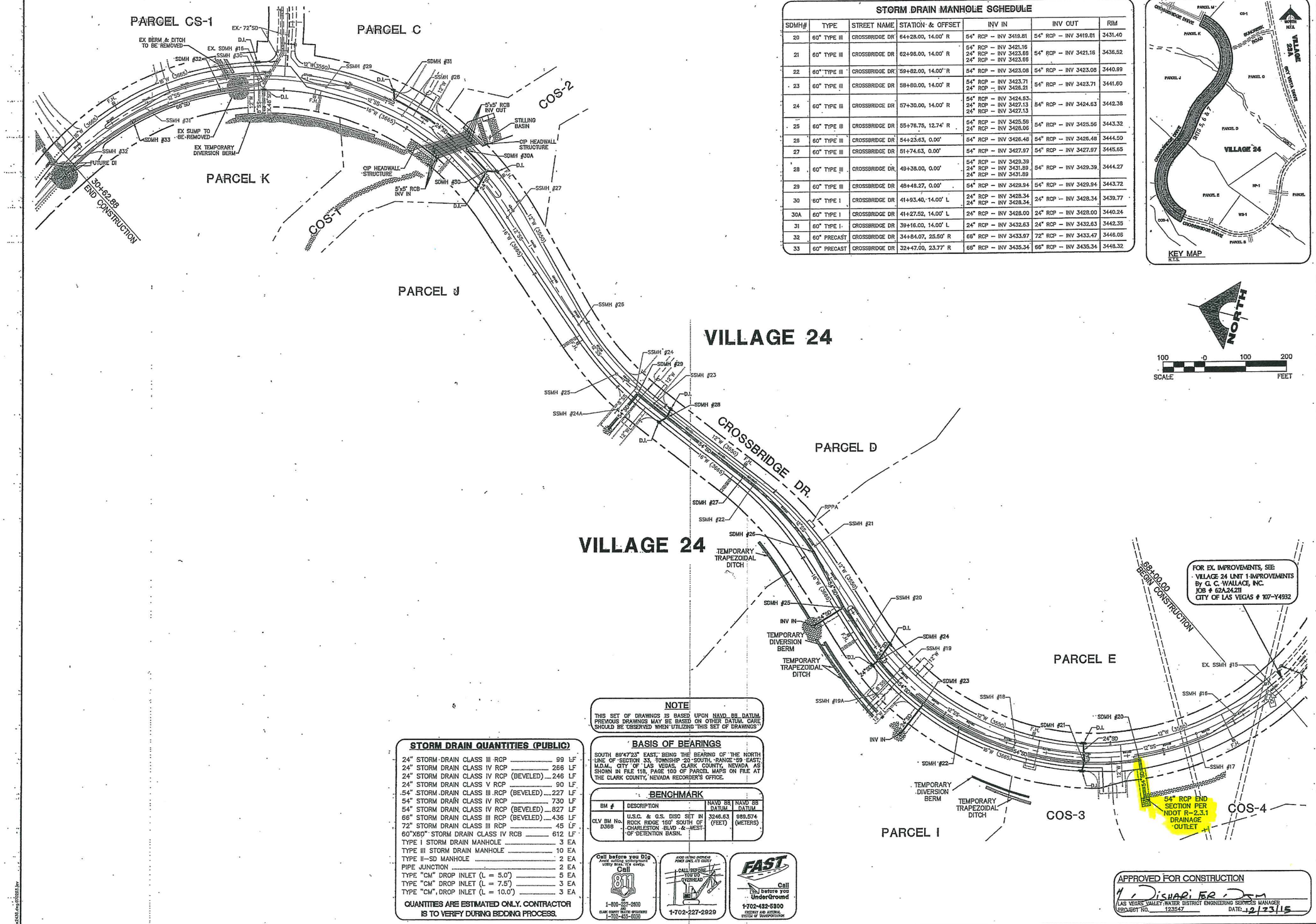
THE HOWARD HUGHES COMPANY, LLC
VILLAGE 24 – CROSSBRIDGE DRIVE UNIT 2 IMPROVEMENT PLANS
COVER SHEET

DRAWING 1
1 OF 53 SHTS

SID NO. 812 PROJECT 9A, 9B AND 10A

10746535

H# 62303



STORM DRAIN MANHOLE SCHEDULE

SDMH#	TYPE	STREET NAME	STATION & OFFSET	INV IN	INV OUT	RIM
20	60" TYPE III	CROSSBRIDGE DR	64+28.00, 14.00' R	54" RCP – INV 3419.81	54" RCP – INV 3419.81	3431.40
21	60" TYPE III	CROSSBRIDGE DR	62+98.00, 14.00' R	54" RCP – INV 3421.16 24" RCP – INV 3423.66 24" RCP – INV 3423.66	54" RCP – INV 3421.16	3436.52
22	60" TYPE III	CROSSBRIDGE DR	59+82.00, 14.00' R	54" RCP – INV 3423.08	54" RCP – INV 3423.08	3440.99
23	60" TYPE III	CROSSBRIDGE DR	58+80.00, 14.00' R	54" RCP – INV 3423.71 24" RCP – INV 3426.21	54" RCP – INV 3423.71	3441.60
24	60" TYPE III	CROSSBRIDGE DR	57+30.00, 14.00' R	54" RCP – INV 3424.63 24" RCP – INV 3427.13 24" RCP – INV 3427.13	54" RCP – INV 3424.63	3442.38
25	60" TYPE III	CROSSBRIDGE DR	55+76.75, 12.74' R	54" RCP – INV 3425.56 24" RCP – INV 3428.06	54" RCP – INV 3425.56	3443.32
26	60" TYPE III	CROSSBRIDGE DR	54+23.63, 0.00'	54" RCP – INV 3426.48	54" RCP – INV 3426.48	3444.50
27	60" TYPE III	CROSSBRIDGE DR	51+74.63, 0.00'	54" RCP – INV 3427.97	54" RCP – INV 3427.97	3445.65
28	60" TYPE III	CROSSBRIDGE DR	49+38.00, 0.00'	54" RCP – INV 3429.39 24" RCP – INV 3431.89 24" RCP – INV 3431.89	54" RCP – INV 3429.39	3444.27
29	60" TYPE III	CROSSBRIDGE DR	48+48.27, 0.00'	54" RCP – INV 3429.94	54" RCP – INV 3429.94	3443.72
30	60" TYPE I	CROSSBRIDGE DR	41+93.40, 14.00' L	24" RCP – INV 3428.34 24" RCP – INV 3428.34	24" RCP – INV 3428.34	3439.77
30A	60" TYPE I	CROSSBRIDGE DR	41+27.52, 14.00' L	24" RCP – INV 3428.00	24" RCP – INV 3428.00	3440.24
31	60" TYPE I	CROSSBRIDGE DR	39+16.00, 14.00' L	24" RCP – INV 3432.63	24" RCP – INV 3432.63	3442.35
32	60" PRECAST	CROSSBRIDGE DR	34+84.07, 25.50' R	66" RCP – INV 3433.97	72" RCP – INV 3433.47	3446.08
33	60" PRECAST	CROSSBRIDGE DR	32+47.00, 23.77' R	66" RCP – INV 3435.34	66" RCP – INV 3435.34	3448.32

STORM DRAIN QUANTITIES (PUBLIC)

24" STORM DRAIN CLASS III RCP	99 LF
24" STORM DRAIN CLASS IV RCP	266 LF
24" STORM DRAIN CLASS IV RCP (BEVELED)	246 LF
24" STORM DRAIN CLASS V RCP	90 LF
54" STORM DRAIN CLASS III RCP (BEVELED)	227 LF
54" STORM DRAIN CLASS IV RCP	730 LF
54" STORM DRAIN CLASS IV RCP (BEVELED)	827 LF
66" STORM DRAIN CLASS III RCP (BEVELED)	436 LF
72" STORM DRAIN CLASS III RCP	45 LF
60"X60" STORM DRAIN CLASS IV RCB	612 LF
TYPE I STORM DRAIN MANHOLE	3 EA
TYPE III STORM DRAIN MANHOLE	10 EA
TYPE II–SD MANHOLE	2 EA
PIPE JUNCTION	2 EA
TYPE "CM" DROP INLET (L = 5.0')	5 EA
TYPE "CM" DROP INLET (L = 7.5')	3 EA
TYPE "CM", DROP INLET (L = 10.0')	3 EA

QUANTITIES ARE ESTIMATED ONLY. CONTRACTOR IS TO VERIFY DURING BIDDING PROCESS.

NOTE

THIS SET OF DRAWINGS IS BASED UPON NAVD 88 DATUM. PREVIOUS DRAWINGS MAY BE BASED ON OTHER DATUM. CARE SHOULD BE OBSERVED WHEN UTILIZING THIS SET OF DRAWINGS

BASIS OF BEARINGS

SOUTH 89°47'23" EAST, BEING THE BEARING OF THE NORTH LINE OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA AS SHOWN IN FILE 118, PAGE 100 OF PARCEL MAPS ON FILE AT THE CLARK COUNTY, NEVADA RECORDER'S OFFICE.

BENCHMARK

BM #	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. D368	U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.	3246.63 (FEET)	989.574 (METERS)

Call before you Dig — Avoid cutting conversations utility lines. It's easy. Call 811 — 1-800-227-2600 or CLARK COUNTY WATER SYSTEMS 1-702-455-8000

AVOID HITTING OVERHEAD POWER LINES, IT'S EASY! — CALL BEFORE YOU DO OVERHEAD — 1-702-227-2929

FAST — Call before you UnderGround — 1-702-432-5300 — FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

PROJECT NO. 123547 DATE 12/23/15

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BLVD - LAS VEGAS, NV 89146
T-702.804.2000 - F-702.804.2299 - GCWALLACE.COM
LAS VEGAS

F:\Projects\600\62024-222\DWG\Production\24c62s08_JM02.dwg
Paul Bremond

PROJECT NO. 62024-222
DESIGN: GCW
DRAWN: GCW
CHECK: JJ
PLOT DATE: 12-09-15
PLOT TIME: 20:37:07

REV	DATE	DESCRIPTION	AGEN APP	DATE	GCW APP	DATE

DATE: 12/09/2015

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - CROSSBRIDGE DRIVE UNIT 2 IMPROVEMENT PLANS

MASTER UTILITY PLAN - STORM DRAIN

BID NO. 812 PROJECT 9A, 9B AND 10A

DRAWING 6 OF 53 SHTS

107V6535
H-62.505

VILLAGE 24
PARCEL E
APN 137-33-801-002

MATCHLINE 64+00 - SEE SHEET 17

DAYLIGHT LINE

30.28 LF 12" DIP W (3550)
Δ = 2°05'05"
T = 15.14

POC POINT
64+16.54
28.59' LT

203.87 LF 12" DIP W (3550)
R=446.50 Δ=26°09'05" T=102.79

450.00 LF 12" C-900 SS @ 2.11%
R=663.50 Δ=38°51'33" T=234.04

24" RCP SD
BEVEL END
R=689.00

SDMH #20
64+28.00
14.00' RT

64+29.40
28.60' LT

66+52.22
28.13' LT

21.85 LF 12" DIP W (3550)

PT POINT
66+29.40
28.50' LT

SSMH #17
65+75.75
11.50' LT

SSMH #16
66+81.31
11.50' LT

100.40 LF 12" DIP W (3550)
S40°37'45"E

106.42 LF 12" C-900 SS @ 7.50%
S59°03'33"E

31.12 LF 12" DIP W (3550)

EX. SSMH #15
67+89.55
29.00' LT

EX. 24" RCP SD

EX. SDMH #19
68+71.42
12.83' RT

11.25° BEND
67+55.57
17.04' LT

67+87.91
17.69' LT

8.30%

203.68 LF 12" C-900 SS @ 5.80%
R=663.50 Δ=8°57'06" T=51.54

69.67 LF 8" PVC W
S40°22'57"W

6" PVC W
FH

6"X9" LVVWD EASEMENT

64+50.00
41.50' RT

EX. 5.0' TYPE "CM2" DI

COMMON LOT

FOR EX. IMPROVEMENTS, SEE:
"VILLAGE 24 UNIT 1 IMPROVEMENTS"
By G. C. WALLACE, INC.
JOB # 62A.24.21I
CITY OF LAS VEGAS # 107-Y4932

VILLAGE 24
PARCEL B
APN 164-03-114-001

BEGIN CONSTRUCTION
BRL=00.00

64+28.00
97.57' RT
INV: 17.80

DRAINAGE OUTLET

24" RCP END SECTION
PER N.D.O.T. R-2.3.1

20' PUBLIC
DRAINAGE ESMT.

RIPRAP
D50=30"
THICKNESS=60"

RIPRAP
D50=30"
THICKNESS=66"
HEIGHT=5' W/
5' CUTOFF WALL

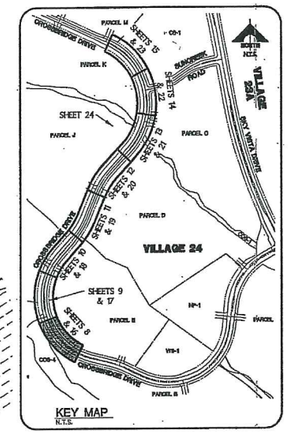
COS-4

RIPRAP
D50=30"
THICKNESS=60"

66+05.00
99.40' RT

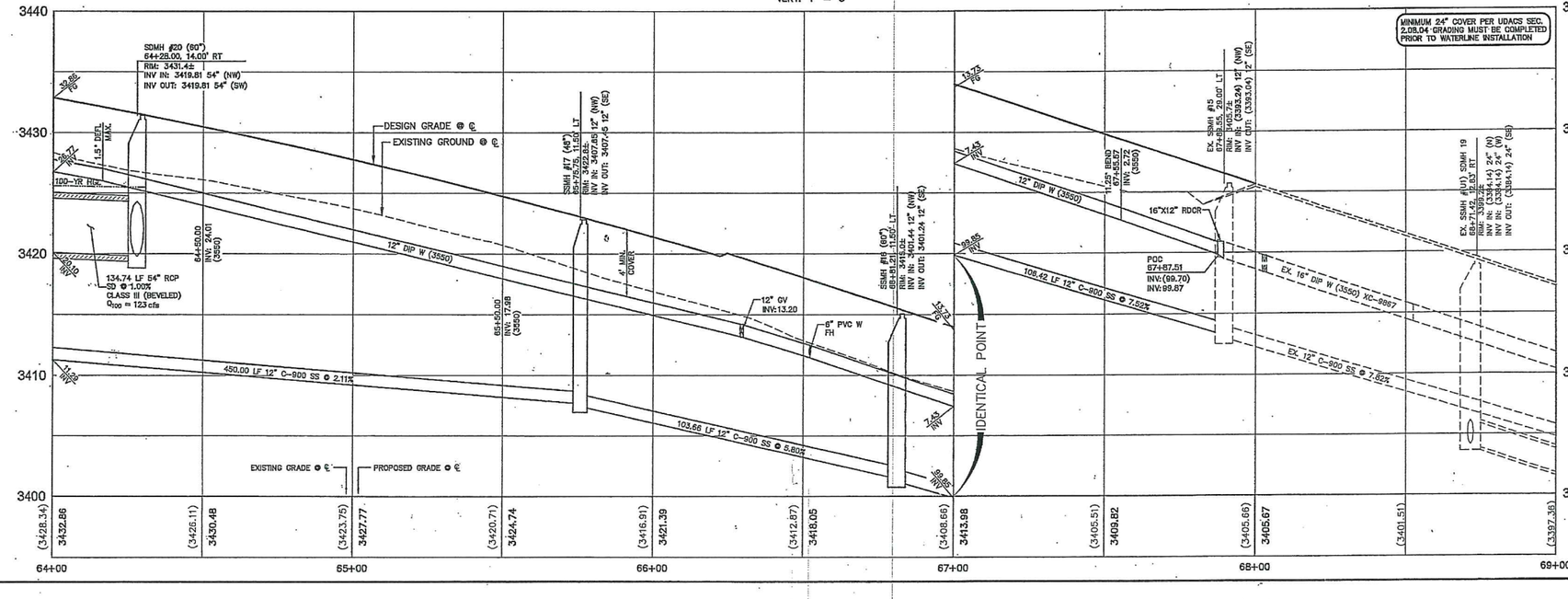
NORTH

20 0 20 40
SCALE FEET



CROSSBRIDGE DRIVE (PUBLIC)

SCALE: HORIZ 1" = 20'
VERT. 1" = 5'



FAST
Call before you UnderGround
1-702-432-5500
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig
Avoid striking underground utility lines. It's easy.
Call 811
1-800-227-2600
OR
CLARK COUNTY WATER SYSTEMS
1-702-455-6000

AVOID ATOMIC ENERGIZED POWER LINES. IT'S EASY!
CALL BEFORE YOU DIG
1-702-227-2929

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BENCHMARK

BM #	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. D368	U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.	3246.83 (FEET)	989.574 (METERS)

APPROVED FOR CONSTRUCTION

Y. DISHARI FOR D.S.M.
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
PROJECT NO. 123547 DATE 12/23/15

ENGINEER - STATE OF NEVADA
No. 15757
DATE: 12/10/2015

REV	DATE	DESCRIPTION	DATE	ASSY APP	DATE	GCW APP

PROJECT. NO. 62024-222
DESIGN: GCW
DRAWN: GCW
CHECK: MJ
PLOT DATE: 12-10-15
PLOT TIME: 09:08:15

G.C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BLVD - LAS VEGAS, NV 89146
P: 702.804.2000 - F: 702.804.2299 - GCWALLACE.COM
LAS VEGAS

F:\Projects\62024-222\VWD\Production\24X36ze1b_U1T1.dwg
Paul Bremmer

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - CROSSBRIDGE DRIVE UNIT 2
IMPROVEMENT PLANS

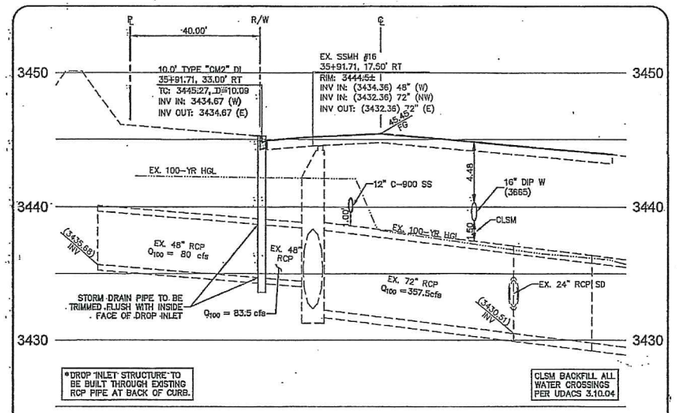
CROSSBRIDGE DRIVE
UTILITY PLAN AND PROFILE 1

SID NO. 812 PROJECT 9A, 9B AND 10A

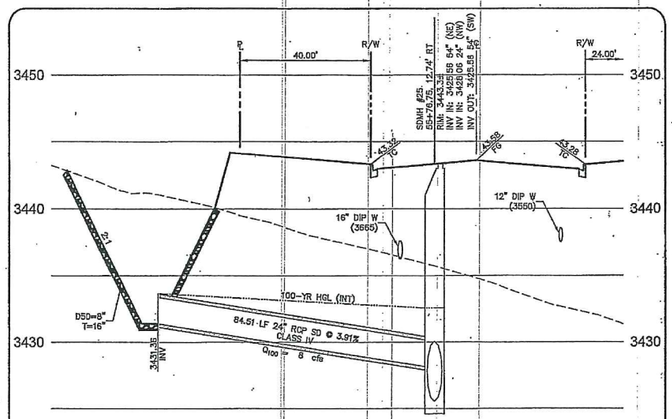
DRAWING 16
16 OF 53 SHTS

HH 62503
LOT 16535

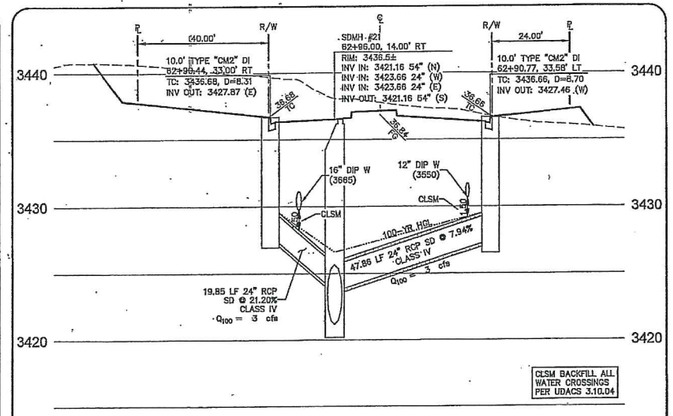
gm2535.dwg 2/2/2013.jpy



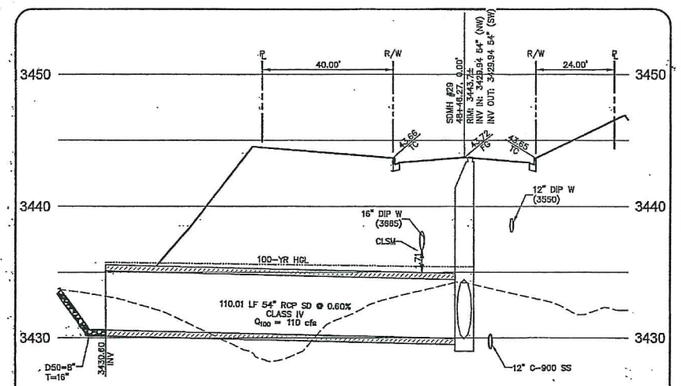
EX. 48" STORM DRAIN & DI (8)
CROSSBRIDGE DRIVE
@ STA: 36+03.18
HORZ. 1" = 20
VERT. 1" = 5



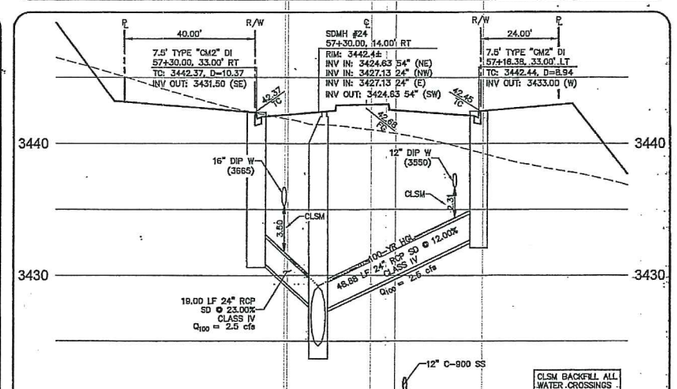
24" STORM DRAIN LINE (INTERIM) (5)
CROSSBRIDGE DRIVE
@ STA: 55+77.17
HORZ. 1" = 20
VERT. 1" = 5



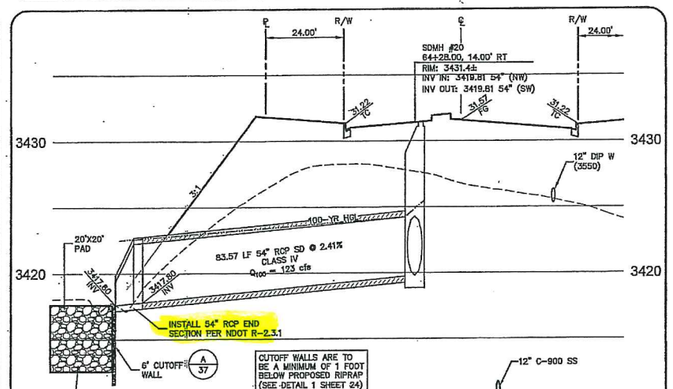
24" STORM DRAIN & DI (2)
CROSSBRIDGE DRIVE
@ STA: 62+94.54
HORZ. 1" = 20
VERT. 1" = 5



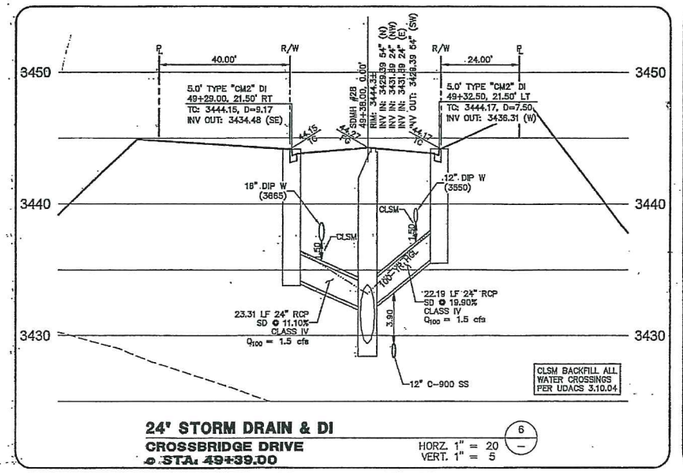
54" STORM DRAIN MAIN (INLET) (7)
CROSSBRIDGE DRIVE
@ STA: 48+46.27
HORZ. 1" = 20
VERT. 1" = 5



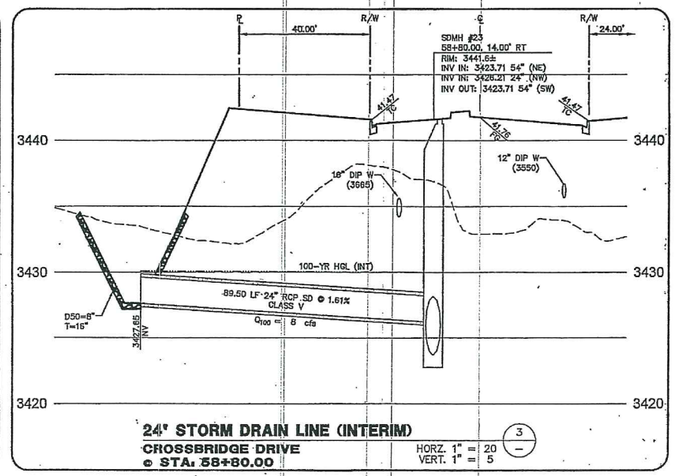
24" STORM DRAIN & DI (4)
CROSSBRIDGE DRIVE
@ STA: 57+26.15
HORZ. 1" = 20
VERT. 1" = 5



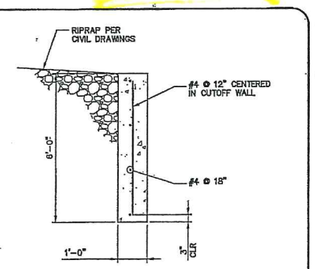
54" STORM DRAIN (OUTFALL) (1)
CROSSBRIDGE DRIVE
@ STA: 64+28.00
HORZ. 1" = 20
VERT. 1" = 5



24" STORM DRAIN & DI (6)
CROSSBRIDGE DRIVE
@ STA: 49+39.00
HORZ. 1" = 20
VERT. 1" = 5



24" STORM DRAIN LINE (INTERIM) (3)
CROSSBRIDGE DRIVE
@ STA: 58+80.00
HORZ. 1" = 20
VERT. 1" = 5



SINGLE CUTOFFWALL DETAIL (A)
NTS

DROP INLET NOTE

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE:

CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL).

APPROVED FOR CONSTRUCTION
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
PROJECT NO. 123547 DATE: 12/23/15

STATE OF NEVADA — REGISTERED ENGINEER — No. 15791 — DATE: 12/09/2015

REV	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP	DATE

PROJECT NO. 62024-222
DESIGN: GCW
DRAWN: GCW
CHECK: JJ
PLOT DATE: 12-09-15
PLOT TIME: 21:01:36

G.C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
2535 S. RAINBOW BLVD · LAS VEGAS, NV 89146
T: 702.804.2000 · F: 702.804.2299 · GCWALLACE.COM
LAS VEGAS
F:\Projects\600\62024-222\DWG\Production\24x36zs37_LAT1.dwg
Paul Brannord

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 24 - CROSSBRIDGE DRIVE UNIT 2
IMPROVEMENT PLANS

LATERAL DETAILS 1

DRAWING 37
37 OF 53 SHTS

SID NO. 812 PROJECT 9A, 9B AND 10A

SUMMERLIN

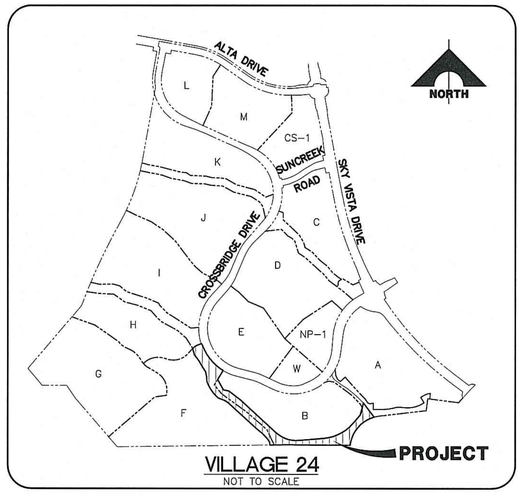
SM

VILLAGE 24
COS 4 WASH IMPROVEMENT PLANS
FROM V24 BOUNDARY TO CROSSBRIDGE DRIVE INCLUDING PARCEL B ARMORING

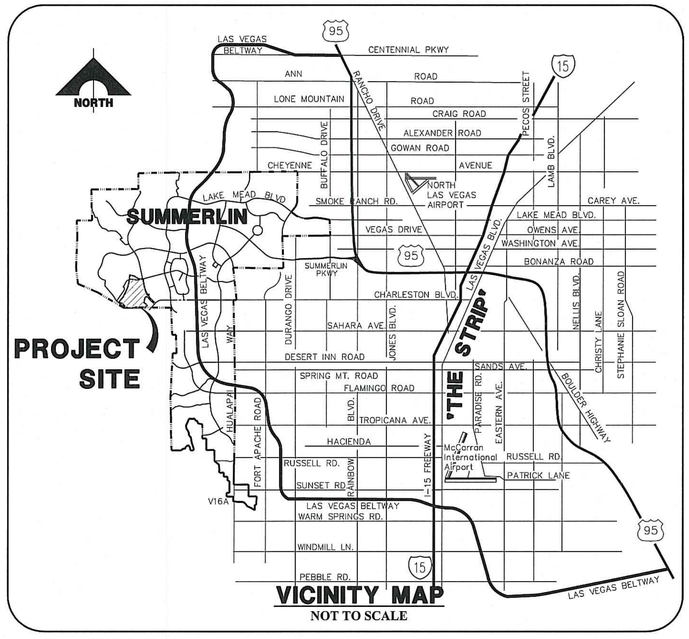
2016

A.P.N. 137-33-801-002

INDEX OF SHEETS	
DWG #	DESCRIPTION
1	COVER SHEET
2	LEGEND AND ABBREVIATIONS
3	HORIZONTAL CONTROL PLAN 1
4	HORIZONTAL CONTROL 2
5	GRADING PLAN – OVERVIEW
6	GRADING PLAN 1
7	GRADING PLAN 2
7A	GRADING PLAN 2A
8	GRADING PLAN 3
9	GRADING PLAN 4
10	GRADING PLAN 5
11	GRADING PLAN 6
12	GRADING PLAN 7
13	GRADING PLAN 8
14	GRADING PLAN 9
15	SLEEVE PROFILE 1
16	SLEEVE PROFILE 2
17	DETAILS AND SECTIONS



VILLAGE 24
NOT TO SCALE



VICINITY MAP
NOT TO SCALE

OWNER/DEVELOPER

THE HOWARD HUGHES COMPANY, LLC
10801 W. CHARLESTON BLVD., 3RD FLOOR
LAS VEGAS, NEVADA 89146
OFFICE PHONE NO. (702) 791-4300

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
or 1-800-227-2600
or CLARK COUNTY TRAFFIC OPERATIONS 702-455-6000

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

FAST
Call before you UnderGround
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

DRAINAGE CERTIFICATION

I CERTIFY THAT THE GRADING PLANS ARE IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

JOSHUA L. JOHNSON P.E. 15789 DATE

DAVID BOWERS: PE, PTOE, PE# 16736 DATE
CITY ENGINEER
CITY OF LAS VEGAS, NEVADA

APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHTS-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS, EXCEPT THOSE SPECIFICALLY LISTED UNDER "DEVIATIONS FROM STANDARDS". THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN "DEVIATIONS FROM STANDARDS" IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

CLV PLANNING DEPARTMENT

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE CITY OF LAS VEGAS PLANNING DEPARTMENT

CHRIS KNIGHT, DIRECTOR BUILDING AND SAFETY DATE

THE HOWARD HUGHES COMPANY, LLC

KEVIN ORROCK DATE
VICE PRESIDENT

UTILITY/AGENCY APPROVALS

COX COMMUNICATIONS LAS VEGAS, INC. DATE

CENTRAL TELEPHONE CO., DBA CENTURYLINK DATE

THE AFFIXED CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

NV ENERGY DATE

NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

NV ENERGY – TRANSMISSION ENGINEERING DATE

SOUTHWEST GAS CORP. DATE

PROFESSIONAL ENGINEER STATE OF NEVADA JOSHUA L. JOHNSON 15789 CIVIL
DATE: 03/10/16

REV	DATE	DESCRIPTION
		03/10/2016 TDS RESPONSE TO COMMENTS – NOT FOR CONSTRUCTION
	DATE	AGEN APP
	DATE	GOV APP

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JLJ
PLOT DATE: 03-10-16
PLOT TIME: 12:08:59

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\60D\62024-226-4\DWG\Production\V24-226-4_COV.dwg
Brian Vincent

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 24 - US WATERS COS - 4 WASH
COVER SHEET

DRAWING 1
1 OF 18 SHTS

CITY OF LAS VEGAS GRADING NOTES

1. IN THE EVENT THAT ANY UNFORESEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SUBGRADE, FINISH GRADES AND SLOPES SHOWN.
3. CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION. ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.
4. THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. ANY ADDITIONAL MATERIAL REQUIRED OR LEFTOVER MATERIAL FOLLOWING EARTHWORK OPERATIONS BECOMES THE RESPONSIBILITY OF THE CONTRACTOR.
5. THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.
6. CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITHIN THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED:

	HORIZONTAL	VERTICAL	COMPACTION
A. PAVEMENT AREA SUBGRADE	0.1'±	+0.0' TO −0.1'	SEE SOILS REPORT
B. ENGINEERED FILL	0.5'±	+0.1' TO −0.1'	SEE SOILS REPORT

COMPACTION TESTING WILL BE PERFORMED BY THE OWNER OR HIS REPRESENTATIVE. COMPACTION SHALL COMPLY WITH THE REQUIREMENTS OF THE ENGINEER.

7. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.
8. THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.
9. THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT- OF-WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOIL, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.
10. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, SUCH ITEM SHALL BE PROVIDED, AS DIRECTED BY THE CITY ENGINEER, AT NO EXPENSE TO THE CITY OF LAS VEGAS. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

REVISED 4/15/10

STORMWATER RUNOFF MANAGEMENT

1. THE OWNER, SITE DEVELOPER, CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATE IN, THE PUBLIC RIGHTS-OF WAYS OF THE CITY OF LAS VEGAS AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.
2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN THE CITY OF LAS VEGAS AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BEST MANAGEMENT PRACTICES MANUAL.
3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY; REFER TO NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY ACTUAL RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".
2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCE WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER OR OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS; ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGN TO BE APPROVED BY THE QUALITY CONTROL DIVISION, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.
8. AC PAVEMENT TO BE 1/2" ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS.
9. CURB AND GUTTER WITH A GRADE OF LESS THAN FOUR-TENTHS OF ONE PERCENT SHALL BE WATER-TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION. ANY CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY SHALL BE REMOVED AND REPLACED PER USD 216.
10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER USD 235; CASE I. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY PROJECT REPRESENTATIVE.
11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF TRANSITIONS TO BE AS SHOWN ON PLANS, OR AS DESIGNATED IN THE FIELD BY CITY PROJECT REPRESENTATIVE.
12. EXACT LOCATION OF ALL SAWCUT LINES MAY BE DETERMINED IN THE FIELD BY A CITY PROJECT REPRESENTATIVE IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.
13. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED, AND SHALL BE DONE ONLY BY A NEVADA PROFESSIONAL LAND SURVEYOR IN ACCORDANCE WITH THE UNIFORM STANDARD DRAWINGS – CLARK COUNTY AREA. A RECORD-OF-SURVEY FOR REPLACEMENT OF PERMANENT SURVEY MONUMENTS SHALL BE SUBMITTED TO THE CITY ENGINEER FOR APPROVAL PRIOR TO RECORDING. THE RECORD-OF-SURVEY SHALL BE PREPARED IN ACCORDANCE WITH NEVADA REVISED STATUTES 625.350.
14. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTER UNLESS WRITTEN APPROVAL IS GRANTED BY THE AFFECTED UTILITY COMPANY AND THE CITY ENGINEER.
15. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE CLV BUILDING DEPARTMENT.
16. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHTS OF WAY.
17. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, SEWER CLEANOUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.
18. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT AND CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.
19. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO THE ENGINEER CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.
20. SANITARY SEWER AND STORM DRAIN FINAL LOCATION INFORMATION SHALL BE PROVIDED TO THE ENGINEER PRIOR TO PROJECT ACCEPTANCE. THE INFORMATION SHALL INCLUDE THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, AND THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXITS THE PUBLIC RIGHT-OF-WAY. THE LOCATION SHALL BE DESCRIBED BY COORDINATES WHICH SHALL BE BASED ON THE OFFICIAL HORIZONTAL AND VERTICAL CONTROL NETWORKS OF THE CITY OF LAS VEGAS. FINAL LOCATION INFORMATION MUST BE SEALED AND CERTIFIED BY A NEVADA PROFESSIONAL LAND SURVEYOR TO HAVE POSITIONAL CERTAINTIES OF ± 0.09 METERS (± 0.3 FEET) HORIZONTALLY AND VERTICALLY. A SEPARATE ELECTRONIC COMMA DELIMITED FILE FOR THE SANITARY SEWER AND STORM DRAIN COORDINATES SHALL ALSO ACCOMPANY THE SANITARY SEWER AND STORM DRAIN FINAL LOCATION INFORMATION.
21. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST ADDITION.
22. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

REVISED JANUARY 23, 2014 (CPM VERSION)

FLOOD ZONE NOTE

NO PORTION OF THE SITE FALLS WITHIN A FEMA DESIGNATED SPECIAL FLOOD HAZARD AREA. SITE LOCATED ON PANEL 32003C2150E, DATED SEPTEMBER 27, 2002, TO REFLECT A LOMR. THIS PANEL SHOWS THAT THE PROJECT IS LOCATED WITHIN A ZONE X AND NOT LOCATED WITHIN A FEMA DESIGNATED 100-YEAR ZONE A OR SPECIAL FLOOD HAZARD AREA.

LEGEND

PROPOSED UTILITIES
EXISTING UTILITIES
FUTURE UTILITIES
SECTION LINE
EASEMENT LINE
RIGHT-OF-WAY LINE
PROPERTY LINE
CENTERLINE
100 YR HYDRAULIC GRADE LINE (ULT)
100 YR HYDRAULIC GRADE LINE (INT)
PROPOSED UTILITY (BY OTHERS)
PROPOSED SEWER LINE W/MH
FUTURE SEWER LINE W/MH
EXISTING SEWER LINE W/MH
EXISTING WATER LINE & GATE VALVE
PROPOSED WATER LINE & GATE VALVE
FUTURE WATER LINE & GATE VALVE
2"G — EXISTING GAS LINE
2-6"E — EXISTING UNDERGROUND ELECTRICAL
CATV — EXISTING CABLE TV
TEL — EXISTING TELEPHONE
OHP — EXISTING OVERHEAD AND POWER POLES
PROPOSED STORM DRAIN W/MH
EXISTING STORM DRAIN W/MH
FUTURE STORM DRAIN W/MH
EXISTING SIDEWALK AND RAMP
CONSTRUCT CURB DEPRESSION FOR FUTURE HANDICAP RAMP
VIEW FENCE
NEW ABANDONED PIPE
EXISTING ABANDONMENT
SAWCUT
STEEL CASING
APPROXIMATE PAVEMENT RESTORATION
TO BE ABANDONED PROFILE HATCH
WATER STUB WITH BLOW-OFF
FUTURE WATER STUB WITH BLOW-OFF
SEWER STUB WITH CAP
FUTURE SEWER STUB WITH CAP
EDGE OF PAVEMENT
OUTSIDE EDGE
CUT LIMIT LINE
FILL LIMIT LINE

1 / CD1 — DRAWING NUMBER FOR DETAIL W/ REF. TO THE SHEET WHERE IT IS SHOWN
XX / YYY — STANDARD DRAWING NUMBER / GOVERNING AGENCY
BENCHMARK
POTHOLE LOCATION
EXISTING NVR RS-100
EXISTING DROP INLET
PROPOSED DROP INLET
FUTURE DROP INLET
EXISTING GATE VALVE
PROPOSED GATE VALVE
FUTURE GATE VALVE
EXISTING WATER METER
PROPOSED WATER METER
EXISTING TRAFFIC SIGNAL PULL BOX
PROPOSED SIGNAL PULLBOX
EXISTING TELEPHONE MANHOLE
EXISTING POWER POLE
EXISTING ELEC MARKER
EXISTING TRAFFIC SIGNAL
PROPOSED TRAFFIC SIGNAL
EXISTING FIRE HYDRANT
PROPOSED FIRE HYDRANT
FUTURE FIRE HYDRANT
EXISTING UTILITY BOX
EXISTING METER BOX
3005 — PROPOSED CONTOUR
(3005) — EXISTING CONTOUR
60.50 TC — SPOT ELEVATION
(60.50) TC — EXISTING SPOT ELEVATION
FUTURE SPOT ELEVATION
EXISTING CLARK COUNTY STREET LIGHT (STLT)
1.00% — ROAD SLOPE
EXISTING SUMMERLIN STREET LIGHT (STLT)
PROPOSED SUMMERLIN STREET LIGHT (STLT)
TOP SLOPE
3:1 SLOPE UNLESS OTHERWISE NOTED ON PLAN
TOE SLOPE

ABBREVIATIONS

A	AIR	FH	FIRE HYDRANT	RCB	REINFORCED CONCRETE BOX
AC	ASPHALT CONCRETE, ACRE	FL	FLOW LINE	RCP	REINFORCED CONCRETE PIPE
ACP	ASBESTOS CEMENT PIPE	FO	FIBER OPTIC	RD	ROAD
ADD'L	ADDITIONAL	FRP	FIBERGLASS REINFORCED PLASTIC	RDWY	ROADWAY
AP	ANGLE POINT	FS	FINISH SURFACE	REC	RECTANGULAR
APN	ASSESSOR'S PARCEL NUMBER	FT	FOOT/FEET	REF	REFERENCE
APPROX	APPROXIMATELY	FTG	FOOTING	REINF	REINFORCED
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS	FUT	FUTURE	REQD	REQUIRED
		G	GAS	RIM	TOP OF RIM ELEVATION
		GA	GAGE, GUY ANCHOR	RND	ROUND
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	GB	GRADE BREAK	ROW,R/W	RIGHT OF WAY
		GND	GROUND	RP	RADIUS POINT
AVE	AVENUE	GRD	GRADE, GROUND	RPM	RAISED PAVEMENT MARKERS
AVAR	AIR VALVE, AIR RELEASE ASSEMBLY	H, HGT	HEIGHT	RSGV	RESILIENT SEAT GATE VALVE
		HDWL	HEADWALL	S	SOUTH
AWWA	AMERICAN WATER WORKS ASSOCIATION	HGL	HYDRAULIC GRADE LINE	SCH	SCHEDULE
		HORIZ	HORIZONTAL	SD	STORM DRAIN
BC	BACK OF CURB	HP	HIGH POINT, HIGH PRESSURE	SDMH	STORM DRAIN MANHOLE
BCR	BEGIN CURB RETURN	HPS	HIGH PRESSURE SODIUM	SECT	SECTION
BLM	BUREAU OF LAND MANAGEMENT	IBC	INTERNATIONAL BUILDING CODE	SF	SQUARE FOOT/FEET
BLVD	BOULEVARD	INV	INVERT	SHLDR	SHOULDER
BM	BENCHMARK	INT	INTERIM	SHT	SHEET
BO	BLOW-OFF	JT	JOINT	SIS	SUMMERLIN IMPROVEMENT STANDARDS
BVCE	BEGIN VERTICAL CURVE ELEVATION	L	LENGTH		
BVCS	BEGIN VERTICAL CURVE STATION	L, LT	LEFT	SL	STREET LIGHT
BW	BACK OF SIDEWALK	LF	LINEAR FEET	SP	SERVICE POINT
℄, ℄	CENTERLINE	LIP	LIP OF GUTTER	SQ	SQUARE
C&G	CURB AND GUTTER	LN	LANE	SR	SEWER RECLAIM MAIN
CATV	UNDERGROUND CABLE TV	LP	LIGHT POLE	SS	SANITARY SEWER
CCBM	CLARK COUNTY BENCH MARK	LSCP	LANDSCAPE	SSMH	SANITARY SEWER MANHOLE
CCPW	CLARK COUNTY PUBLIC WORKS	LVVWD	LAS VEGAS VALLEY WATER DISTRICT	STA	STATION
CCTV	CLOSED-CIRCUIT TELEVISION	MAX	MAXIMUM	ST	STREET
CCWRD	CLARK COUNTY WATER RECLAMATION DISTRICT	MH	MANHOLE	STD	STANDARD
		MIN	MINIMUM	STL	STEEL
CFS	CUBIC FEET PER SECOND	MLCP	MORTAR LINED AND COATED PIPE	STRUCT	STRUCTURE
CIP	CAPITAL IMPROVEMENTS PROJECT, CORRUGATED IRON PIPE	MP	MESA PARK	SVZ	SIGHT VISIBILITY ZONE
		MOD	MODIFY/MODIFIED	SW	SIDEWALK
	CAST IN PLACE	MON	MONUMENT	SWG	SOUTHWEST GAS
CIPM	CAST-IN-PLACE MANHOLE	MPH	MILES PER HOUR	T	TELEPHONE OR TOP
CIPP	CAST-IN-PLACE PIPE	N	NORTH	TAN	TANGENT
CIR	CIRCLE	NDOT	NEVADA DEPARTMENT OF TRANSPORTATION	TB	TOP OF BERM
CLR	CLEAR OR CLEARANCE			TC	TOP OF CURB
CLSM	CONTROLLED LOW STRENGTH MATERIAL	NO	NUMBER	TCE	TEMPORARY CONSTRUCTION ESMT
		NOSHA	STATE OF NEVADA OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION	TEL,TELE	TELEPHONE
CLV	CITY OF LAS VEGAS			TEMP	TEMPORARY
CMP	CORRUGATED METAL PIPE			TF	TOP OF FOOTING
CMU	CONCRETE MASONRY UNIT	NVE	NEVADA ENERGY	TG	TOP OF GRATE
CNLV	CITY OF NORTH LAS VEGAS	NTS	NOT TO SCALE	TMH	TOP OF MANHOLE
CO	CLEANOUT	OB	OVERBUILD	TOP	TOP OF PIPE
CONC	CONCRETE	OC	ON CENTER	TP	TELEPHONE POLE
COND	CONDUIT	OHC	OVERHEAD COX COMMUNICATION	TRANS	TRANSITION
CONST	CONSTRUCT OR CONSTRUCTION	OHP	OVERHEAD POWER LINE	TRW	TOP OF RETAINING WALL
COORD	COORDINATE	P	POWER LINE	TS	TRAFFIC SIGNAL
COR	CORNER	PB	PULL BOX	TW	TOP OF WALL
CPEP	CORRUGATED POLYETHELYNE PIPE	PBS	PLANTMIX BITUMINOUS SURFACE	TYP,(TYP)	TYPICAL
CT	COURT	PC	POINT OF CURVE, PRESSURE	UDACS	UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR WATER DISTRIBUTION SYSTEMS (LATEST EDITION)
CY	CUBIC YARD(S)		CLASS		
Δ	DELTA	PCC	POINT OF COMPOUND CURVE		
DBL	DOUBLE	PE	PROJECT ENGINEER OR POLYETHYLENE		
WES	DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER			UG	UNDERGROUND
		PED	PEDESTRIAN	ULT	ULTIMATE
	COLLECTION SYSTEM (LATEST EDITION)	PGL	PROFILE GRADE LINE	USD	UNIFORM DESIGN AND CONSTRUCTION STANDARDS
		PH	POTHOLE		
DEFL	DEFLECTION	PI	POINT OF INTERSECTION	USDCCA	UNIFORM STD. DRAWINGS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS CLARK COUNTY AREA, NEVADA (LATEST EDITION)
DG	DESIGN GRADE	PIV	POST INDICATOR VALVE		
DIA, ⌀	DIAMETER	℄	PROPERTY LINE		
DIP	DUCTILE IRON PIPE	PLCP	POLYURETHANE LINED AND COATED STEEL PIPE		
DIST	DISTANCE				
DR	DRIVE	PMF	PAVEMENT MARKING FILM	UT	UNDERGROUND TELEPHONE
DS	DOWNSPOUT	POB	POINT OF BEGINNING	VAR	VARIABLE/VARIES
DTL	DETAIL	POC	POINT ON CURVE	VC	VERTICAL CURVE
DW	DRIVEWAY	P.O.C.	POINT OF CONNECTION	VCP	VITRIFIED CLAY PIPE
DWG	DRAWING	POT	POINT ON TANGENT	VERT	VERTICAL
E	EAST	PP	POWER POLE	VG	VALLEY GUTTER
ECR	END CURB RETURN	PROP	PROPOSED	VOL	VOLUME
ELE,ELEC	ELECTRICAL	PRC	POINT OF REVERSE CURVE	W	WATER, WEST
ELEV	ELEVATION	PRVC	POINT OF REVERSE VERTICAL CURVE	W/	WITH
EP, EOP	EDGE OF PAVEMENT			WOTUS	WATERS OF THE UNITED STATES
ESMT	EASEMENT	PSI	POUNDS PER SQUARE INCH	WS	WATER SUPPLY
EVC	END VERTICAL CURVE	PT	POINT OF TANGENCY	WT	WEIGHT
EXIST,EX	EXISTING	PVC	POLYVINYL CHLORIDE	WTR	WATER
EXP	EXPANSION JOINT	PVI	POINT OF VERTICAL INTERSECTION	XING	CROSSING
FC	FACE OF CURB	PVMT	PAVEMENT	YD	YARD, YARD DRAIN
FF, FFE	FINISH FLOOR ELEVATION	PZ	PRESSURE ZONE	Z	PRESSURE ZONE
FG	FINISH GRADE	R, RAD	RADIAL, RADIUS		
		R, RT	RIGHT		

DEVIATIONS FROM STANDARDS

1. NONE

NOTE

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BM #	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
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AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD — 1-702-227-2929

FAST — Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

JOSHUA L. JOHNSON — STATE OF NEVADA — 15787 — PROFESSIONAL ENGINEER — 03/10/16

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	CGW APP	DATE

03/10/2016 TDS RESPONSE TO COMMENTS — NOT FOR CONSTRUCTION

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JLJ
PLOT DATE: 03-10-16
PLOT TIME: 12:08:55

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

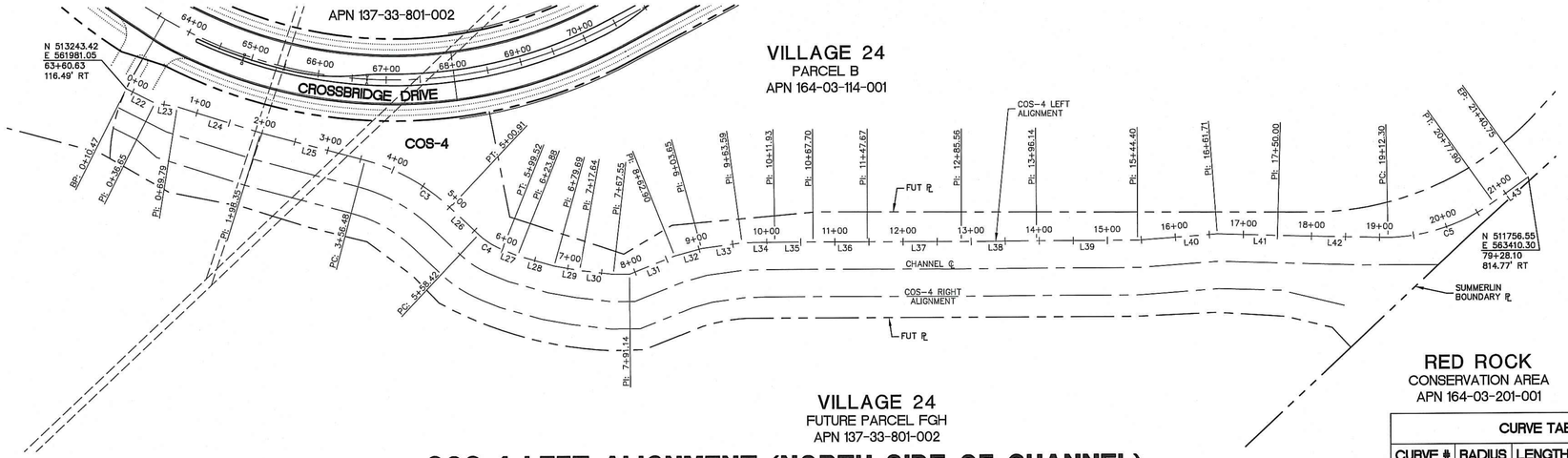
F:\Projects\600\62024-226-4\DWG\Production\V24-226-4_NT.dwg
Brian Vincent

THE HOWARD HUGHES COMPANY, LLC

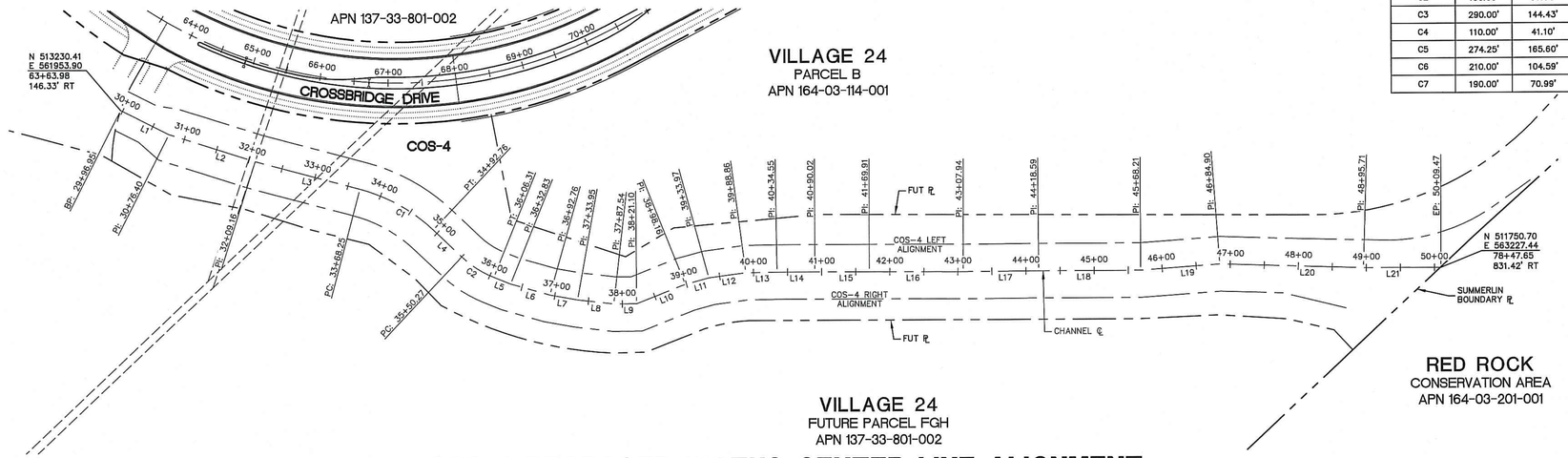
VILLAGE 24 - US WATERS
COS - 4 WASH

LEGEND AND ABBREVIATIONS

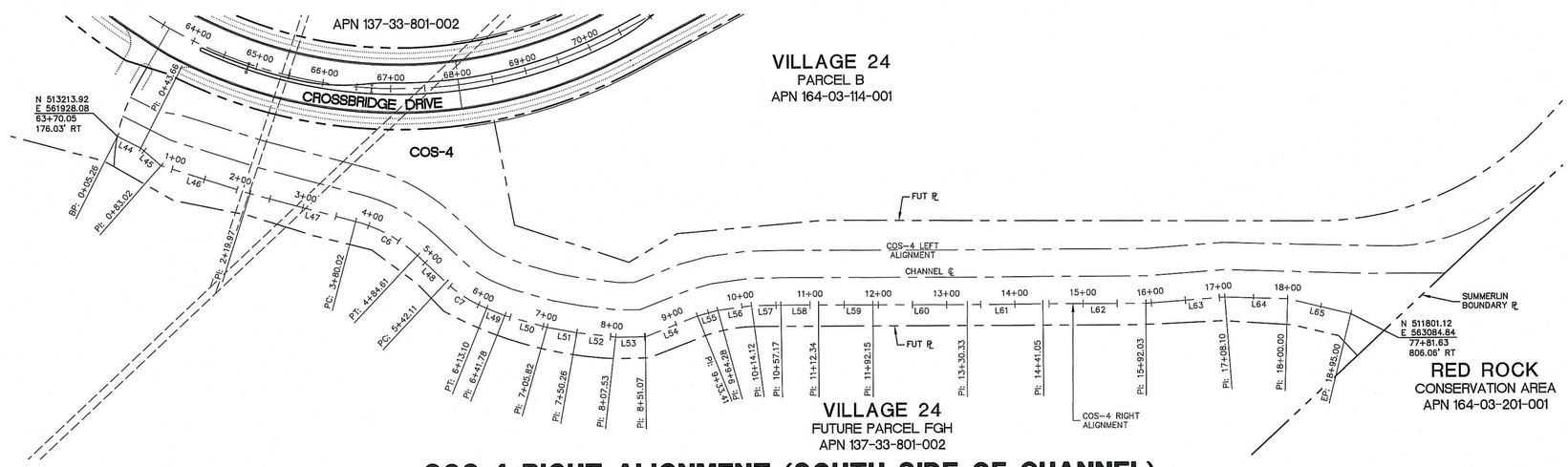
DRAWING 2
2 OF 18 SHTS



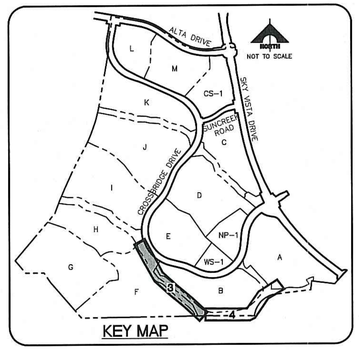
COS-4 LEFT ALIGNMENT (NORTH SIDE OF CHANNEL)



COS-4 PROPOSED WOTUS CENTER LINE ALIGNMENT



COS-4 RIGHT ALIGNMENT (SOUTH SIDE OF CHANNEL)



CURVE TABLE

CURVE #	RADIUS	LENGTH	DELTA	TANGENT
C1	250.00'	124.51'	28°32'06"	63.57'
C2	150.00'	56.04'	21°24'27"	28.35'
C3	290.00'	144.43'	28°32'06"	73.75'
C4	110.00'	41.10'	21°24'27"	20.79'
C5	274.25'	165.60'	34°35'46"	85.41'
C6	210.00'	104.59'	28°32'06"	53.40'
C7	190.00'	70.99'	21°24'27"	35.91'

LINE TABLE

LINE #	LENGTH	DIRECTION
L1	79.45'	S20°50'34"E
L2	132.76'	S30°06'02"E
L3	159.09'	S32°50'31"E
L4	57.51'	S04°18'25"E
L5	26.52'	S25°42'52"E
L6	59.93'	S31°54'01"E
L7	41.19'	S37°29'34"E
L8	53.59'	S41°10'27"E
L9	33.56'	S48°02'13"E
L10	77.05'	S69°29'31"E
L11	35.81'	S62°56'15"E
L12	54.89'	S55°20'59"E
L13	45.69'	S48°29'43"E
L14	55.48'	S47°46'29"E
L15	79.89'	S47°38'46"E
L16	138.03'	S47°33'07"E
L17	110.65'	S48°03'13"E
L18	149.62'	S47°45'02"E
L19	116.69'	S51°57'05"E
L20	210.81'	S45°57'55"E
L21	113.76'	S47°36'53"E
L22	47.12'	S20°50'34"E
L23	33.14'	S38°24'27"E
L24	128.56'	S30°06'02"E
L25	158.13'	S32°50'31"E
L26	57.51'	S04°18'25"E
L27	24.36'	S25°42'52"E
L28	55.81'	S31°54'01"E
L29	37.95'	S37°29'34"E
L30	49.91'	S41°10'27"E
L31	71.76'	S69°29'31"E
L32	40.75'	S62°56'15"E
L33	59.94'	S55°20'59"E

LINE TABLE

LINE #	LENGTH	DIRECTION
L34	48.34'	S48°29'43"E
L35	55.77'	S47°46'29"E
L36	79.97'	S47°38'46"E
L37	137.89'	S47°33'07"E
L38	110.58'	S48°03'13"E
L39	148.26'	S47°45'02"E
L40	117.32'	S51°57'05"E
L41	88.29'	S45°57'55"E
L42	162.30'	S46°21'02"E
L43	62.85'	S83°09'31"E
L44	38.40'	S20°50'34"E
L45	39.36'	S06°07'29"E
L46	136.95'	S30°06'02"E
L47	160.05'	S32°50'31"E
L48	57.51'	S04°18'25"E
L49	28.68'	S25°42'52"E
L50	64.04'	S31°54'01"E
L51	44.43'	S37°29'34"E
L52	57.28'	S41°10'27"E
L53	43.54'	S48°02'13"E
L54	82.34'	S69°29'31"E
L55	30.87'	S62°56'15"E
L56	49.85'	S55°20'59"E
L57	43.04'	S48°29'43"E
L58	55.18'	S47°46'29"E
L59	79.81'	S47°38'46"E
L60	138.17'	S47°33'07"E
L61	110.72'	S48°03'13"E
L62	150.98'	S47°45'02"E
L63	116.07'	S51°57'05"E
L64	91.90'	S45°57'55"E
L65	95.00'	S34°03'23"E

NORTH

100 0 100 200

SCALE FEET

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OR
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OR
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FAST
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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER - STATE OF NEVADA
JOSHUA T. JOHNSON
No. 15788
PROFESSIONAL
DATE: 03/10/16

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP
		03/10/2016 TDS RESPONSE TO COMMENTS -- NOT FOR CONSTRUCTION				

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JJJ
PLOT DATE: 03-10-16
PLOT TIME: 12:08:40

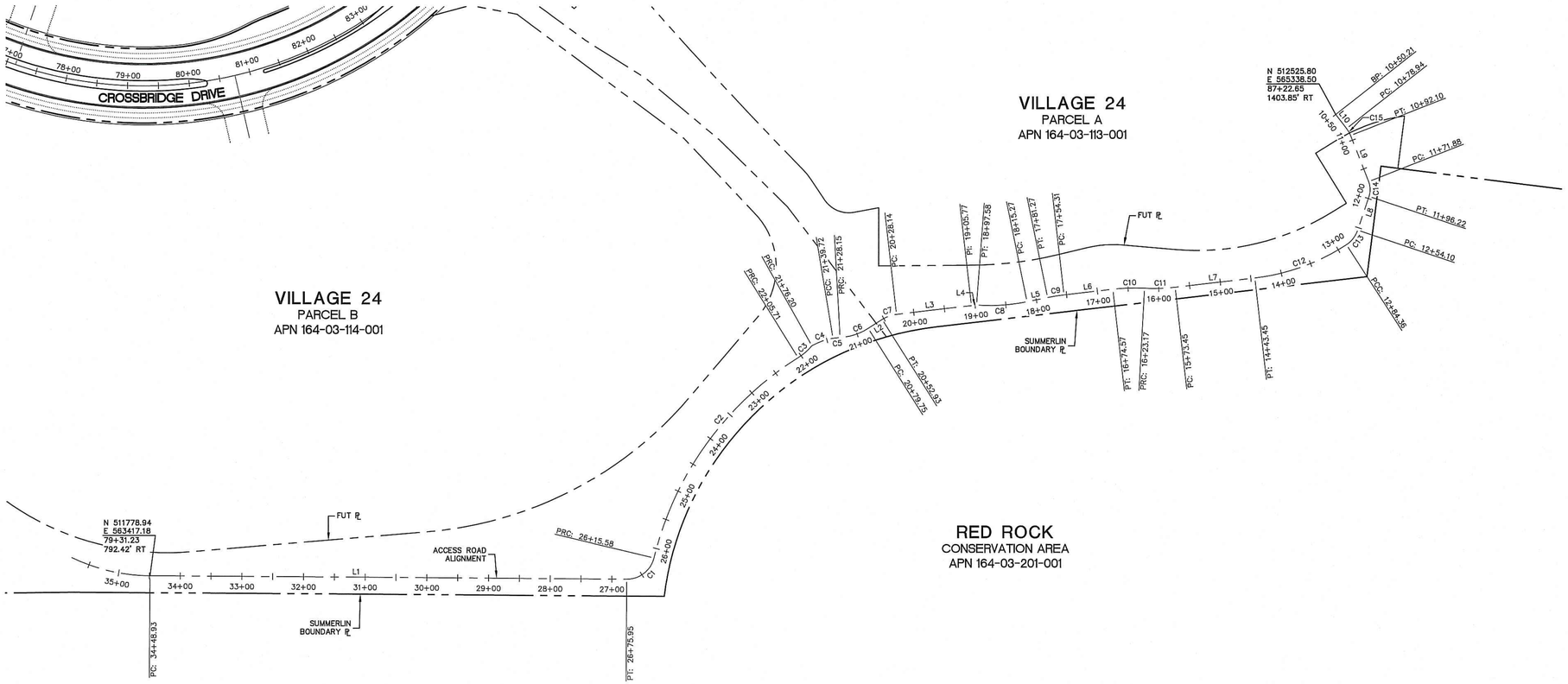
GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
F:\Projects\600\62024-226-4\DWG\Production\V24-226-4_JJC.dwg
Brian Vincent

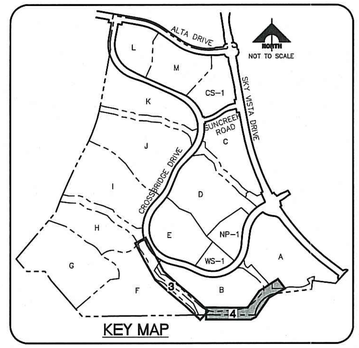
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

HORIZONTAL CONTROL PLAN 1

DRAWING
3
3 OF 18 SHTS

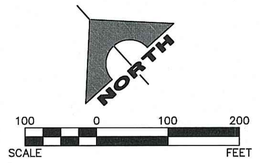




COS-4 ACCESS ROAD ALIGNMENT

LINE TABLE		
LINE #	LENGTH	DIRECTION
L1	772.98'	N89°40'23"W
L2	26.82'	S57°35'17"W
L3	122.36'	S83°24'53"W
L4	8.19'	S83°24'53"W
L5	34.00'	S78°21'00"W
L6	79.75'	S83°24'53"W
L7	130.00'	S83°24'53"W
L8	57.88'	S18°27'37"W
L9	79.78'	S21°22'34"E
L10	28.73'	S38°07'58"E

CURVE TABLE				
CURVE #	RADIUS	LENGTH	DELTA	TANGENT
C1	45.00'	60.37'	76°52'11"	35.71'
C2	527.50'	409.87'	44°31'08"	215.91'
C3	95.00'	29.51'	17°48'00"	14.88'
C4	105.00'	36.47'	19°54'12"	18.42'
C5	105.00'	11.57'	6°18'54"	5.79'
C6	95.00'	48.40'	29°11'36"	24.74'
C7	55.00'	24.79'	25°49'36"	12.61'
C8	295.00'	82.31'	15°59'13"	41.43'
C9	305.00'	26.96'	5°03'53"	13.49'
C10	305.00'	51.40'	9°39'21"	25.76'
C11	295.00'	49.71'	9°39'21"	24.92'
C12	345.00'	159.09'	26°25'17"	80.99'
C13	45.00'	30.26'	38°31'59"	15.73'
C14	35.00'	24.33'	39°50'12"	12.68'
C15	45.00'	13.16'	16°45'23"	6.63'



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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER: STATE OF NEVADA
JOSHUA JOHNSON
No. 15786
PROFESSIONAL ENGINEER
DATE: 03/10/16

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP
		03/10/2016 TDS RESPONSE TO COMMENTS — NOT FOR CONSTRUCTION				

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JJ
PLOT DATE: 03-10-16
PLOT TIME: 12:07:56

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\600\62024-226-4\DWG\Production\V24-226-4_HC 2.dwg
Brian Vincent

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

HORIZONTAL CONTROL 2

DRAWING
4
4 OF 18 SHTS

VILLAGE 24
PARCEL A

VILLAGE 24
FUTURE PARCEL NP-1
APN 137-33-801-002

VILLAGE 24
FUTURE PARCEL WS-1
APN 137-33-801-002

VILLAGE 24
PARCEL B
APN 164-03-114-001

VILLAGE 24
FUTURE PARCEL D
APN 137-33-801-002

VILLAGE 24
FUTURE PARCEL FGH
APN 137-33-801-002

RED ROCK
CONSERVATION AREA
APN 164-03-201-001

CROSSBRIDGE DRIVE
CLW107/86535

CROSSBRIDGE DRIVE
CLW107/86532

DWG 6

DWG 7

DWG 8

DWG 9

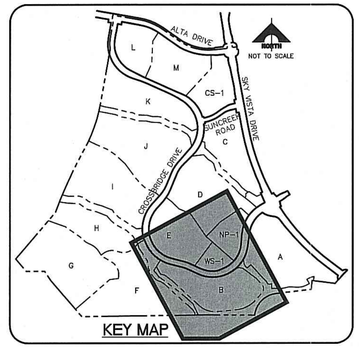
DWG 10

DWG 11

DWG 12

DWG 13

DWG 14



KEY MAP

EARTHWORK QUANTITIES

CUT	936	CY
FILL	24259	CY

QUANTITIES

48" RCP	52	LF
48" RCP END SECTION	1	EA
18" RCP CASING	353	LF
RIPRAP (D50=12")	233	CY
RIPRAP (D50=24")	424	CY
RIPRAP (D50=42")	858	CY
1' TO 3' CONCRETE EMBEDDED RIPRAP	6051	CY

NORTH

100 0 100 200
SCALE FEET

RIPRAP GENERAL NOTE:

ALL RIPRAP, EXCLUDING CONCRETE EMBEDDED RIPRAP, SHALL ADHERE TO REQUIREMENTS OF UNIFORM STANDARD SPECIFICATION SECTION 610 "SLOPE AND CHANNEL PROTECTION." FOR CONCRETE EMBEDDED RIPRAP, SEE SECTION 610 "SLOPE AND CHANNEL PROTECTION ADDITIONAL REQUIREMENTS" PER SHEET 17.

COS WASH MAINTENANCE GENERAL NOTE:

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CCRFCD RAINFALL GAUGE 4329 IS LOCATED IN BROWNSTONE CANYON UPSTREAM OF VILLAGE 24.

CCRFCD RAINFALL GAUGE 4344 IS LOCATED IN THE RED ROCK DETENTION BASIN DOWNSTREAM OF VILLAGE 24.

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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER - STATE OF NEVADA
JOSHUA J. JOHNSON
No. 15789
PROFESSIONAL
DATE: 03/10/16

REV	DESCRIPTION	DATE	AGEN APP	DATE	GOV APP
	TDS RESPONSE TO COMMENTS -- NOT FOR CONSTRUCTION	03/10/2016			

PROJECT NO. 62024-226-4
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GCW
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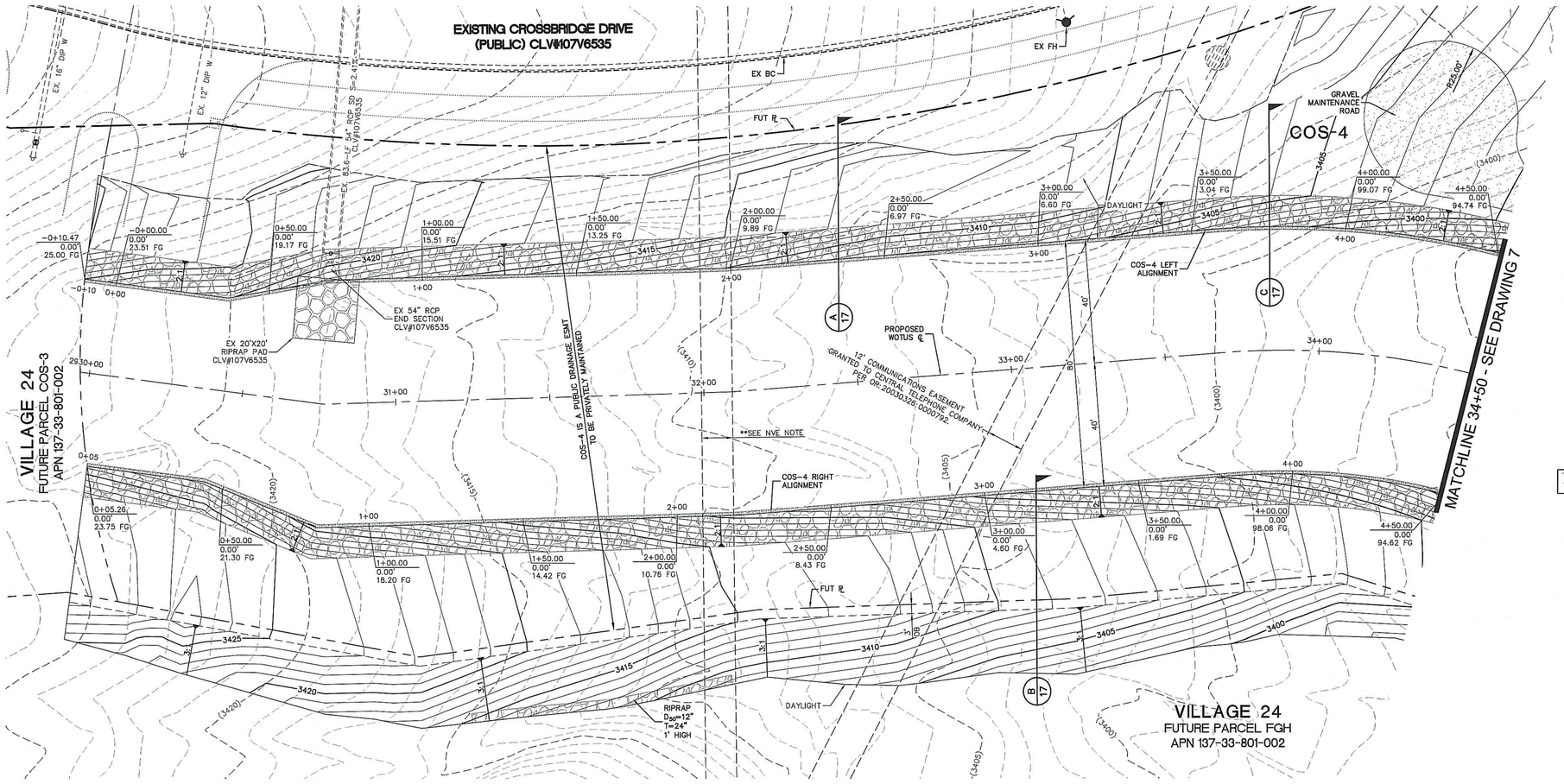
F: 702.804.2299
gowengineering.com
F:\Projects\600\62024-226-4\DWG\Production\V24-226-4_GD.dwg
Brian Vincent

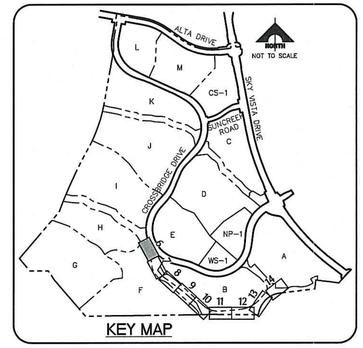
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

GRADING PLAN - OVERVIEW

DRAWING
5
5 OF 18 SHTS

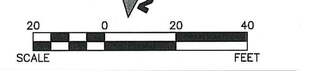




KEY MAP

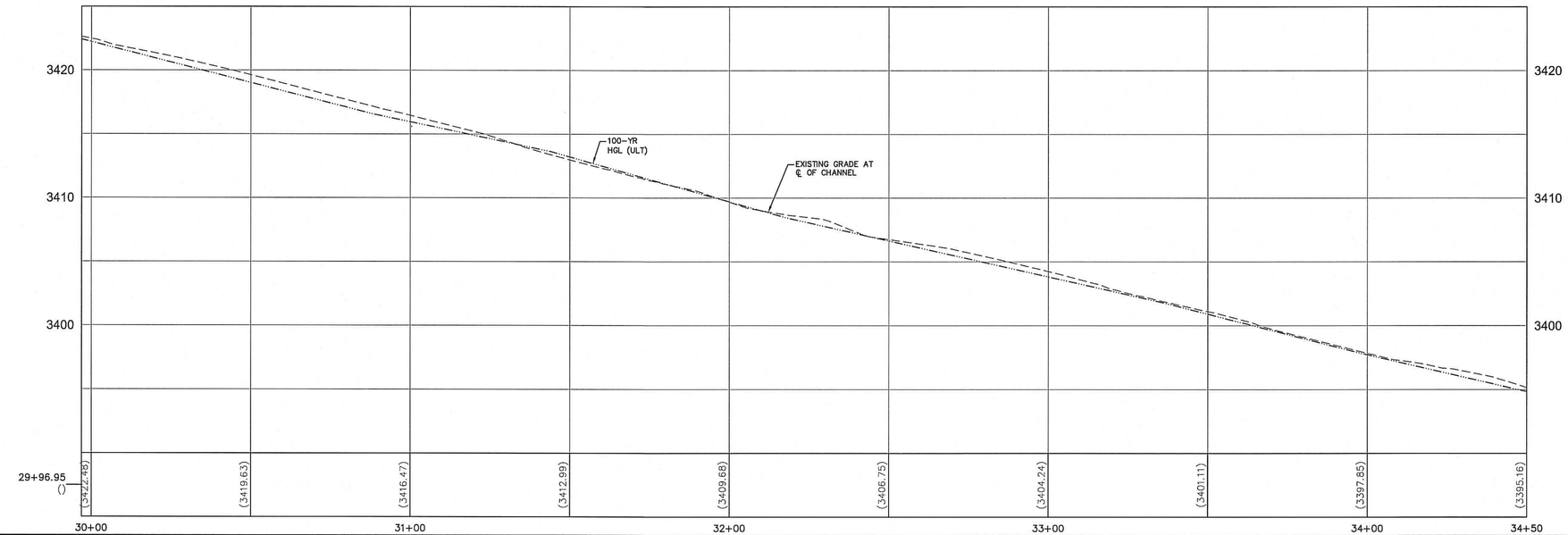
GRAVEL MAINTENANCE ROAD

2" CRUSHED ROCK/GRAVEL @ 95%



COS-4 (WATERS OF THE US)

SCALE: HORIZ 1" = 20'
VERT. 1" = 5'



NVE NOTE:
10' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR:20060427:0004171, AND 10' COMMUNICATIONS EASEMENT GRANTED TO CENTRAL TELEPHONE COMPANY PER OR:20060804:0004988

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BENCHMARK

BM #	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. D368	U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.	3246.63 (FEET)	989.574 (METERS)

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1-702-227-2929

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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER - STATE OF NEVADA
JOSHUA L. JOHNSON
No. 15769
PROFESSIONAL
DATE: 03/10/16

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GOV APP

08/10/2016 TDS RESPONSE TO COMMENTS -- NOT FOR CONSTRUCTION

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JJJ
PLOT DATE: 03-10-16
PLOT TIME: 12:06:24

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F: 702.804.2299
gcwengineering.com
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Brion Vincent

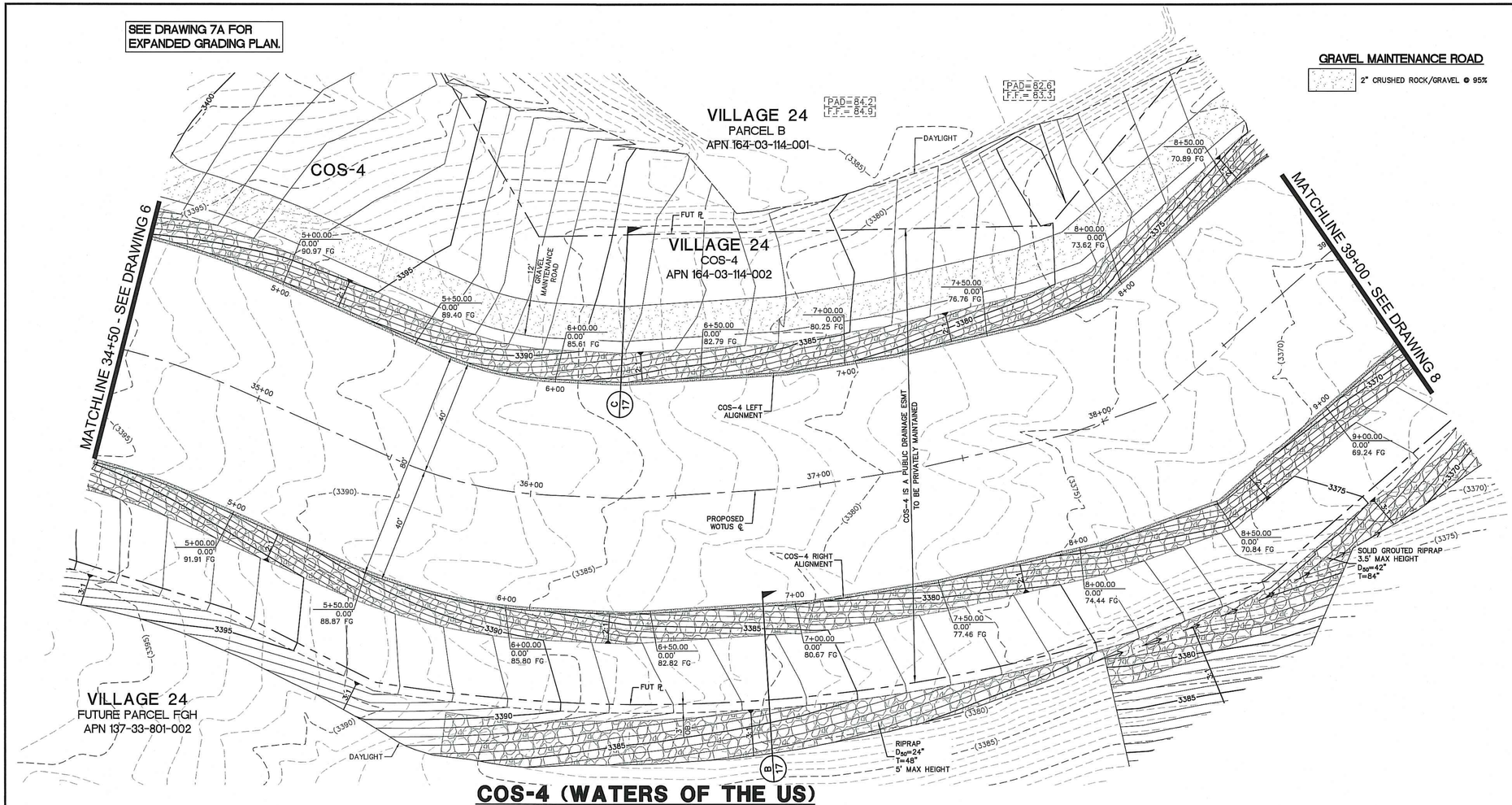
THE HOWARD HUGHES COMPANY, LLC

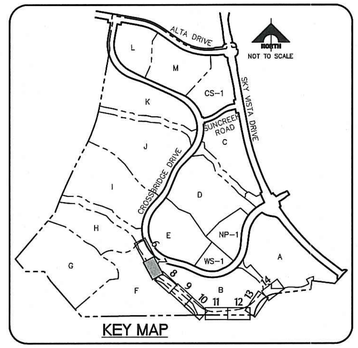
VILLAGE 24 - US WATERS
COS - 4 WASH

GRADING PLAN 1

DRAWING 6
6 OF 18 SHTS

SEE DRAWING 7A FOR EXPANDED GRADING PLAN.

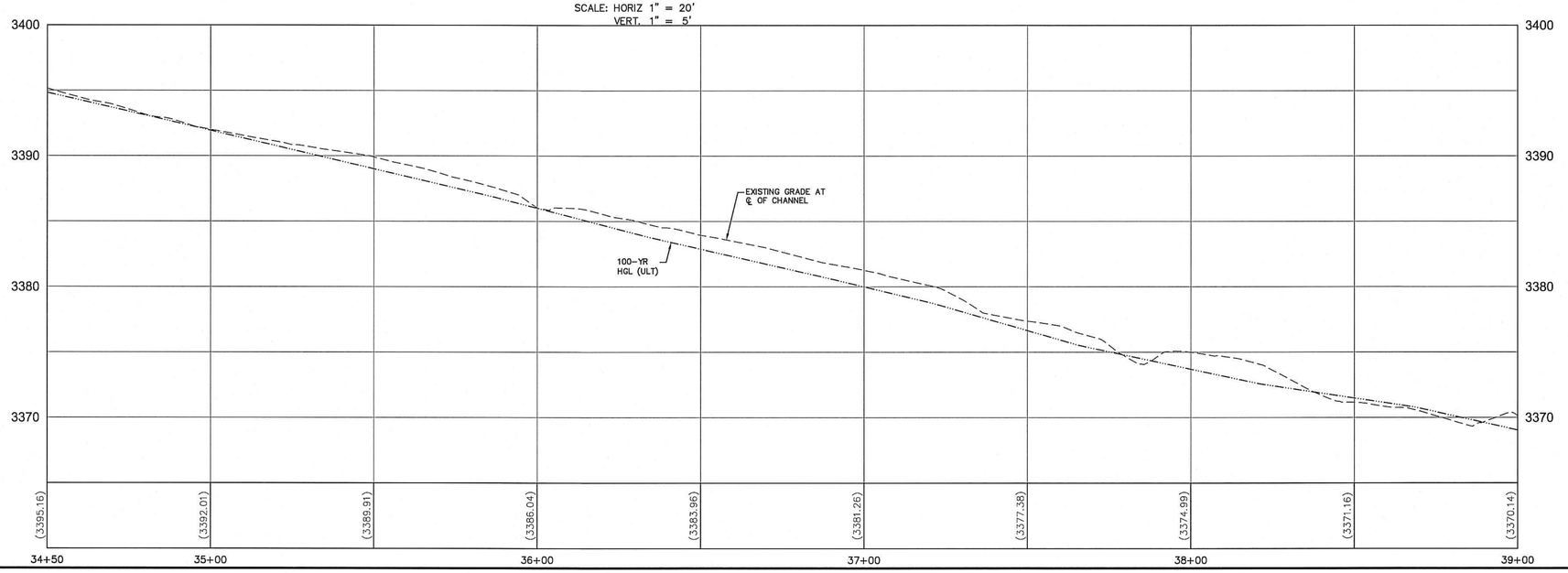


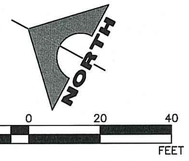


KEY MAP

COS-4 (WATERS OF THE US)

SCALE: HORIZ 1" = 20'
VERT. 1" = 5'





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ENGINEER: STATE OF NEVADA — JOSHUA L. JOHNSON — No. 15787 — PROFESSIONAL ENGINEER — CIVIL — DATE: 03/10/16

REV	DATE	DESCRIPTION	DATE	AGSN APP	DATE	CCW APP
	03/10/2016	TDS RESPONSE TO COMMENTS -- NOT FOR CONSTRUCTION				

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JLJ
PLOT DATE: 03-10-16
PLOT TIME: 12:05:13

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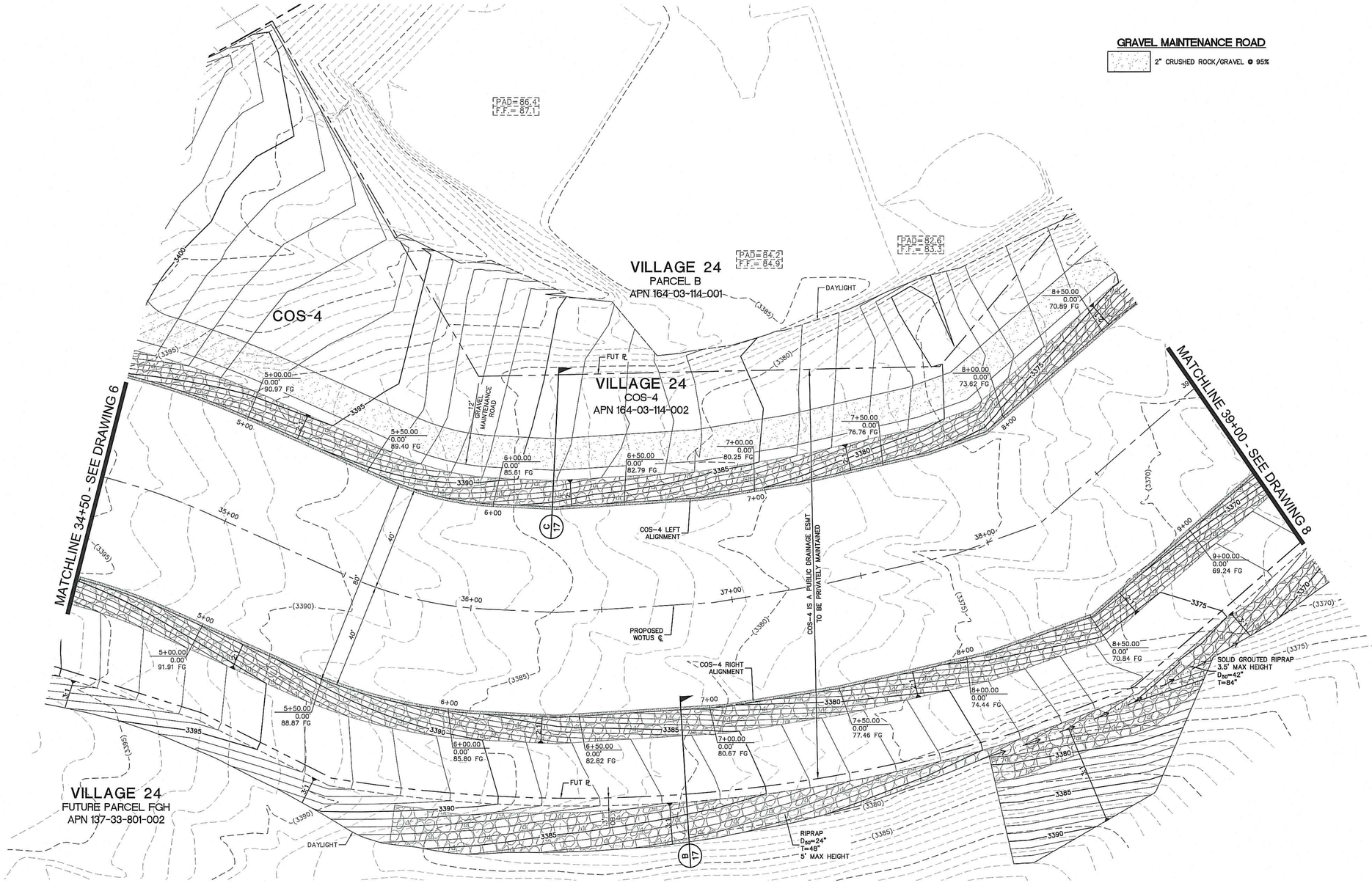
Brian Vincent

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

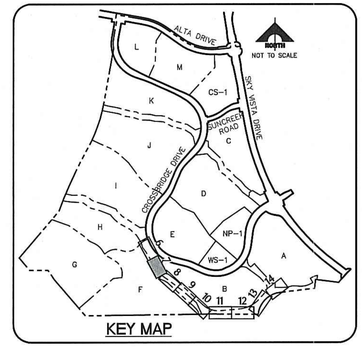
GRADING PLAN 2

DRAWING 7
7 OF 18 SHTS

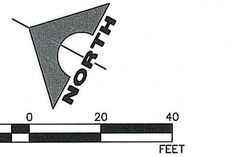


COS-4 (WATERS OF THE US)

SCALE: HORIZ 1" = 20'



KEY MAP



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ENGINEER: STATE OF NEVADA — JOSHUA J. JOHNSON — No. 15789 — PROFESSIONAL — DATE: 03/10/16

REV	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP
	03/10/2016 TDS RESPONSE TO COMMENTS — NOT FOR CONSTRUCTION				

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JJJ
PLOT DATE: 03-10-16
PLOT TIME: 12:04:02

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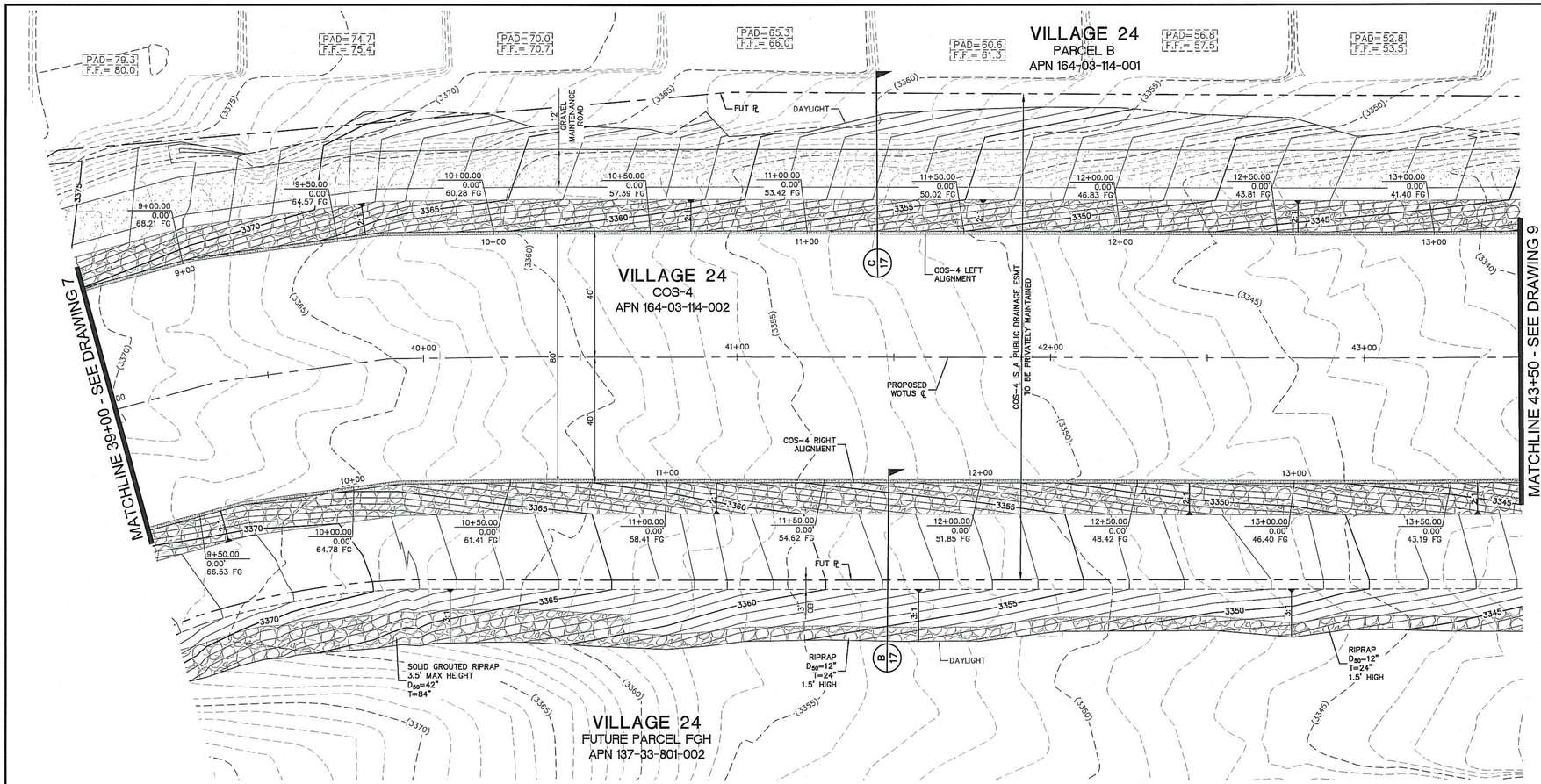
Brian Vincent

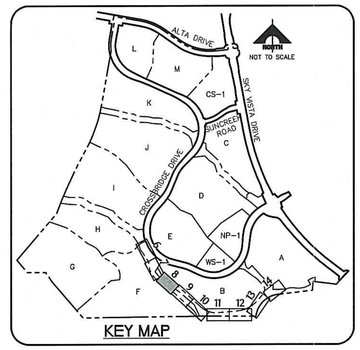
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

GRADING PLAN 2A

DRAWING 7A
8 OF 18 SHTS





KEY MAP

GRAVEL MAINTENANCE ROAD

2" CRUSHED ROCK/GRAVEL @ 95%

COS-4 (WATERS OF THE US)

SCALE: HORIZ 1" = 20'
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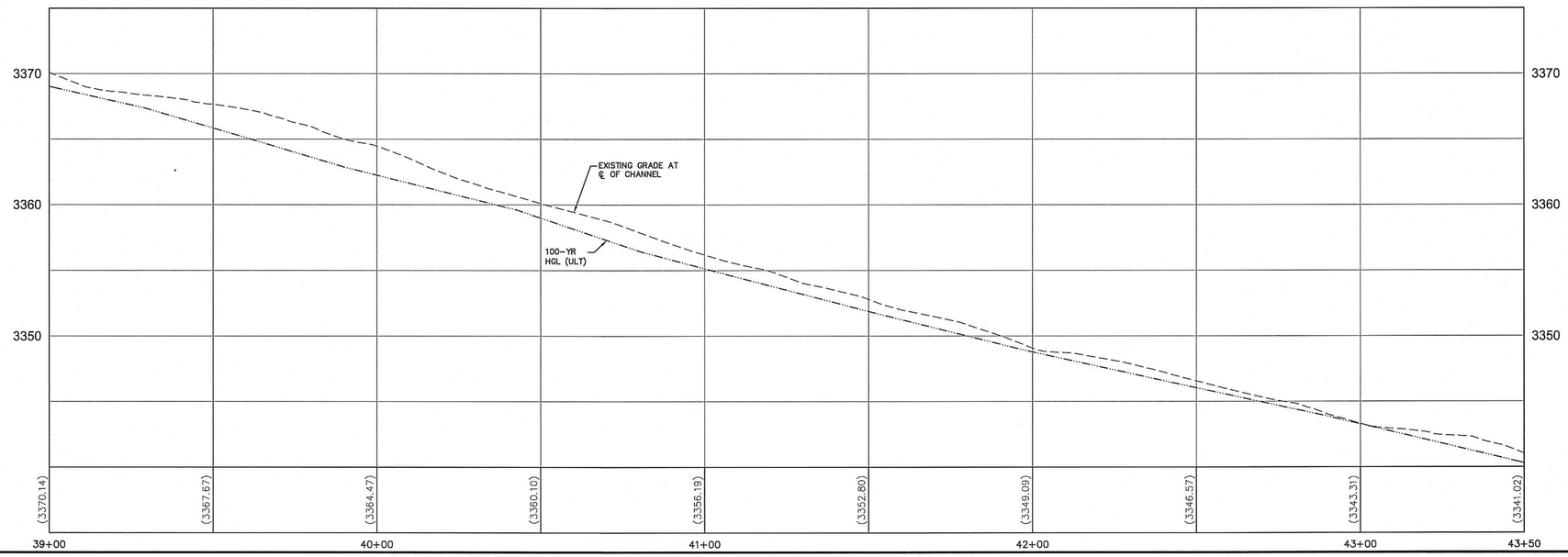

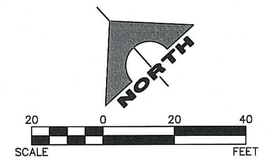

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Brian Vincent

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: AJJ
PLOT DATE: 03-10-16
PLOT TIME: 12:03:15

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	CCW APP
	03/10/2016	TDS RESPONSE TO COMMENTS -- NOT FOR CONSTRUCTION				

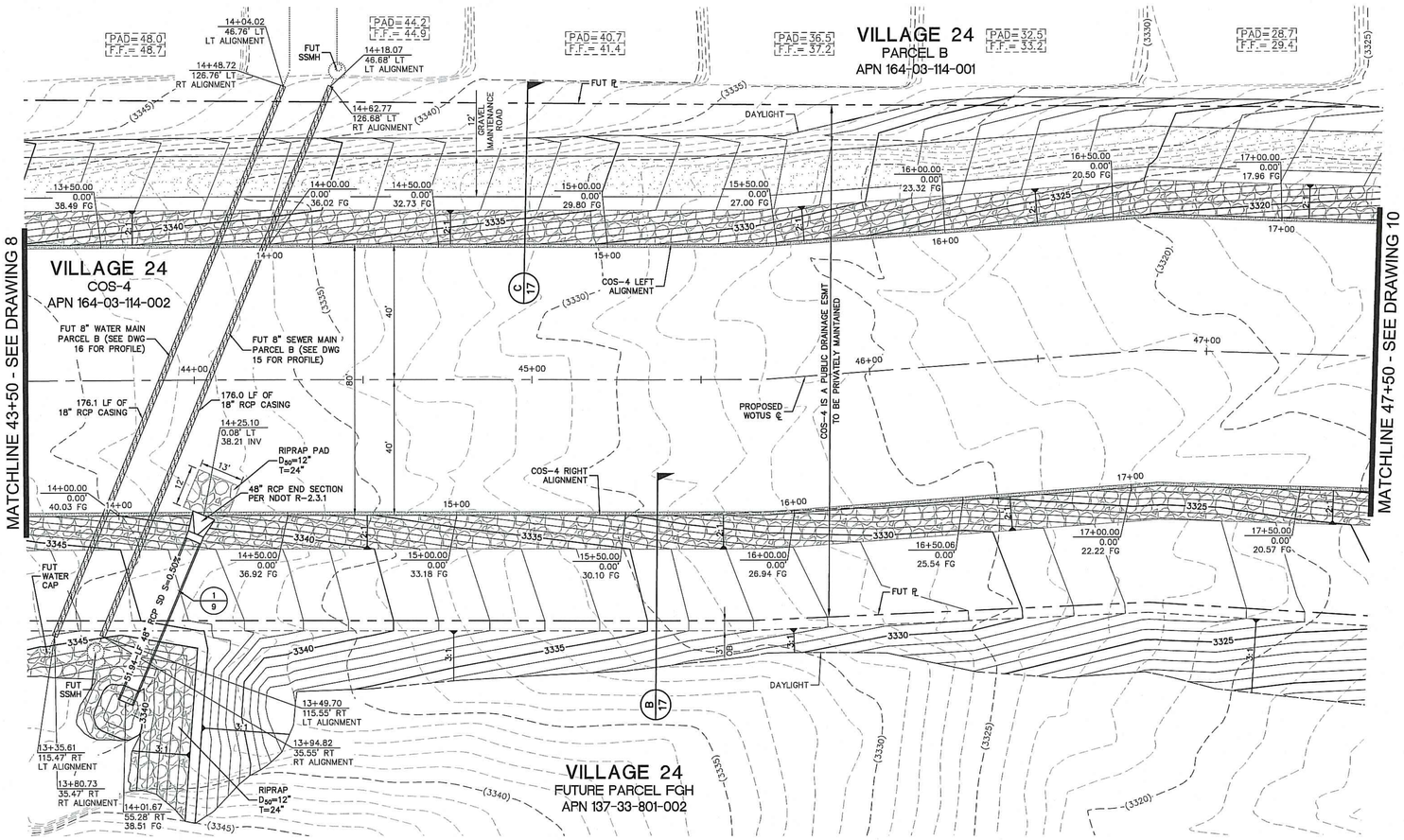
ENGINEER - STATE OF NEVADA
JOSHUA J. JOHNSON
No. 15786
PROFESSIONAL ENGINEER
DATE: 03/10/16

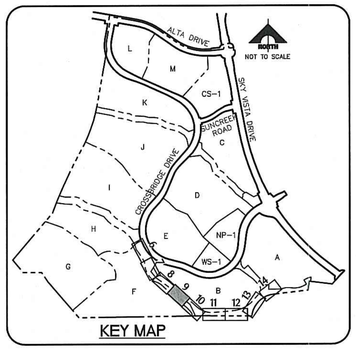
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

GRADING PLAN 3

DRAWING
8
9 OF 18 SHTS





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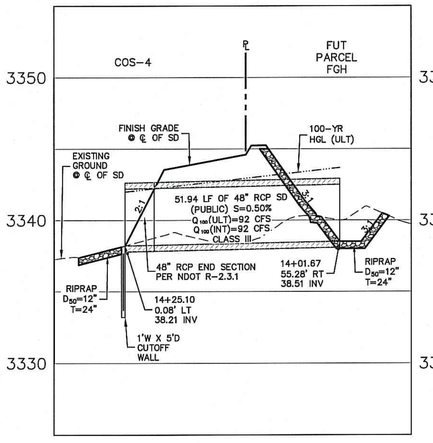

COS-4 (WATERS OF THE US)

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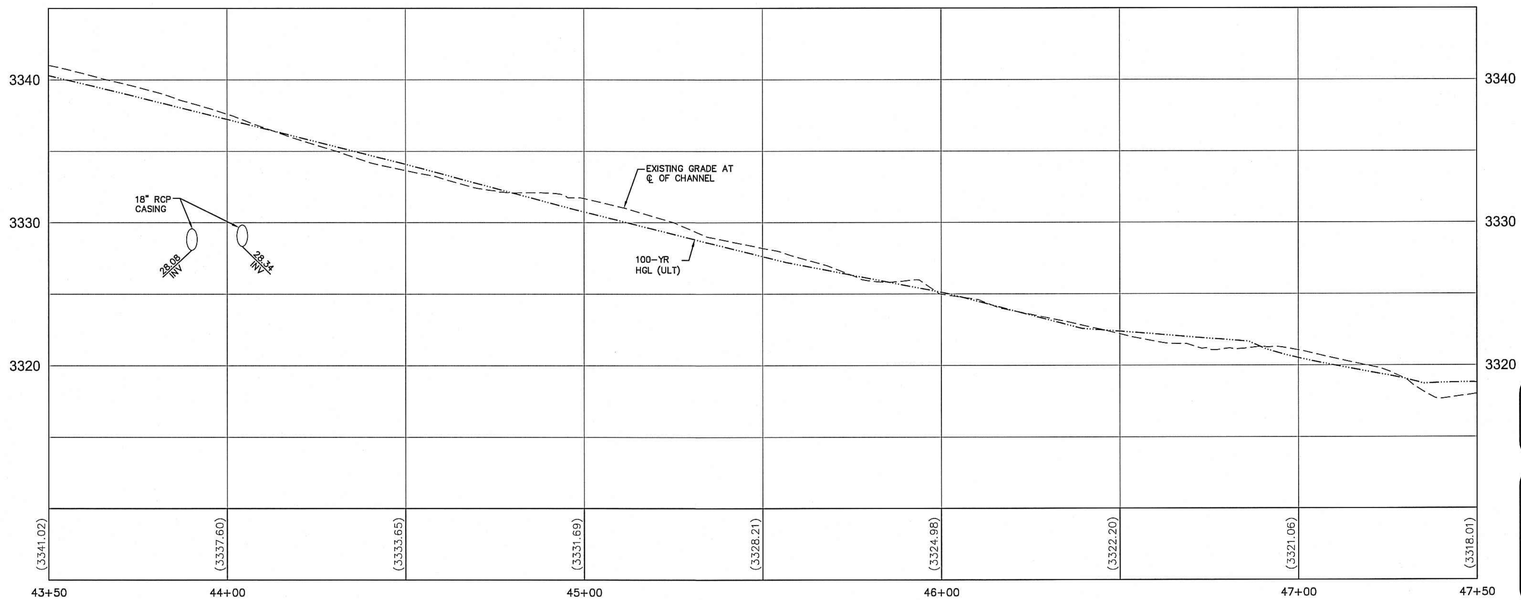

COS-4
STORM DRAIN PROFILE @ 14+26.23

(RIGHT BERM ALIGNMENT) 1/—

SCALE: HORIZ. 1"=20', VERT. 1"=5'

NORTH

SCALE 20 0 20 40 FEET

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FAST — Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER - STATE OF NEVADA — JOSHUA L. JOHNSON — No. 15768 — PROFESSIONAL — CIVIL — DATE: 05/10/16

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GOV APP
		03/10/2016 TDS RESPONSE TO COMMENTS — NOT FOR CONSTRUCTION				

PROJECT NO. 62024-226-4

DESIGN: LG/BV
DRAWN: BV
CHECK: JLJ
PLOT DATE: 03-10-16
PLOT TIME: 12:02:09

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T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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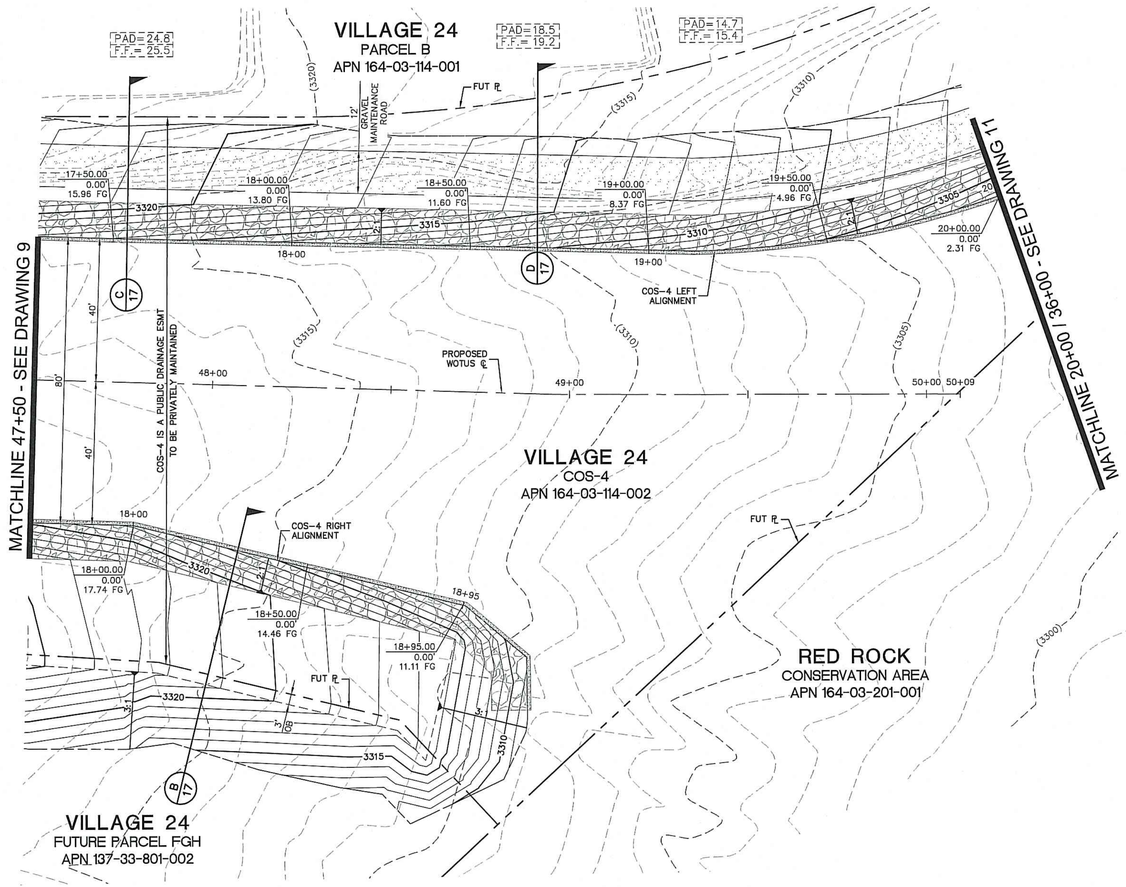
Brian Vincent

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

GRADING PLAN 4

DRAWING 9
10 OF 18 SHTS



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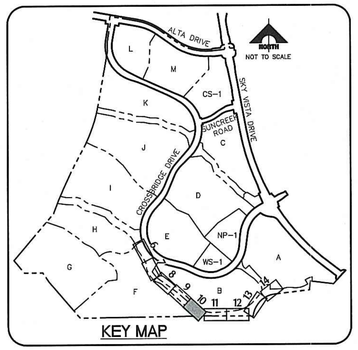

KEY MAP

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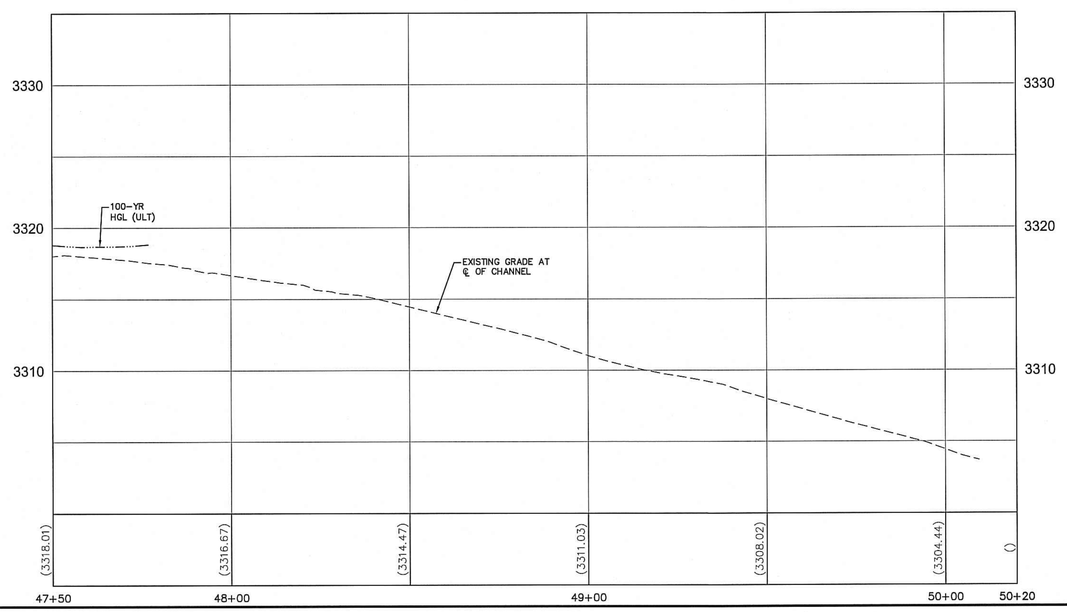

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ENGINEER - STATE OF NEVADA — JOSHUA L. JOHNSON — No. 15787 — PROFESSIONAL — DATE: 03/10/16

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T: 702.804.2000
F: 702.804.2299
gcwengineering.com
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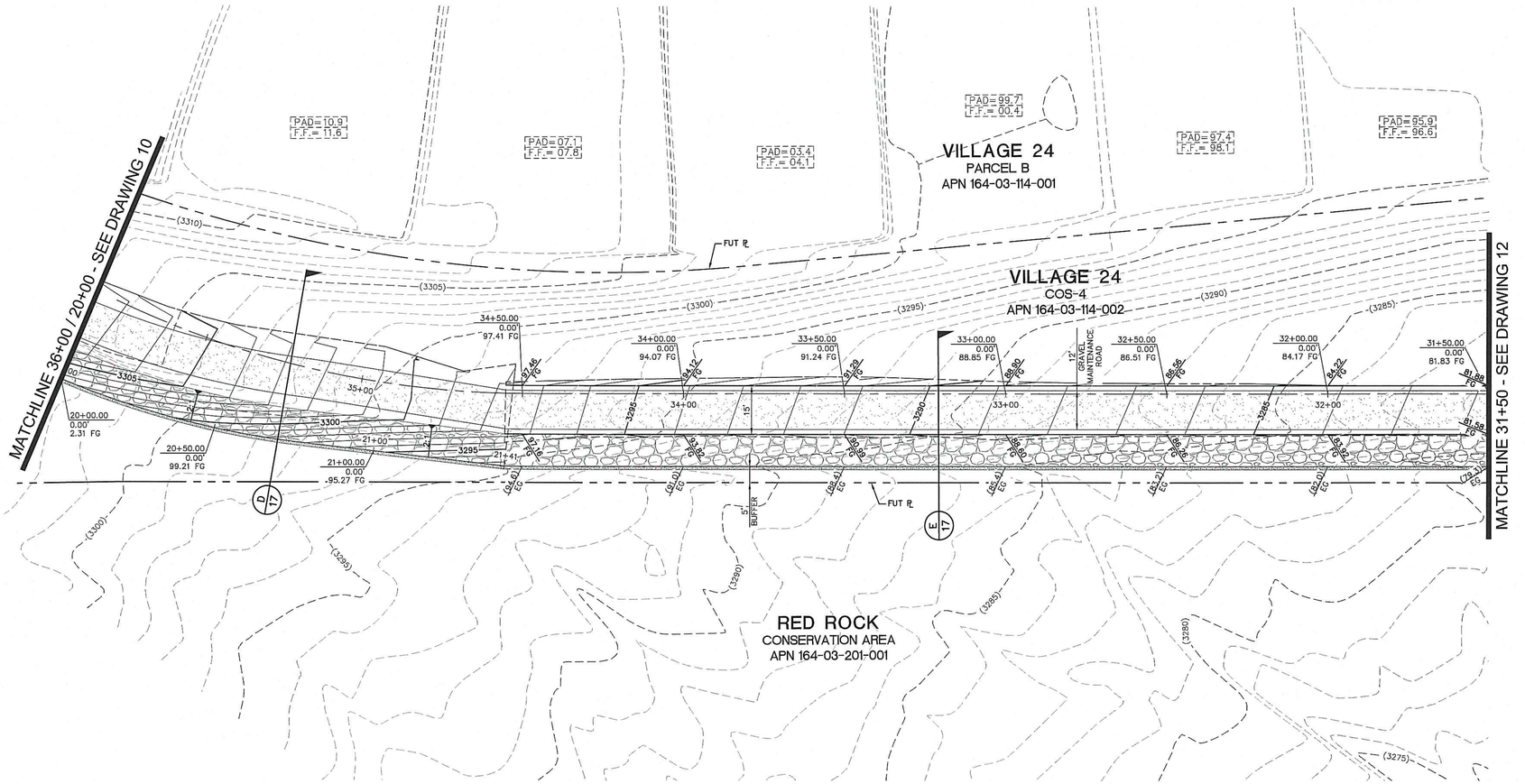
Brian Vincent

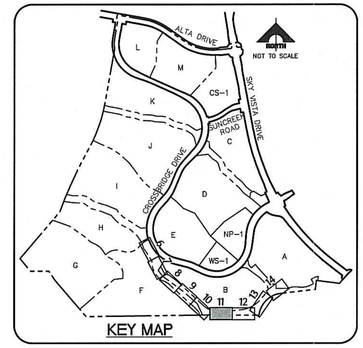
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

GRADING PLAN 5

DRAWING 10
11 OF 18 SHTS



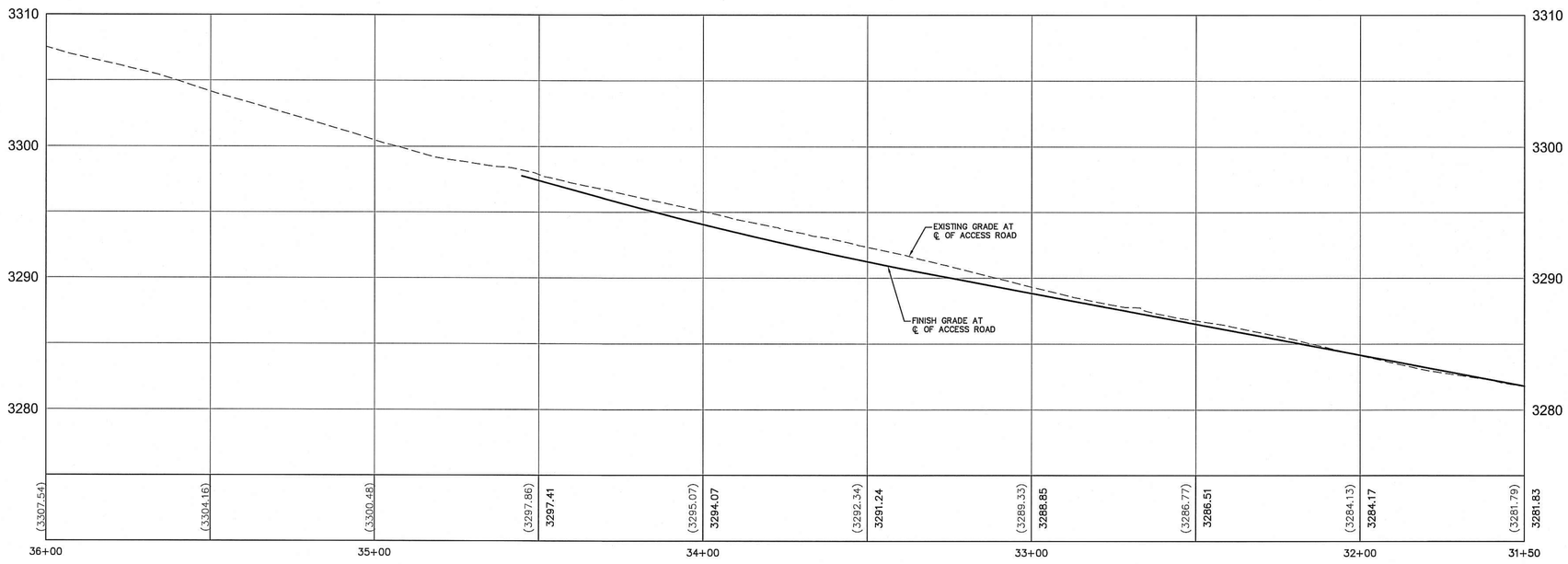


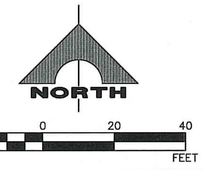
GRAVEL MAINTENANCE ROAD

2" CRUSHED ROCK/GRAVEL @ 95%

COS-4 (WATERS OF THE US)

SCALE: HORIZ 1" = 20'
VERT. 1" = 5'





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NOTE

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BENCHMARK

BM #	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. D368	U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.	3246.63 (FEET)	989.574 (METERS)

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FAST — Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER - STATE OF NEVADA — JOSHUA ALLEN JOHNSON — No. 15767 — DATE: 03/10/16

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP
		03/10/2016 TDS RESPONSE TO COMMENTS — NOT FOR CONSTRUCTION				

PROJECT NO. 62024-226-4
DESIGN: LC/BV
DRAWN: BV
CHECK: JEJ
PLOT DATE: 03-10-16
PLOT TIME: 11:59:41

GCW ENGINEERS\ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

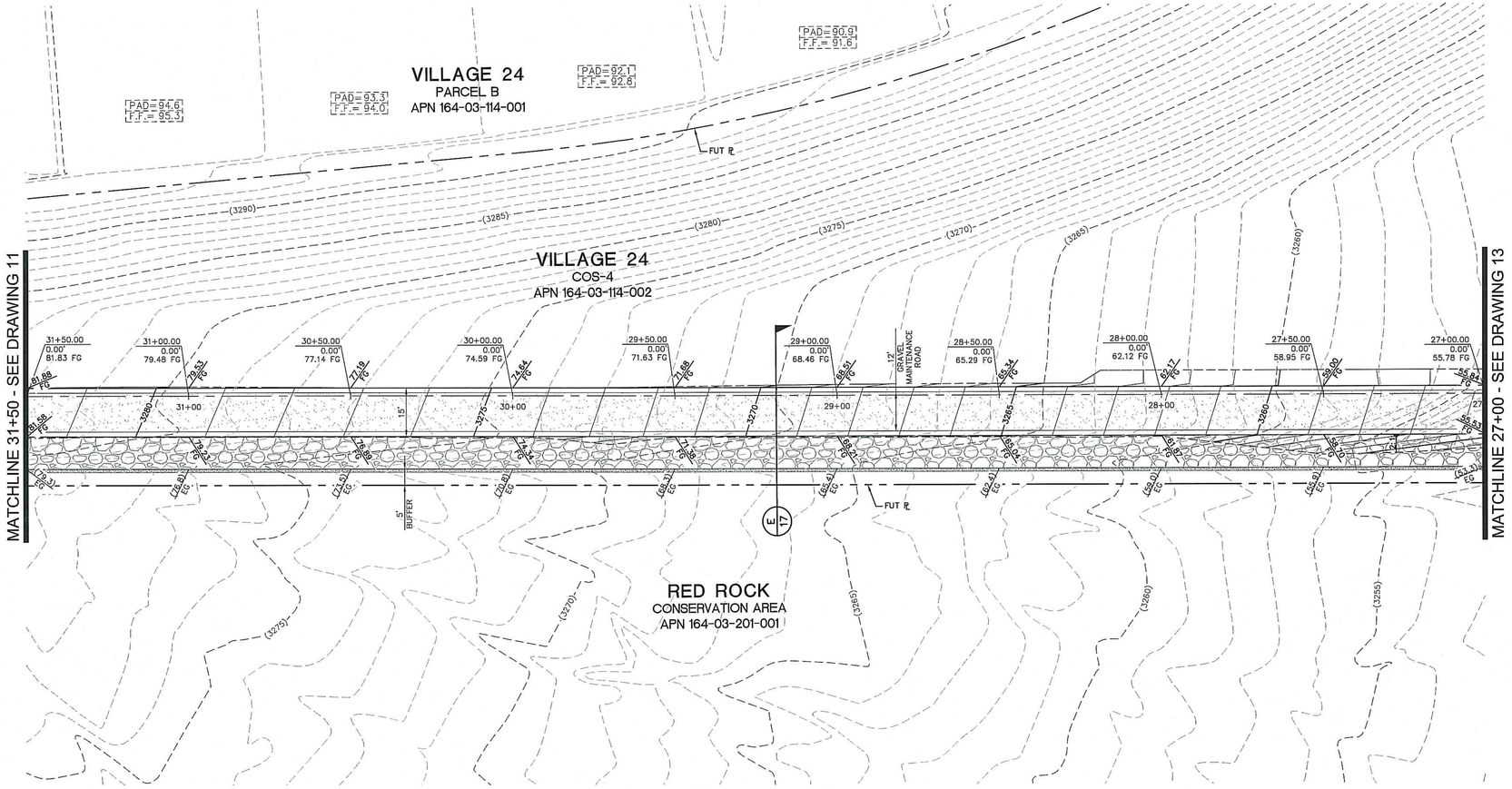
F:\Projects\620\62024-226-4\DWG\Production\V24-226-4_GD.dwg
Brian Vincent

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

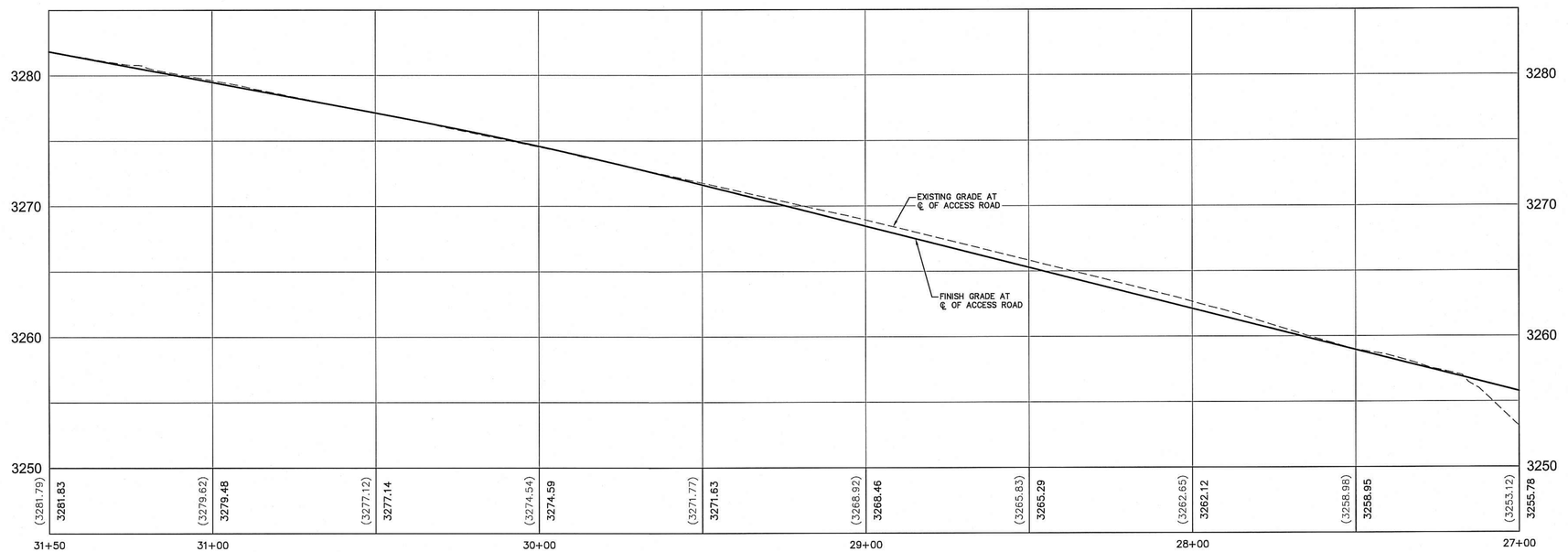
GRADING PLAN 6

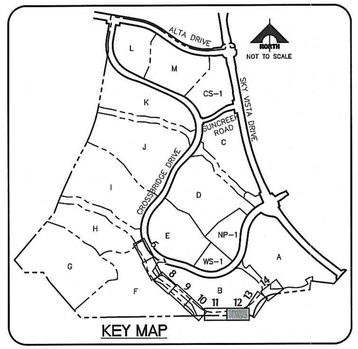
DRAWING 11
12 OF 18 SHTS



COS-4 (WATERS OF THE US)

SCALE: HORIZ 1" = 20'
VERT. 1" = 5'





KEY MAP

GRAVEL MAINTENANCE ROAD

2" CRUSHED ROCK/GRAVEL @ 95%

NORTH

SCALE: 20 0 20 40 FEET

RIPRAP GENERAL NOTE:

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BENCHMARK

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1-702-227-2929

FAST
Call before you UnderGround
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER - STATE OF NEVADA
JOSHUA L. JOHNSON
No. 15769
PROFESSIONAL
CIVIL
DATE: 03/10/16

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GOV APP
		03/10/2016 TDS RESPONSE TO COMMENTS — NOT FOR CONSTRUCTION				

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JLJ
PLOT DATE: 03-10-16
PLOT TIME: 11:58:34

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

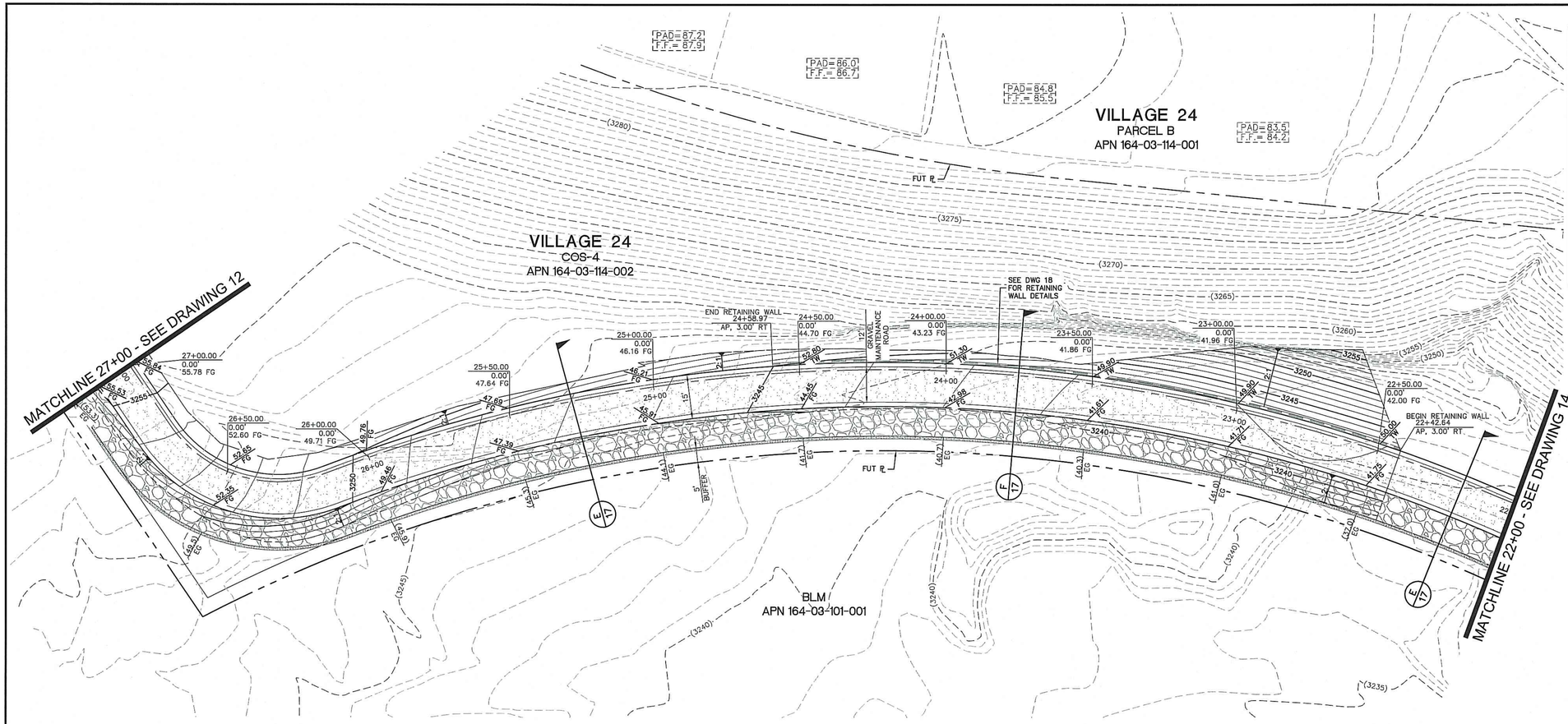
F:\Projects\600\62024-226-4\DWG\Production\V24-226-4_C0.dwg
Brian Vincent

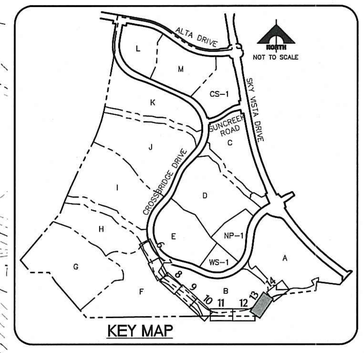
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

GRADING PLAN 7

DRAWING
12
13 OF 18 SHTS





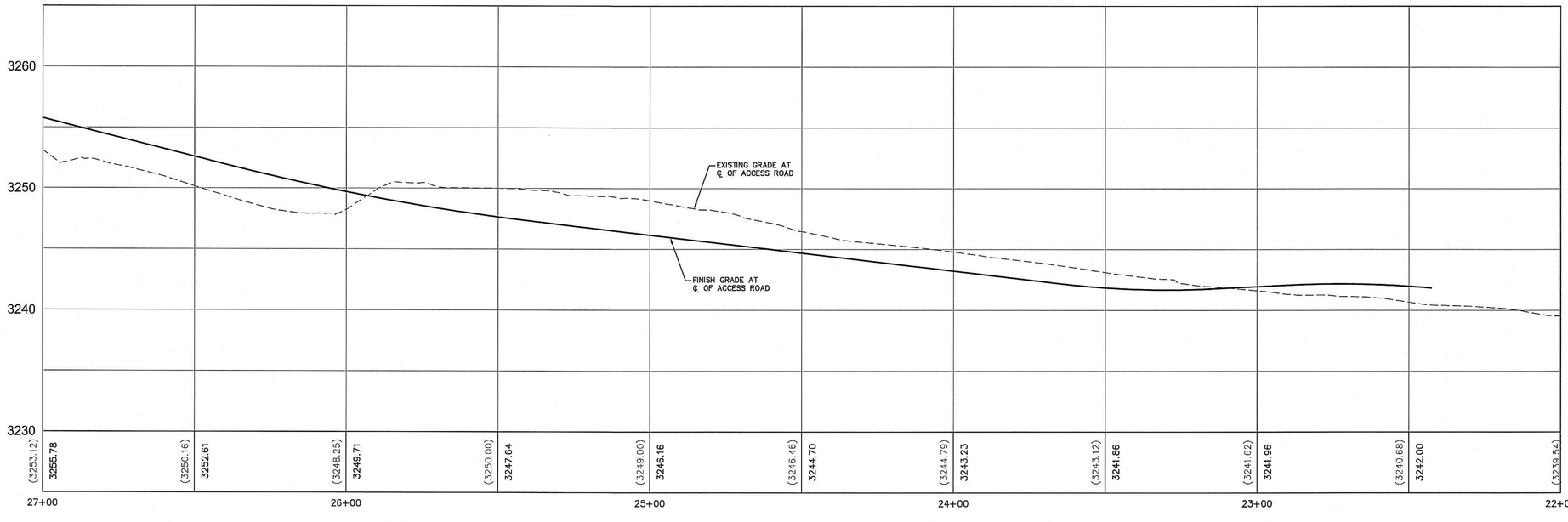
KEY MAP

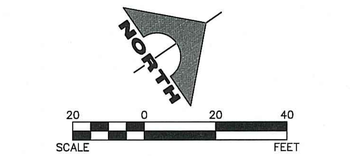
GRAVEL MAINTENANCE ROAD

2" CRUSHED ROCK/GRAVEL @ 95%

COS-4 (WATERS OF THE US)

SCALE: HORIZ 1" = 20'
VERT. 1" = 5'





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BENCHMARK

BM #	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. D368	U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.	3246.63 (FEET)	989.574 (METERS)

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1-702-227-2929

FAST
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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER: STATE OF NEVADA — JOSHUA E. JOHNSON — No. 15787 — PROFESSIONAL ENGINEER — DATE: 09/10/16

REV	DATE	DESCRIPTION	AGEN APP	DATE	GCW APP	DATE
	03/10/2016	TDS RESPONSE TO COMMENTS -- NOT FOR CONSTRUCTION				

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JLJ
PLOT DATE: 03-10-16
PLOT TIME: 11:57:29

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
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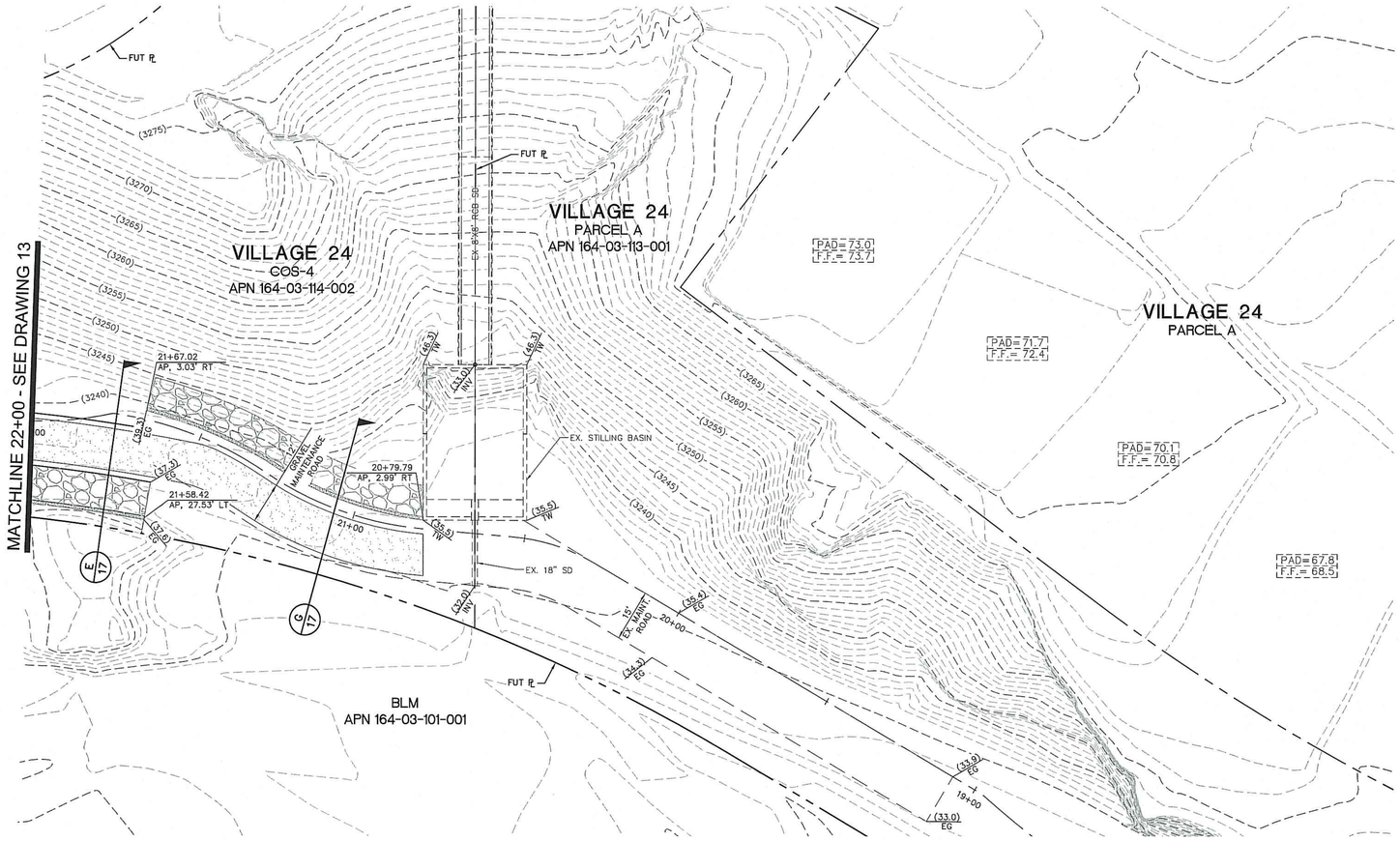
Brian Vincent

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

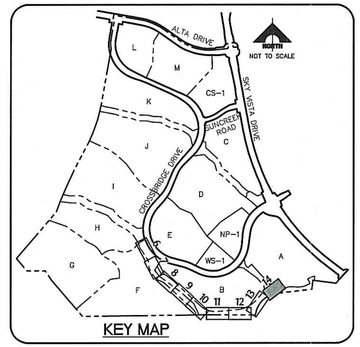
GRADING PLAN 8

DRAWING 13
14 OF 18 SHTS



COS-4 (WATERS OF THE US)

SCALE: HORIZ 1" = 20'
VERT. 1" = 5'



KEY MAP

GRAVEL MAINTENANCE ROAD

2" CRUSHED ROCK/GRAVEL @ 95%

NORTH

SCALE: 20 0 20 40 FEET

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BENCHMARK

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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER - STATE OF NEVADA
PROFESSIONAL
JOSHUA JOHNSON
No. 15788
Exp. 12/31/17
DATE: 03/10/16

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP
	03/10/2016	TDS RESPONSE TO COMMENTS — NOT FOR CONSTRUCTION				

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JJJ
PLOT DATE: 03-10-16
PLOT TIME: 11:56:22

GCW
ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
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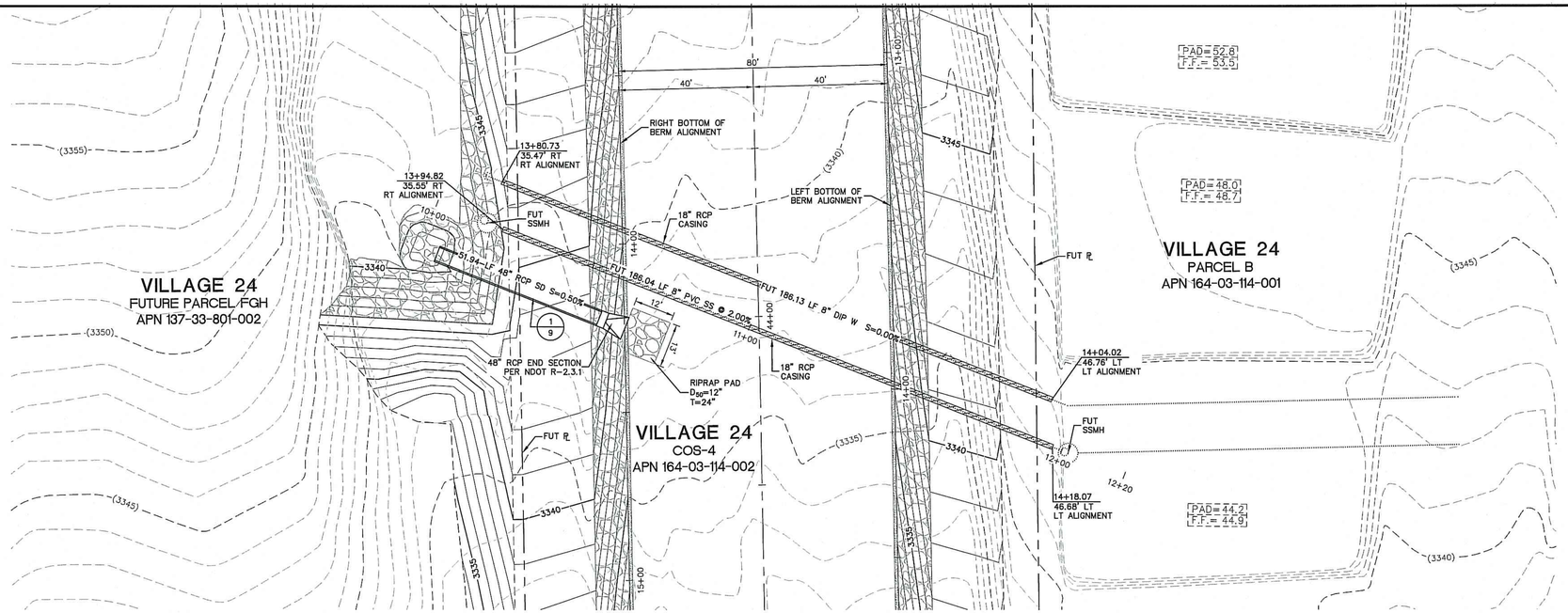
Brian Vincent

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

GRADING PLAN 9

DRAWING
14
15 OF 18 SHTS



COS-4 (WATERS OF THE US)

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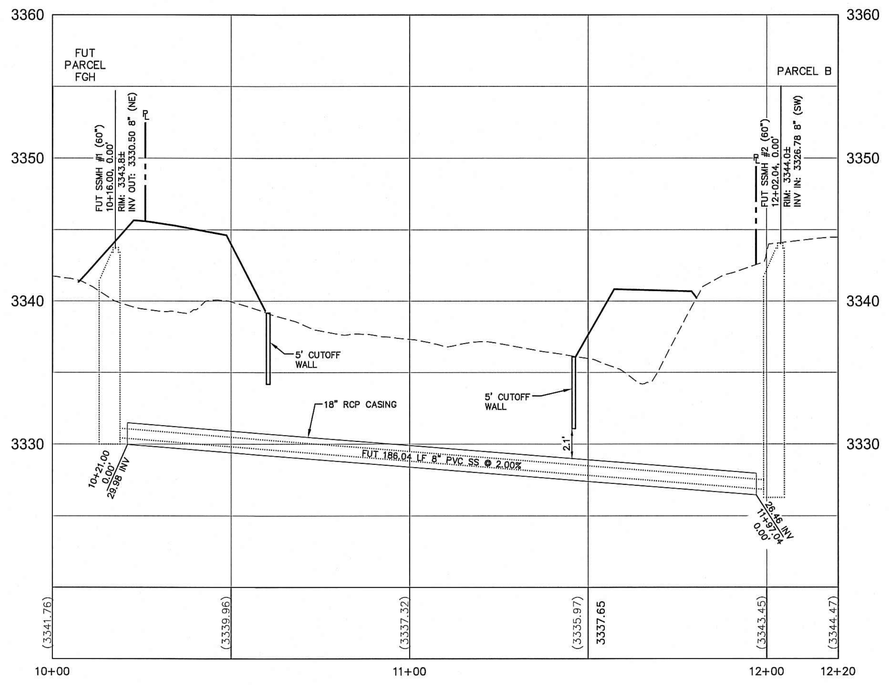
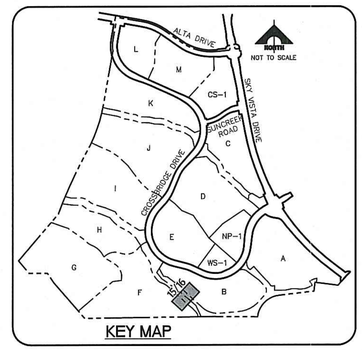
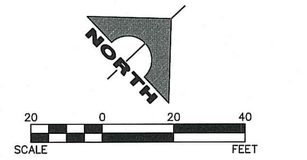
VERT. 1" = 5'





KEY MAP



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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER - STATE OF NEVADA
JOSHUA L. TUSHIN
No. 15788
CIVIL
PROFESSIONAL ENGINEER
DATE: 03/10/16

REV	DATE	DESCRIPTION	AGEN APP	DATE	GCW APP
	03/10/2016	TDS RESPONSE TO COMMENTS — NOT FOR CONSTRUCTION			

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JLJ
PLOT DATE: 03-10-16
PLOT TIME: 11:52:50
PROFILE: 1
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Brian Vincent

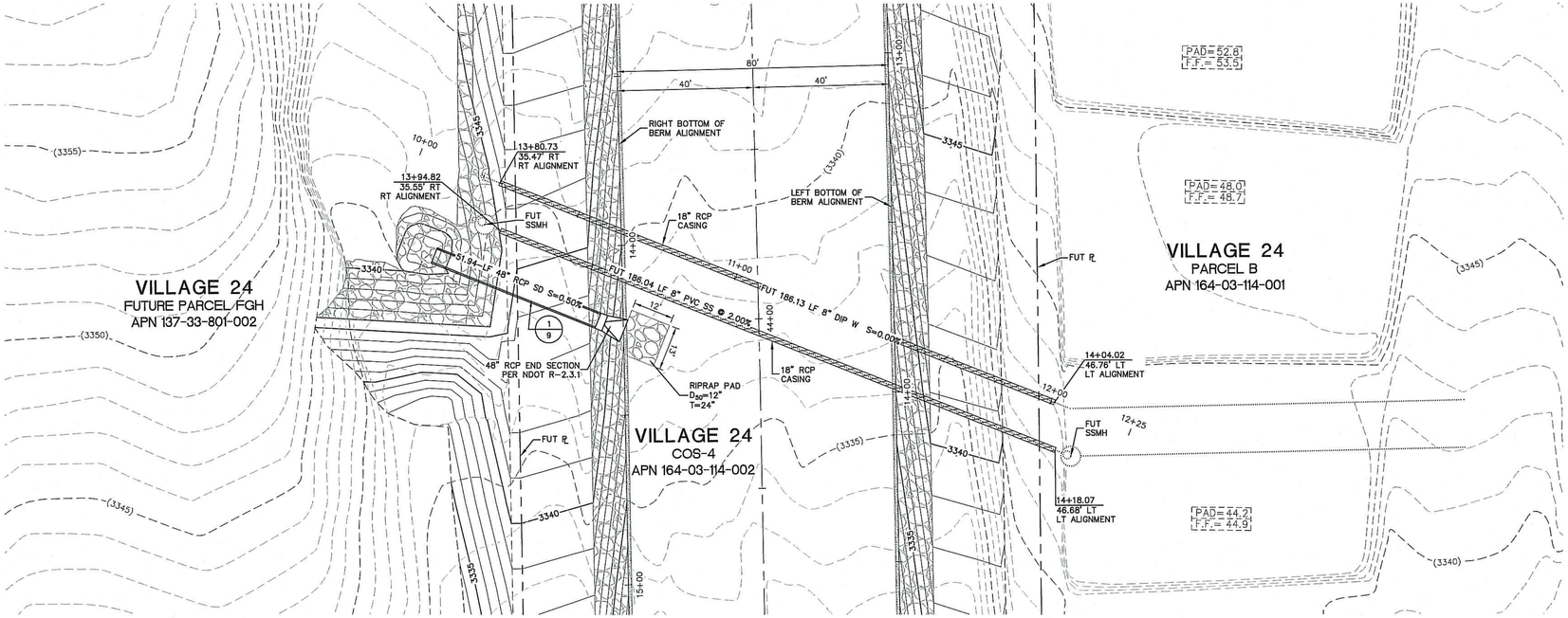
GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

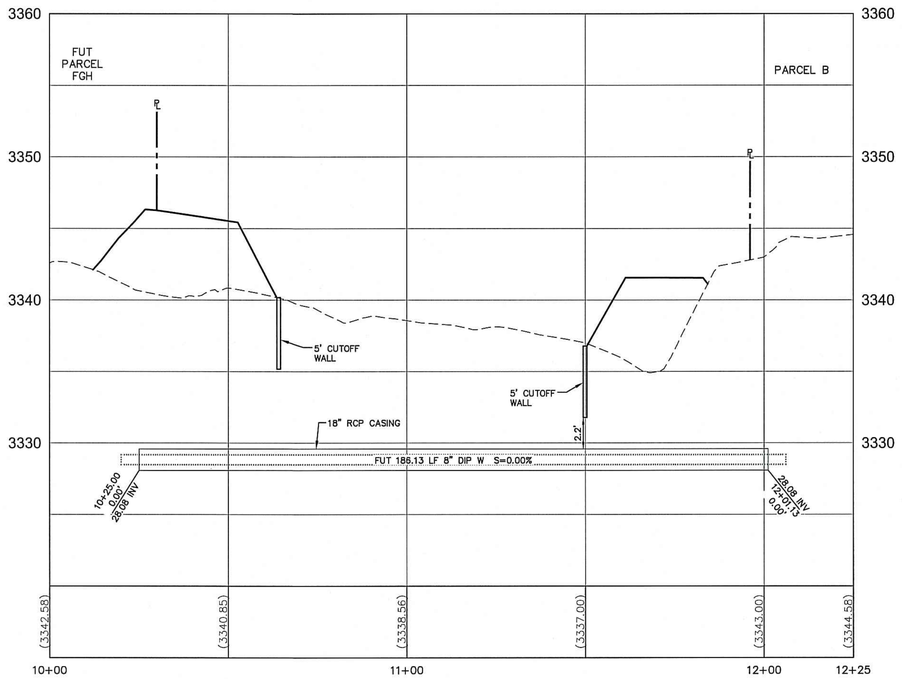
SLEEVE PROFILE 1

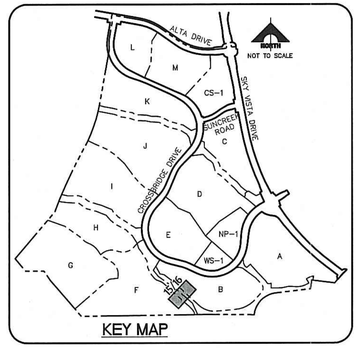
DRAWING
15
16 OF 18 SHTS



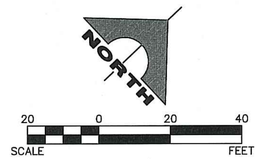
COS-4 (WATERS OF THE US)

SCALE: HORIZ 1" = 20'
VERT. 1" = 5'





KEY MAP



RIPRAP GENERAL NOTE:

ALL RIPRAP, EXCLUDING CONCRETE EMBEDDED RIPRAP, SHALL ADHERE TO REQUIREMENTS OF UNIFORM STANDARD SPECIFICATION SECTION 610 "SLOPE AND CHANNEL PROTECTION." FOR CONCRETE EMBEDDED RIPRAP, SEE SECTION 610 "SLOPE AND CHANNEL PROTECTION ADDITIONAL REQUIREMENTS" PER SHEET 17.

COS WASH MAINTENANCE GENERAL NOTE:

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CCRFCD RAINFALL GAUGE 4329 IS LOCATED IN BROWNSTONE CANYON UPSTREAM OF VILLAGE 24.

CCRFCD RAINFALL GAUGE 4344 IS LOCATED IN THE RED ROCK DETENTION BASIN DOWNSTREAM OF VILLAGE 24.

NOTE

THIS SET OF DRAWINGS IS BASED UPON NAVD 88 DATUM. PREVIOUS DRAWINGS MAY BE BASED ON OTHER DATUM. CARE SHOULD BE OBSERVED WHEN UTILIZING THIS SET OF DRAWINGS

BASIS OF BEARINGS

SOUTH 89°47'23" EAST, BEING THE BEARING OF THE NORTH LINE OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA AS SHOWN IN FILE 118, PAGE 100 OF PARCEL MAPS ON FILE AT THE CLARK COUNTY, NEVADA RECORDER'S OFFICE.

BENCHMARK

BM #	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. D368	U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.	3246.63 (FEET)	989.574 (METERS)

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Avoid cutting underground utility lines. It's costly.
Call 811
or 1-800-227-2600
AND
CLARK COUNTY TRAFFIC OPERATIONS
1-702-455-6000

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

FAST
Call before you UnderGround
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER: STATE OF NEVADA
JOSHUA L. JOHNSON
No. 15789
PROFESSIONAL
DATE: 03/10/16

REV	DATE	DESCRIPTION
		TDS RESPONSE TO COMMENTS — NOT FOR CONSTRUCTION
	03/10/2016	

	DATE	AGEN APP	DATE	GOV APP

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JLJ
PLOT DATE: 03-10-16
PLOT TIME: 11:52:16

GCW
ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\60\62024-226-4\DWG\Production\V24-226-4_SLEEVE PROFILE 2.dwg
Brian Vincent

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

SLEEVE PROFILE 2

DRAWING
16
17 OF 18 SHTS

SECTION 610
SLOPE AND CHANNEL PROTECTION ADDITIONAL REQUIREMENTS

610.02.04 STONES FOR RIPRAP

A. STONES USED FOR RIPRAP SHALL BE HARD, DURABLE, ANGULAR IN SHAPE, RESISTANT TO WEATHERING AND EROSION, AND FREE FROM SPOILS, CRACKS, AND ORGANIC MATTER.

ADD 4 AND 5 TO THIS SUBSECTION:

4. THE SPECIFIC GRAVITY OF THE CONCRETE EMBEDDED RIPRAP SHALL NOT BE LESS THAN 2.45.

5. THE NOMINAL STONE SIZE FOR THE CONCRETE EMBEDDED RIPRAP SHALL BE 1–FOOT TO 3–FOOT.

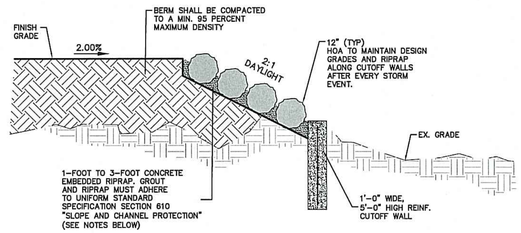
C. CONTROL OF GRADATION WILL BE BY VISUAL INSPECTION.

REVISE SUBSECTION AS FOLLOWS:

1. THE CONTRACTOR SHALL PROVIDE A SAMPLE OF STONE OF AT LEAST 5 TONS MEETING THE GRADATION FOR CONCRETE EMBEDDED RIPRAP.

REVISE SUBSECTION D. AS FOLLOWS:

D. CALICHE STONE OR CEMENTITIOUS MATERIALS MEETING THE REQUIREMENTS OF THIS SECTION MAY BE USED AS RIPRAP WITH PRIOR APPROVAL OF THE ENGINEER. CALICHE STONE OR CEMENTITIOUS MATERIAL MAY NOT BE USED FOR CONCRETE EMBEDDED RIPRAP.



NOTES:
1. WASHES MUST BE INSPECTED AND MAINTAINED AFTER EACH STORM EVENT. IF THE CUTOFF WALL IS EXPOSED, BACKFILL MUST BE PLACED TO THE TOP OF CUTOFF WALL, BENCHED 1–FOOT HORIZONTALLY AND GRADED TO A 3:1 SLOPE.

TYPICAL WASH SIDE SLOPE SECTION

NTS (1)

SECTION 610
SLOPE AND CHANNEL PROTECTION ADDITIONAL NOTES

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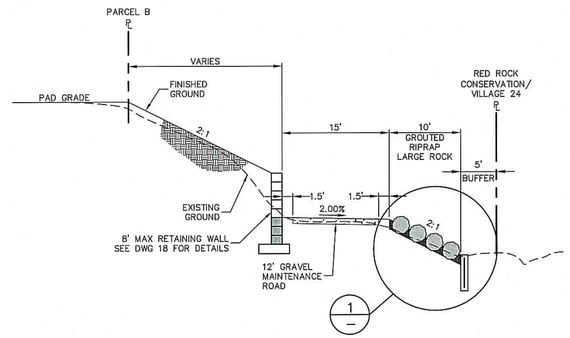
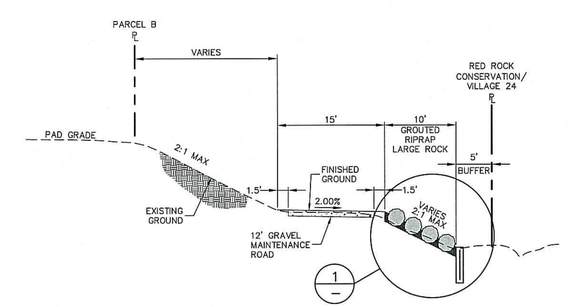


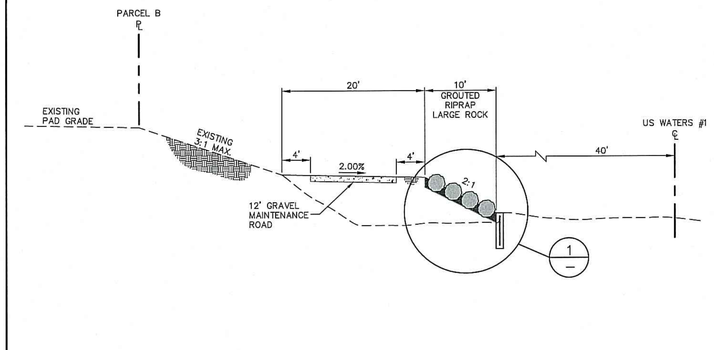
SECTION F

NTS (F —)



SECTION E

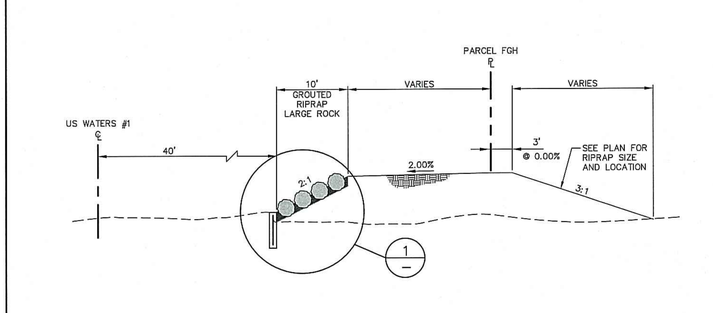
NTS (E —)



SECTION C (LEFT ALIGNMENT BERM)

STA: 3+25.00 TO 18+00.00

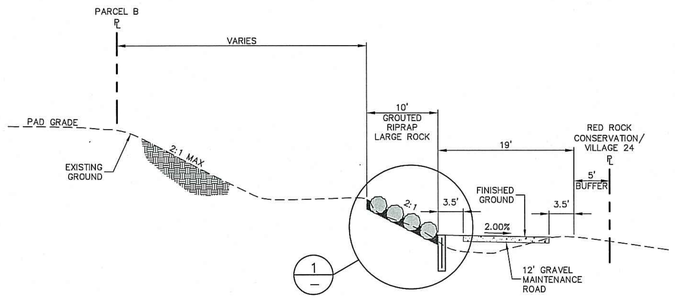
NTS (C —)



SECTION B (RIGHT ALIGNMENT BERM)

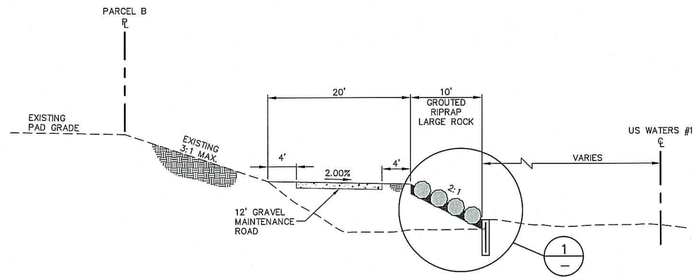
STA: 00+00.00 TO 19+87.97

NTS (B —)



SECTION G

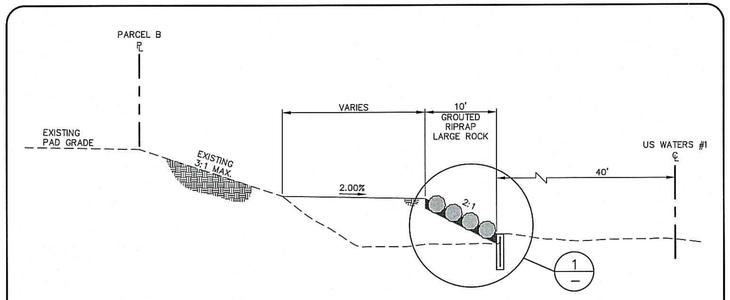
NTS (G —)



SECTION D (LEFT ALIGNMENT BERM)

STA: 3+25.00 TO 18+00.00

NTS (D —)



SECTION A (LEFT ALIGNMENT BERM)

STA: −0+10.47 TO 3+25.00

NTS (A —)

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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER – STATE OF NEVADA
JOSHUA L. JOHNSON
No. 15769
PROFESSIONAL
DATE: 03/10/16

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GOV APP
		03/10/2016 TDS RESPONSE TO COMMENTS — NOT FOR CONSTRUCTION				

PROJECT NO. 62024-226-4
DESIGN: LG/BV
DRAWN: BV
CHECK: JLJ
PLOT DATE: 03-10-16
PLOT TIME: 11:46:38

GCW
ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
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gcwengineering.com
F:\Projects\600\62024-226-4\DWG\Production\V24-226-4_DT.dwg
Brion Vincent

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24 - US WATERS
COS - 4 WASH

DETAILS AND SECTIONS

DRAWING
17
18 OF 18 SHTS

Sta	Plan Sta	ULT Q	FL Elevation	WS Elevation	Depth	E.G. Slope	Vel	Flow Area	Top Width	Froude #	Radius	Freeboard	Superelevation	Total Depth	Channel Depth	Riprap	Footing Depth
		(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(fps)	(sq ft)	(ft)			(ft)	(ft)	(ft)	(ft)	(D50-inches)	(ft)
2699	10+27.20	7200	3551.00	3552.82	1.82	0.017800	6.00	119.94	109.51	1.01	0	1.2	0.0	3.0	-	-	-
2650	10+70.35	7200	3546.00	3549.20	1.20	0.007229	9.45	76.18	100.86	1.92	0	1.3	0.0	2.5	-	-	-
2575	11+03.32	7200	3544.00	3545.84	1.84	0.017070	10.33	71.82	85.83	1.93	0	1.3	0.0	3.1	-	-	-
2600	11+27.48	7200	3543.00	3544.18	1.18	0.007890	9.96	72.30	88.23	2.01	0	1.3	0.0	2.4	-	-	-
2550	11+46.83	7200	3541.00	3542.52	1.52	0.007789	10.20	70.59	88.23	2.01	0	1.3	0.0	2.8	-	-	-
2450	12+45.67	7200	3534.00	3535.70	1.70	0.006851	11.13	64.66	64.11	1.95	0	1.3	0.0	3.0	-	-	-
2400	13+16.06	7200	3530.00	3531.68	1.68	0.006789	9.49	75.64	95.24	1.87	0	1.3	0.0	3.0	-	-	-
2300	13+84.79	7200	3526.00	3527.19	1.19	0.009917	10.62	67.81	95.54	2.22	0	1.3	0.0	2.2	-	-	-
2250	14+12.69	7200	3524.00	3525.40	1.40	0.007603	10.30	69.94	84.34	1.99	0	1.3	0.0	2.7	-	-	-
2225	14+51.58	7200	3521.00	3522.53	1.53	0.008641	11.12	64.76	76.43	2.13	0	1.3	0.0	2.9	-	-	-
2200	14+87.50	7200	3519.00	3520.98	1.98	0.005751	9.60	74.98	81.45	1.76	0	1.3	0.0	3.3	-	-	-
2175	15+12.83	7200	3518.00	3519.63	1.63	0.006127	9.21	78.19	94.98	1.79	0	1.3	0.0	2.9	-	-	-
2150	15+36.31	7200	3516.00	3518.26	2.26	0.006391	9.37	76.84	93.77	1.82	0	1.3	0.0	3.6	-	-	-
2125	15+77.87	7200	3513.00	3514.99	1.99	0.008012	11.77	61.18	62.66	2.10	0	1.4	0.0	3.4	-	-	-
2100	16+16.45	7200	3512.00	3512.57	1.57	0.007851	11.36	60.19	60.12	2.11	0	1.3	0.0	2.9	-	-	-
2050	16+45.73	7200	3509.00	3510.18	1.18	0.006495	11.29	63.80	72.22	2.15	0	1.3	0.0	2.5	-	-	-
1975	17+05.68	7200	3504.00	3505.10	1.10	0.007959	10.11	71.23	91.38	2.02	0	1.3	0.0	2.4	-	-	-
1900	17+77.96	7200	3498.00	3499.43	1.43	0.007153	10.82	66.51	71.21	1.97	0	1.3	0.0	2.7	-	-	-
1825	18+69.10	7200	3493.00	3494.04	1.04	0.006946	10.06	71.57	83.87	1.92	0	1.3	0.0	2.3	-	-	-
1800	19+00.09	7200	3491.00	3491.97	0.97	0.006336	9.67	74.49	86.38	1.83	0	1.2	0.0	2.2	-	-	-
1750	19+30.71	7200	3489.00	3489.95	0.95	0.006894	9.78	73.63	89.41	1.90	0	1.2	0.0	2.2	-	-	-
1660	20+15.31	7200	3484.00	3485.06	1.06	0.006672	9.57	75.27	91.97	1.86	0	1.2	0.0	2.3	-	-	-
1600	20+85.97	7200	3480.00	3481.08	1.08	0.009284	10.43	69.00	94.43	2.15	0	1.3	0.0	2.3	-	-	-
1545	21+55.18	7200	3476.00	3477.41	1.41	0.006288	10.82	66.54	63.53	1.86	0	1.3	0.0	2.7	-	-	-
1500	22+16.98	7200	3472.00	3473.16	1.16	0.007247	10.20	70.58	83.39	1.95	0	1.3	0.0	2.4	-	-	-
1460	22+57.11	7200	3469.00	3470.08	1.08	0.009774	9.63	74.76	120.81	2.16	0	1.2	0.0	2.2	-	-	-
1375	23+16.62	7200	3464.00	3464.65	0.65	0.010041	9.35	72.34	113.47	2.20	0	1.2	0.0	1.9	-	-	-
1300	23+79.17	7200	3459.00	3460.36	1.36	0.014232	10.50	67.95	125.87	2.54	0	1.2	0.0	2.7	-	-	-
1225	24+69.35	7200	3453.00	3455.14	2.14	0.016947	9.08	79.32	116.12	1.94	0	1.3	0.0	3.4	-	-	-
1150	25+29.34	7200	3450.00	3450.83	0.83	0.005257	8.35	86.22	108.33	1.65	0	1.2	0.0	2.0	-	-	-
1075	26+10.01	7200	3444.00	3445.70	1.70	0.009472	10.50	67.95	92.07	2.17	0	1.3	0.0	3.0	-	-	-
1050	26+45.61	7200	3442.00	3443.67	1.67	0.008044	9.46	76.09	108.82	1.99	0	1.3	0.0	3.0	-	-	-
1000	26+86.80	7200	3441.00	3442.09	1.09	0.005654	8.62	81.62	99.78	1.72	0	1.2	0.0	2.3	-	-	-
925	27+43.01	7200	3436.00	3437.31	1.31	0.006483	9.33	77.15	95.87	1.83	0	1.3	0.0	2.6	-	-	-
850	28+47.94	7200	3431.00	3432.83	1.83	0.004554	9.30	86.95	81.97	1.83	0	1.3	0.0	3.1	-	-	-
775	29+42.50	7200	3424.00	3426.14	2.14	0.007972	11.29	70.76	77.14	2.08	0	1.4	0.0	3.5	-	-	-
700	30+14.92	7200	3422.00	3422.63	1.63	0.001788	11.72	68.18	61.95	1.97	0	1.3	0.0	3.0	8.0	12 (LOB, ROB)	5.0
650	30+61.08	7200	3381.00	3383.76	1.83	0.006528	11.06	92.05	86.80	1.87	0	1.3	0.0	3.2	5.9	12 (LOB, ROB)	5.0
600	31+23.30	7200	3396.00	3397.86	1.64	0.006966	11.58	89.06	83.52	1.98	0	1.3	0.0	3.0	6.6	12 (LOB, ROB)	5.0
550	31+64.49	7200	3412.00	3413.63	1.63	0.004875	10.50	98.19	81.79	1.69	0	1.3	0.0	2.9	6.3	12 (LOB, ROB)	5.0
500	32+40.88	7200	3406.00	3408.46	1.68	0.006763	13.05	79.00	59.63	2.00	0	1.4	0.0	3.1	6.7	12 (LOB, ROB)	5.0
450	33+62.68	7200	3398.62	3401.75	2.13	0.005580	11.32	91.05	73.33	1.79	0	1.4	0.0	3.5	7.4	12 (LOB, ROB)	5.0
400	34+23.30	7200	3396.22	3397.86	1.64	0.006966	11.58	89.06	83.52	1.98	0	1.3	0.0	3.0	6.6	12 (LOB, ROB)	5.0
350	34+72.30	7200	3393.00	3394.83	1.83	0.006390	11.30	93.74	88.25	1.87	0	1.3	0.0	3.2	5.4	12 (LOB, ROB)	5.0
300	35+17.24	7200	3390.96	3392.49	1.53	0.005287	10.90	95.42	80.80	1.75	0	1.3	0.0	2.8	5.4	12 (LOB, ROB)	5.0
250	35+76.20	7200	3385.45	3387.41	1.96	0.006644	11.15	92.44	87.16	1.91	0	1.3	0.0	3.3	6.2	12 (LOB, ROB)	5.0
200	36+41.08	7200	3381.93	3383.76	1.83	0.006528	11.06	92.05	86.80	1.87	0	1.3	0.0	3.2	5.9	12 (LOB, ROB)	5.0
150	37+14.92	7200	3377.00	3378.72	1.72	0.004930	8.62	130.79	151.91	1.62	0	1.3	0.0	3.0	7.0	12 (LOB, ROB)	5.0
100	37+47.46	7200	3317.00	3318.72	1.72	0.004930	8.62	130.79	151.91	1.62	0	1.3	0.0	3.0	7.0	12 (LOB, ROB)	5.0
50	38+09.69	7200	3320.66	3322.57	1.91	0.006501	11.59	96.60	85.19	1.92	0	1.4	0.0	3.3	6.5	12 (LOB, ROB)	5.0
0	38+46.89	7200	3323.00	3325.04	2.04	0.004724	10.57	105.99	85.88	1.68	0	1.3	0.0	3.4	6.5	12 (LOB, ROB)	5.0
-50	39+00.77	7200	3325.94	3327.22	1.28	0.006062	11.33	98.82	86.29	1.87	0	1.3	0.0	2.6	4.9	12 (LOB, ROB)	5.0
-100	39+35.35	7200	3328.00	3329.90	1.90	0.006755	11.51	96.45	87.91	1.95	0	1.4	0.0	3.3	4.1	12 (LOB, ROB)	5.0
-150	39+77.11	7200	3332.62	3334.11	1.49	0.006336	11.39	96.36	87.53	1.89	0	1.3	0.0	2.8	4.8	12 (LOB, ROB)	5.0
-200	40+17.91	7200	3337.00	3339.06	2.06	0.006060	11.24	99.64	87.31	1.85	0	1.4	0.0	3.4	5.8	12 (LOB, ROB)	5.0
-250	40+70.16	7200	3341.92	3343.85	1.93	0.005019	10.28	100.34	87.46	1.69	0	1.3	0.0	3.2	6.1	12 (LOB, ROB)	5.0
-300	41+27.59	7200	3347.25	3348.89	1.64	0.006410	10.82	95.27	92.32	1.88	0	1.3	0.0	3.0	5.6	12 (LOB, ROB)	5.0
-350	41+79.54	7200	3350.05	3351.73	1.68	0.006651	11.16	92.40	86.13	1.80	0	1.3	0.0	3.0	6.0	12 (LOB, ROB)	5.0
-400	42+35.51	7200	3353.00	3354.59	1.59	0.006603	11.22	91.92	86.41	1.82	0	1.3	0.0	2.9	5.6	12 (LOB, ROB)	5.0
-450	43+00.47	7200	3356.00	3357.68	1.68	0.006803	11.39	91.63	86.24	1.81	0	1.3	0.0	3.0	6.2	12 (LOB, ROB)	5.0
-500	43+49.91	7200	3360.73	3362.89	2.16	0.007417	11.59	88.92	86.24	2.01	0	1.4	0.0	3.5	6.2	12 (LOB, ROB)	5.0
-550	43+97.46	7200	3365.45	3367.41	1.96	0.006644	11.15	92.44	87.16	1.91	0	1.3	0.0	3.3	6.2	12 (LOB, ROB)	5.0
-600	44+46.69	7200	3370.81	3372.58	2.58	0.005168	10.24	100.69	89.56	1.70	0	1.4	0.0	3.9	8.6	12 (LOB, ROB)	5.0
-650	44+96.77	7200	3375.53	3377.72	2.53	0.007229	11.58	89.02	85.09	2.00	0	1.4	0.0	3.9	7.8	12 (LOB, ROB)	5.0
-700	45+48.43	7200	3381.00	3382.73	1.73	0.006413	11.18	94.92	87.03	1.83	0	1.3	0.0	3.2	6.8	12 (LOB, ROB)	5.0
-750	45+97.68	7200	3384.00	3385.53	1.61	0.005353	10.70	96.40	85.68	1.78	0	1.3	0.0	2.9	6.3	12 (LOB, ROB)	5.0
-800	46+47.91	7200	3388.00	3389.83	1.87	0.006390	11.30	93.74	88.25	1.88	0	1.3	0.0	3.2	5.4	12 (LOB, ROB)	5.0
-850	46+97.69	7200	3391.00	3392.89	1.89	0.006390	11.30	93.74	88.25	1.88	0	1.3	0.0	3.2	5.4	12 (LOB, ROB)	5.0
-900	47+47.46	7200	3317.00	3318.83	3.46	0.015766	7.46	152.66	92.55	1.02	0	1.3	0.0	4.7	6.9	12 (LOB, ROB)	5.0

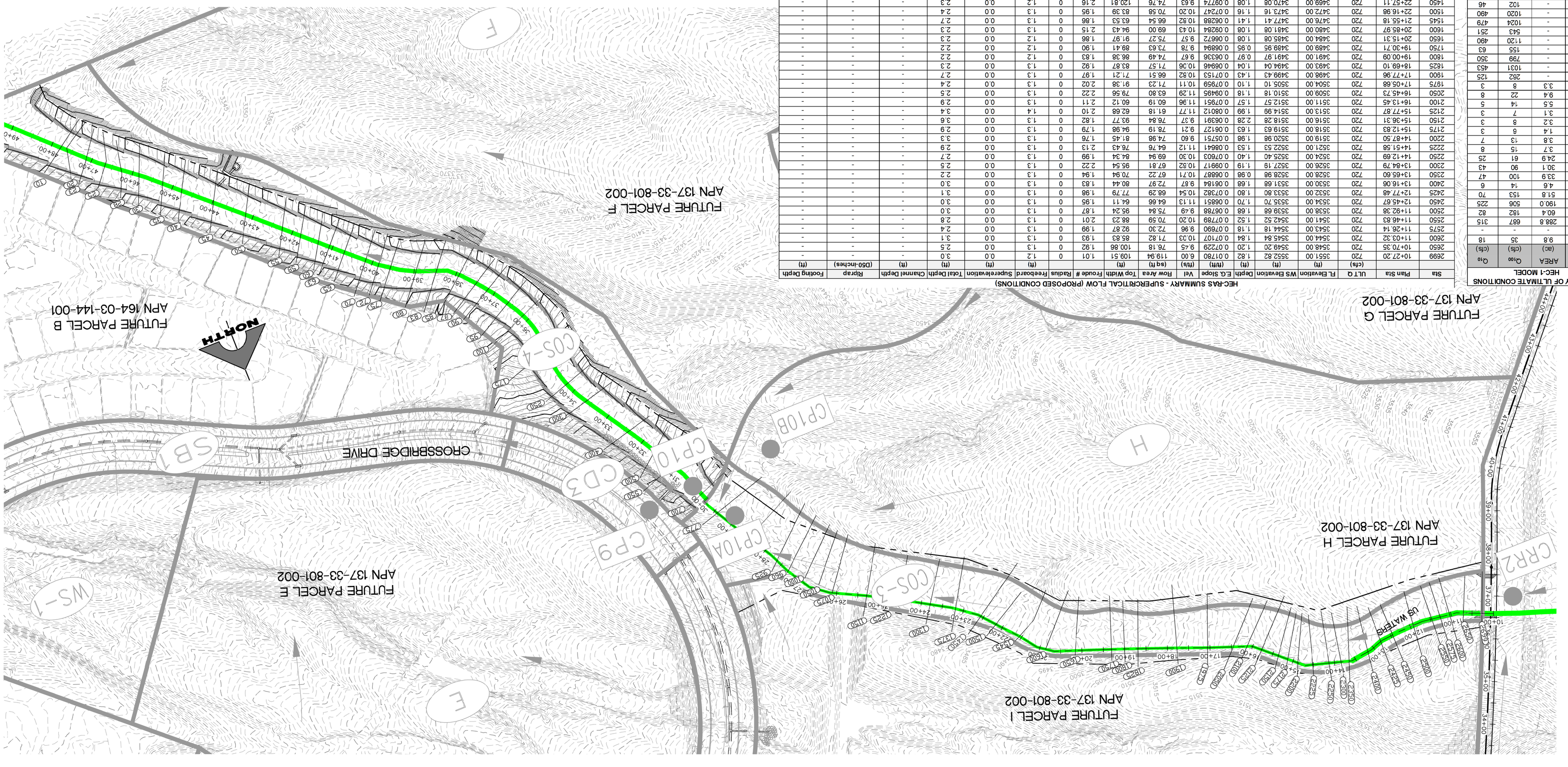
HEC-RAS SUMMARY - SUPERCRITICAL FLOW (PROPOSED CONDITIONS)

Sta	Elevation	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
	(ft)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(fps)	(sq ft)	(ft)	
2699	Inl Struct	7200	3551.00	3552.82	3552.82	3553.00	0.017800	6.00	119.94	109.51	1.01
2650	Inl Struct	7200	3546.00	3549.20	3548.00	3549.20	0.007229	9.45	76.18	100.86	1.92
2575	Inl Struct	7200	3544.00	3545.84	3544.84	3545.84	0.017070	10.33	71.82	85.83	1.93
2600	Inl Struct	7200	3543.00	3544.18	3543.84	3544.18	0.007890	9.96	72.30	88.23	2.01
2550	Inl Struct	7200	3541.00	3542.52	3542.00	3542.52	0.007789	10.20	70.59	88.23	2.01
2450	Inl Struct	7200	3534.00	3535.70	3535.70	3535.70	0.006851	11.13	64.66	64.11	1.95
2400	Inl Struct	7200	3530.00	3531.68	3531.68	3531.68	0.006789	9.49	75.64	95.24	1.87
2300	Inl Struct	7200	3526.00	3527.19	3526.62	3527.19	0.009917	10.62	67.81	95.54	2.22
2250	Inl Struct	7200	3524.00	3525.40	3524.98	3525.40	0.007603	10.30	69.94	84.34	1.99
2225	Inl Struct	7200	3521.00	3522.53	3521.53	3522.53	0.008641	11.12	64.76	76.43	2.13
2200	Inl Struct	7200	3519.00	3520.98	3519.98	3520.98	0.005751	9.60	74.98	81.45	1.76
2175	Inl Struct	7200	3518.00	3519.63	3518.63	3519.63	0.006127	9.21	78.19	94.98	1.79
2150	Inl Struct	7200	3516.00	3518.26	3517.26	3518.26	0.006391	9.37	76.84	93.77	1.82
2125	Inl Struct	7200	3513.00	3514.99	3513.99	3514.98	0.008012	11.77	61.18	62.66	2.10
2100	Inl Struct	7200	3512.00	3512.57	3512.57	3512.57	0.007851	11.36	60.19	60.12	2.11
2050	Inl Struct	7200	3509.00	3510.18	3509.68	3510.18	0.006495	11.29	63.80	72.22	2.15
1975	Inl Struct	7200	3504.00	3505.10	3504.60	3505.10	0.007959	10.11	71.23	91.38	2.02
1900	Inl Struct	7200	3498.00	3499.43	3498.43	3499.43	0.007153	10.82	66.51	71.21	1.97
1825	Inl Struct	7200	3493.00	3494.04	3493.54	3494.04	0.006946	10.06	71.57	83.87	1.92
1800	Inl Struct	7200	3491.00	3491.97	3491.47	3491.97	0.006336	9.67	74.49	86.38	1.83
1750	Inl Struct	7200	3489.00	3489.95	3489.45	3489.95	0.006894	9.78	73.63	89.41	1.90
1660	Inl Struct	7200	3484.00	3485.06	3484.56	3485.06	0.006672	9.57	75.27	91.97	1.86
1600	Inl Struct	7200	3480.00	3481.08	3480.58	3481.08	0.009284	10.43	69.00	94.43	2.15
1545	Inl Struct	7200	3476.00	3477.41	3476.91	3477.41	0.006288	10.82	66.54	63.53	1.86
1500	Inl Struct	7200	3472.00	3473.16	3472.66	3473.16	0.007247	10.20	70.58	83.39	1.95
1460	Inl Struct	7200	3469.00	3470.08	3469.58	3470.08	0.009774	9.63	74.76	120.81	2.16
1375	Inl Struct	7200	3464.00	3464.65	3464.15	3464.65	0.010041	9.35	72.34	113.47	2.20
1300	Inl Struct	7200	3459.00	3460.36	3459.86	3460.36	0.014232	10.50	67.95	125.87	2.54
1225	Inl Struct	7200	3453.00	3455.14	3454.14	3455.14	0.016947	9.08	79.32	116.12	1.94
1150	Inl Struct	7200	3450.00	3450.83	3450.33	3450.83	0.005257	8.35	86.22	108.33	1.65
1075	Inl Struct	7200	3444.00	3445.70	3444.70	3445.70	0.009472	10.50	67.95	92.07	2.17
1050	Inl Struct	7200	3442.00	3443.67	3442.67	3443.67	0.008044	9.46	76.09	108.82	1.99
1000	Inl Struct	7200	3441.00	3442.09	3441.09	3442.09	0.005654	8.62	81.62	99.78	1.72
925	Inl Struct	7200	3436.00	3437.31	3436.81	3437.31	0.006483	9.33	77.15	95.87	1.83
850	Inl Struct	7200	3431.00	3432.83	3431.83	3432.83	0.004554	9.30	86.95	81.97	1.83
775	Inl Struct	7200	3424.00	3426.14	3425.14	3426.14	0.007972	11.29	70.76	77.14	2.08
700	Inl Struct	7200	3422.00	3422.63	3422.13	3422.63	0.001788	11.72	68.18	61.95	1.97
650	Inl Struct	7200	3381.00	3383.76	3383.26	3383.76	0.006528	11.06	92.05	86.80	1.87
600	Inl Struct	7200	3396.00	3397.86	3397.36	3397.86	0.006966	11.58	89.06	83.52	1.98
550	Inl Struct	7200	3412.00	3413.63	3413.13	3413.63	0.004875	10.50	98.19	81.79	1.69
500	Inl Struct	7200	3406.00	3408.46	3407.96	3408.46	0.006763	13.05	79.00	59.63	2.00
450	Inl Struct	7200	3398.62	3401.75	3400.75	3401.75	0.005580	11.32	91.05	73.33	1.79
400	Inl Struct	7200	3396.22	3397.86	3397.36	3397.86	0.006966	11.58	89.06	83.52	1.98
350	Inl Struct	7200	3393.00	3394.83	3394.33	3394.83	0.006390	11.30	93.74	88.25	1.88
300	Inl Struct	7200	3390.96	3392.49	3391.99	3392.49	0.005287	10.90	95.42	80.80	1.75
250	Inl Struct	7200	3385.45	3387.41	3386.91	3387.41	0.006644	11.15	92.44	87.16	1.91
200	Inl Struct	7200	3381.93	3383.76	3383.26	3383.76	0.006528	11.06	92.05	86.80	1.87
150	Inl Struct	7200	3377.00	3378.72	3378.22	3378.72	0.004930	8.62	130.79	151.91	1.62
100	Inl Struct	7200	3317.00	3318.72	3318.22	3318.72	0.004930	8.62	130.79	151.91	1.62
50	Inl Struct	7200	3320.66	3322.57	3321.87	3322.57	0.006501	11.59	96.60	85.19	1.92
0	Inl Struct	7200	3323.00	3325.04	3324.04	3325.04	0.004724	10.57	105.99	85.88	1.68
-50	Inl Struct	7200	3325.94	3327.22	3326.72	3327.22	0.006062	11.33	98.82	86.29	1.87
-100	Inl Struct	7200	3328.00	3329.90	3329.40	3330.90	0.006755	11.51	96.45	87.91	1.95
-150	Inl Struct	7200	3332.62	3334.11	3333.61	3334.11	0.006336	11.39	96.36	87.53	1.89
-200	Inl Struct	7200	3337.00	3339.06	3338.06	3339.06	0.006060	11.24	99.64	87.31	1.85
-250	Inl Struct	7200	3341.92	3343.85	3343.35	3343.85	0.005019	10.28	100.34	87.46	1.69
-300	Inl Struct	7200	3347.25	3348.89	3348.39	3348.89	0.006410	10.82	95.27	92.32	1.88
-350	Inl Struct	7200	3350.05	3351.73	3351.23	3351.73	0.006651	11.16	92.40	86.13	1.80
-400	Inl Struct	7200	3353.00	3354.59	3354.09	3354.59	0.006603	11.22	91.92	86.41	1.82
-450	Inl Struct	7200	3356.00	3357.68	3357.18	3357.68	0.006803	11.39	91.63	86.24	1.81
-500	Inl Struct	7200	3360.73	3362.89	3362.39	3362.89	0.007417	11.59	88.92	86.24	2.01
-550	Inl Struct	7200	3365.45	3367.41	3366.91	3367.41	0.006644	11.15	92.44	87.16	1.91
-600	Inl Struct	7200	3370.81	3372.58	3372.08	3372.58	0.005168	10.24	100.69	89.56	1.70
-650	Inl Struct	7200	3375.53	3377.72	3377.22	3377.72	0.007229	11.58	89.02	85.09	2.00
-700	Inl Struct	7200	3381.00	3382.73	3382.23	3382.73	0.006413	11.18	94.92	87.03	1.83
-750	Inl Struct	7200	3384.00	3385.53	3385.03	3385.53	0.005353	10.70	96.40	85.68	1.78
-800	Inl Struct	7200	3388.00	3389.83	3389.33	3389.83	0.006390	11.30	93.74	88.25	1.88
-850	Inl Struct	7200	3391.00	3392.89	3392.39	3392.89	0.006390	11.30	93.74	88.25	1.88
-900	Inl Struct	7200	3317.00	3318.83	3318.33	3318.83	0.015766	7.46	152.66	92.55	1.02

SUMMARY OF ULTIMATE CONDITIONS			
HEC-1 MODEL			
SC OR CP	AREA (ac)	Q_{100} (cfs)	Q_{10} (cfs)
ALTA	9.8	35	18
7-2A	288.8	687	315
7-2B	60.4	182	82
7-5A	190.0	506	225
7-2B	60.4	182	82
7-2A	288.8	687	315
-	-	-	-
CD1	3.7	15	8
CD2	3.8	13	7
CD3	1.4	8	3
CP1	17.7	45	20
CP10A	1.2	4	2
CP10B	1.2	4	2
CP11	1.2	4	2
CP12	1.2	4	2
CP13	1.2	4	2
CP14	1.2	4	2
CP15	1.2	4	2
CP16	1.2	4	2
CP17	1.2	4	2
CP17A	1.2	4	2
CP18	1.2	4	2
CP2	1.2	4	2
CP3	1.2	4	2
CP4	1.2	4	2
CP5	1.2	4	2
CP6	1.2	4	2
CP7	1.2	4	2
CP8	1.2	4	2
CP9	1.2	4	2
CRD1	1.2	4	2
CRD2	1.2	4	2
CRD3	1.2	4	2
CS-1	16.8	55	27
CSR2	-	720	313
CSR1	-	841	366
CSV3	-	554	255
CSV2	-	25	12
CSV1	-	23	12
CPAD	-	40	21
CPA2	-	114	54
CP9	-	123	52
CP8	-	949	446
CP7	-	595	274
CP6	-	435	204
CP5	-	408	192
CP3	-	356	165
CP2	-	354	164
CP19	-	1172	558
CP18	-	1102	525
CP17A	-	78	34
CP17	-	102	46
CP16	-	1020	490
CP15	-	1024	479
CP14	-	543	251
CP11	-	1120	490
CP10B	-	155	63
CP10A	-	799	350
CP10	-	1031	453
CP1	-	282	125
COS-5	3.3	8	3
COS-4	9.4	22	8
COS-3	5.5	14	5
COS-2	3.1	7	3
COS-1	1.2	8	3
CD3	1.4	8	3
CD2	3.8	13	7
CD1	3.7	15	8
C	24.9	61	25
B	30.1	90	43
A2	33.9	100	47
A1	4.6	14	6
7-7A	51.8	153	70
7-5A	190.0	506	225
7-2B	60.4	182	82
7-2A	288.8	687	315
-	-	-	-
ALTA	9.8	35	18
SC OR CP	AREA (ac)	Q_{100} (cfs)	Q_{10} (cfs)

SUMMARY OF ULTIMATE CONDITIONS
HEC-1 MODEL

WS-1	5.9	19	9
SV3	2.7	11	6
SV2	2.1	9	4
SV1	3.6	14	8
ST6	1.8	8	4
ST4	6.0	22	12
ST2	9.6	33	17
ST1	1.1	5	2
SB4	0.5	2	1
SB3	3.5	13	7
SB2	1.3	5	3
SB1	3.5	14	7
RETD1	-	287	132
NP-1	10.5	22	8
M	22.0	73	36
L	15.5	53	26
K	29.6	80	34
J	43.6	110	46
I	38.6	102	43
H	22.1	58	24
G	42.6	100	39
FS1	-	554	255
F	37.6	92	36
E	24.1	64	27
DV1	-	287	132
D	34.8	88	37



THE HOWARD HUGHES COMPANY, LLC

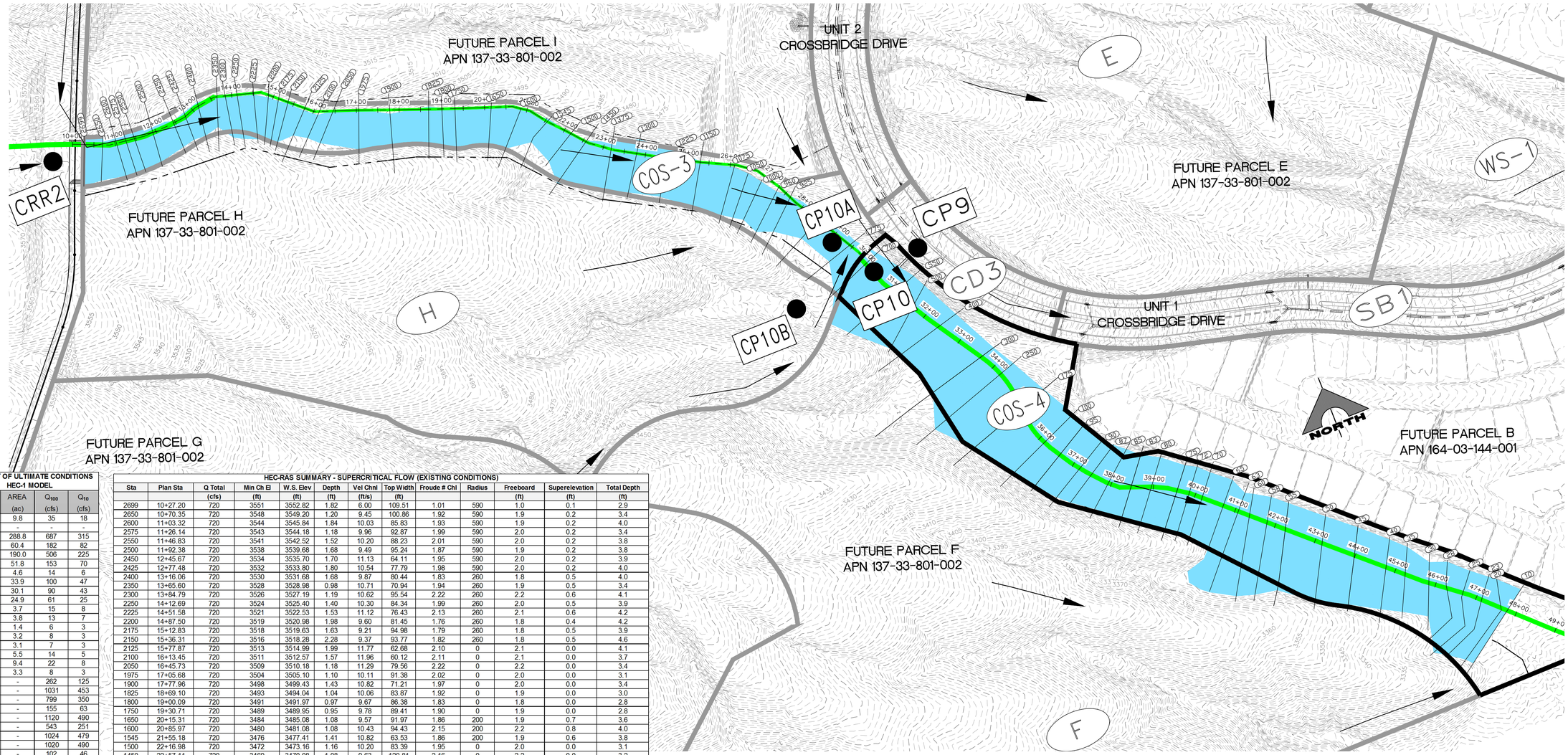
VILLAGE 24 - US WATERS

CC&S-4 WASH
PROPOSED CONDITIONS HEC-RAS EXHIBIT

DRAWING
FIG-7R
OF SHTS

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\600\6024 - 25A\Drawings



SUMMARY OF ULTIMATE CONDITIONS HEC-1 MODEL

SC OR CP	AREA (ac)	Q_{100} (cfs)	Q_{10} (cfs)
ALTA	9.8	35	18
7-2A	288.8	687	315
7-2B	60.4	182	82
7-5A	190.0	506	225
7-7A	51.8	153	70
A1	4.6	14	6
A2	33.9	100	47
B	30.1	90	43
C	24.9	61	25
CD1	3.7	15	8
CD2	3.8	13	7
CD3	1.4	6	3
COS-1	3.2	8	3
COS-2	3.1	7	3
COS-3	5.5	14	5
COS-4	9.4	22	8
COS-6	3.3	8	3
CP1	-	262	125
CP10	-	1031	453
CP10A	-	799	350
CP10B	-	155	63
CP11	-	1120	490
CP12	-	543	251
CP15	-	1024	479
CP16	-	1020	490
CP17	-	102	46
CP17A	-	78	34
CP18	-	1102	525
CP19	-	1172	558
CP2	-	354	164
CP3	-	356	165
CP5	-	408	192
CP6	-	435	204
CP7	-	595	274
CP8	-	949	446
CP9	-	123	52
CPA2	-	114	54
CPAD	-	40	21
CPSV2	-	23	12
CPSV3	-	25	12
CRR1	-	841	386
CRR2	-	720	313
CS-1	16.8	55	27
D	34.8	88	37
DIV1	-	287	132
E	24.1	64	27
F	37.8	92	36
FS1	-	554	255
G	42.6	100	39
H	22.1	58	24
I	38.6	102	43
J	43.6	110	46
K	29.6	80	34
L	15.5	53	26
M	22.0	73	36
NP-1	10.5	22	8
RETD1	-	287	132
SB1	3.5	14	7
SB2	1.3	5	3
SB3	3.5	13	7
SB4	0.5	2	1
ST1	1.1	5	2
ST2	9.6	33	17
ST4	6.0	22	12
ST6	1.8	8	4
SV1	3.6	14	8
SV2	2.1	9	4
SV3	2.7	11	6
WS-1	5.9	19	9

HEC-RAS SUMMARY - SUPERCRITICAL FLOW (EXISTING CONDITIONS)

Sta	Plan Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Depth (ft)	Vel Chnl (ft/s)	Top Width (ft)	Froude # Chl	Radius	Freeboard (ft)	Superelevation (ft)	Total Depth (ft)
2699	10+27.20	720	3551	3552.82	1.82	6.00	109.51	1.01	590	1.0	0.1	2.9
2650	10+70.35	720	3548	3549.20	1.20	9.45	100.86	1.92	590	1.9	0.2	3.4
2600	11+03.32	720	3544	3545.84	1.84	10.03	85.83	1.93	590	1.9	0.2	4.0
2575	11+26.14	720	3543	3544.18	1.18	9.96	92.87	1.99	590	2.0	0.2	3.4
2550	11+46.83	720	3541	3542.52	1.52	10.20	88.23	2.01	590	2.0	0.2	3.8
2500	11+92.38	720	3538	3539.68	1.68	9.49	95.24	1.87	590	1.9	0.2	3.8
2450	12+45.67	720	3534	3535.70	1.70	11.13	64.11	1.95	590	2.0	0.2	3.9
2425	12+77.48	720	3532	3533.80	1.80	10.54	77.79	1.98	590	2.0	0.2	4.0
2400	13+16.06	720	3530	3531.68	1.68	9.87	80.44	1.83	260	1.8	0.5	4.0
2350	13+65.60	720	3528	3528.98	0.98	10.71	70.94	1.94	260	1.9	0.5	3.4
2300	13+84.79	720	3526	3527.19	1.19	10.62	95.54	2.22	260	2.2	0.6	4.1
2250	14+12.69	720	3524	3525.40	1.40	10.30	84.34	1.99	260	2.0	0.5	3.9
2225	14+51.58	720	3521	3522.53	1.53	11.12	76.43	2.13	260	2.1	0.6	4.2
2200	14+87.50	720	3519	3520.98	1.98	9.60	81.45	1.76	260	1.8	0.4	4.2
2175	15+12.83	720	3518	3519.63	1.63	9.21	94.98	1.79	260	1.8	0.5	3.9
2150	15+36.31	720	3516	3518.28	2.28	9.37	93.77	1.82	260	1.8	0.5	4.6
2125	15+77.87	720	3513	3514.99	1.99	11.77	62.68	2.10	0	2.1	0.0	4.1
2100	16+13.45	720	3511	3512.57	1.57	11.96	60.12	2.11	0	2.1	0.0	3.7
2050	16+45.73	720	3509	3510.18	1.18	11.29	79.56	2.22	0	2.2	0.0	3.4
1975	17+05.68	720	3504	3505.10	1.10	10.11	91.38	2.02	0	2.0	0.0	3.1
1900	17+77.96	720	3498	3499.43	1.43	10.82	71.21	1.97	0	2.0	0.0	3.4
1825	18+69.10	720	3493	3494.04	1.04	10.06	83.87	1.92	0	1.9	0.0	3.0
1800	19+00.09	720	3491	3491.97	0.97	9.67	86.38	1.83	0	1.8	0.0	2.8
1750	19+30.71	720	3489	3489.95	0.95	9.78	89.41	1.90	0	1.9	0.0	2.8
1650	20+15.31	720	3484	3485.08	1.08	9.57	91.97	1.86	200	1.9	0.7	3.6
1600	20+85.97	720	3480	3481.08	1.08	10.43	94.43	2.15	200	2.2	0.8	4.0
1545	21+55.18	720	3476	3477.41	1.41	10.82	63.53	1.86	200	1.9	0.6	3.8
1500	22+16.98	720	3472	3473.16	1.16	10.20	83.39	1.95	0	2.0	0.0	3.1
1450	22+57.11	720	3469	3470.08	1.08	9.63	120.81	2.16	0	2.2	0.0	3.2
1375	23+18.62	720	3464	3464.65	0.65	9.95	113.47	2.20	0	2.2	0.0	2.9
1300	23+79.17	720	3459	3460.36	1.36	10.60	125.87	2.54	0	2.5	0.0	3.9
1225	24+69.35	720	3453	3455.14	2.14	9.08	116.12	1.94	0	1.9	0.0	4.1
1150	25+29.34	720	3450	3450.83	0.83	8.35	108.32	1.65	0	1.7	0.0	2.5
1075	26+10.01	720	3444	3445.70	1.70	10.60	92.07	2.17	0	2.2	0.0	3.9
1050	26+45.61	720	3442	3443.67	1.67	9.46	108.82	1.99	0	2.0	0.0	3.7
1000	26+86.80	720	3441	3442.09	1.09	8.82	99.78	1.72	0	1.7	0.0	2.8
960	27+27.71	720	3438	3439.74	1.74	8.77	104.98	1.75	0	1.8	0.0	3.5
925	27+63.01	720	3436	3437.31	1.31	9.33	95.87	1.83	0	1.8	0.0	3.1
850	28+47.94	799	3431	3432.83	1.83	9.30	81.97	1.60	0	1.6	0.0	3.4
775	29+42.50	799	3424	3426.14	2.14	11.29	77.14	2.08	0	2.1	0.0	4.2
700	30+14.92	799	3421	3422.65	1.65	11.54	62.06	1.93	0	1.9	0.0	3.6
550	31+10.26	1031	3416	3417.29	1.29	7.76	141.19	1.41	0	1.4	0.0	2.7
500	31+64.49	1031	3411	3412.66	1.66	9.01	130.68	1.70	0	1.7	0.0	3.4
400	32+40.88	1031	3407	3408.30	1.30	11.50	99.52	2.14	0	2.1	0.0	3.4
300	33+62.68	1031	3400	3401.40	1.40	9.59	125.74	1.83	0	1.8	0.0	3.2
250	34+23.30	1031	3396	3397.38	1.38	8.16	198.80	1.80	0	1.8	0.0	3.2
175	35+17.24	1031	3390	3391.31	1.31	9.05	173.01	1.96	878	2.0	0.3	3.5
100	36+14.97	1031	3384	3385.58	1.58	10.51	143.53	2.24	878	2.2	0.3	4.1
95	36+61.08	1031	3382	3383.09	1.09	7.63	183.29	1.57	878	1.6	0.2	2.8
90	37+17.65	1031	3378	3379.45	1.45	9.47	143.56	1.92	878	1.9	0.2	3.6
87	37+48.34	1031	3376	3377.79	1.79	8.96	128.13	1.67	878	1.7	0.2	3.6
85	37+92.84	1031	3373	3375.16	2.16	8.30	157.51	1.65	878	1.7	0.2	4.0
83	38+47.42	1031	3370	3372.04	2.04	8.74	154.57	1.76	878	1.8	0.2	4.0
80	38+95.33	1031	3367	3368.98	1.98	10.55	103.43	1.91	878	1.9	0.2	4.1
75	39+56.20	1031	3364	3366.31	2.31	9.18	120.60	1.68	878	1.7	0.2	4.2
72	39+85.09	1031	3363	3364.38	1.38	9.11	121.21	1.66	878	1.7	0.2	3.2
70	40+17.18	1031	3361	3362.26	1.26	9.33	155.26	1.95	878	2.0	0.2	3.4
65	40+70.16	1031	3358	3359.21	1.21	9.18	162.11	1.94	0	1.9	0.0	3.2
63	41+07.62	1031	3353	3354.38	1.38	13.12	82.53	2.37	0	2.4	0.0	3.8
60	41+35.51	1031	3351	3353.47	2.47	8.36	155.99	1.66	0	1.7	0.0	4.1
58	41+79.54	1031	3349	3351.07	2.07	7.57	231.48	1.74	0	1.7	0.0	3.8
55	42+25.29	1031	3347	3348.53	1.53	7.22	204.89	1.52	0	1.5	0.0	3.1
50	43+17.42	1031	3342	3343.30	1.30	7.48	199.62	1.59	0	1.6	0.0	2.9
45	43+97.91	1120	3337	3338.29	1.29	8.13	181.87	1.65	0	1.7	0.0	3.0
40	44+77.01	1120	3333	3333.93	0.93	8.74	161.55	1.73	0	1.7	0.0	2.6
35	45+24.82	1120	3329	3330.87	1.87	9.20	148.09	1.79	0	1.8	0.0	3.6
30	45+83.77	1120	3326	3326.85	0.85	9.58	148.33	1.90	0	1.9	0.0	2.7
28	46+27.38	1120	3323	3324.61	1.61	8.26	192.57	1.74	0	1.7	0.0	3.3
25	46+66.69	1120	3321	3322.13	1.13	8.14	228.23	1.85	0	1.8	0.0	3.0
23	47+13.40	1120	3319	3320.89	1.89	6.49	165.43	1.12	0	1.1	0.0	3.0
20	47+62.46	1120	3317	3318.72	1.72	8.53	152.12	1.62	0	1.5	0.0	3.2
10	47+78.43	1120	3316	3317.86	1.86	6.59	151.31	1.10	0	1.1	0	3.0

SCALE 120 0 120 240 FEET

LEGEND

- COS-3 — DRAINAGE SUBBASIN
- CP1 — CONCENTRATION POINT
- SUBBASIN BOUNDARY
- AREA OF INUNDATION
- 850 — HEC-RAS CROSS SECTION
- EX. US WATERS DELINEATION

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 03-01-16
PLOT TIME: 14:37:33

REV	DATE	DESCRIPTION	DATE: AGEN. APP	DATE: GCW APP

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F:\Projects\600\602024 - 224\Division 1\Civil\Figures\Fig-6R Existing COS-4 RAS1.dwg

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 24 - US WATERS
COS-4 WASH
EXISTING CONDITIONS HEC-RAS EXHIBIT

DRAWING
FIG-6R
OF SHTS

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