APPENDIX J

FINAL HYDRAULICS STUDY WITH ACOE FLOWS

OC Loop Bikeway Segments OPQ

Hydraulics Study
Artesia Blvd. & Valley View Street Undercrossings

Prepared For:

ORANGE COUNTY PublicWorks

Draft Submittal
July 1, 2020
Revision No. 1
August 19, 2020
Revision No. 2
January 27, 2021

Table of Contents

Appendix Index

1. Introduction

1.1 Purpose of the Report

The purpose of this Location Hydraulics Study (Study) is to provide the Hydrology and Hydraulic basis for the existing conditions and evaluation of the proposed improvements along Coyote Creek for proposed undercrossings at Valley View Street and Artesia Boulevard. This Study is being prepared in conjunction with Improvement Plans and CEQA/NEPA Documents for OC Loop Bikeway Segments OPQ.

1.2 Goals and Objectives

This Study provides a detailed methodology for establishing flow rates to model along the project limits with a focus on two proposed bridge under crossings that require encroachment into and modification to the existing improved Coyote Creek Channel. This study utilizes a steady state analysis performed in HEC-RAS for both the existing and proposed conditions to document the channel flow characteristics for each condition.

The primary goal and objectives of this study include the following:

- Research, collect, and review previous hydrology and hydraulic studies, as-built / record information, and improvement plans along the study area and project reaches.
- Develop/Establish US Army Corps of Engineers (USACOE) Design Discharge rates for analysis of the existing Coyote Creek Channel
- Model the proposed and existing condition using the HEC-RAS software developed by the US Army Corp of Engineers (USACOE).
- Prepare a hydraulic analysis one-thousand feet (1,000') upstream and downstream of the Valley View Street and Artesia Boulevard bridge crossings.

2. Project Information

2.1 Project Description

The Orange County Loop (OC Loop) is primarily a Class I bikeway facility accommodating bicyclists and pedestrians and is located in the northwestern portions of Orange County, California. When completed, the 66-mile loop will provide commuting & recreational opportunities for users and will link important regional facilities such as the Santa Ana River Bikeway, the Coastal Bikeway, the San Gabriel River Bikeway and the Coyote Creek Bikeway.

A 2.7 mile gap in the OC Loop, designated as Segments O, P, and Q, currently exists along Coyote Creek Channel. This gap is located upstream and downstream of the Santa Ana Freeway (I-5), beginning at the North Fork Channel confluence and ending at La Mirada Blvd. bridge crossing. The Orange County Bike Loop O/P/Q Segments Project (Project) proposes to close the existing gap through the construction of a Class I bikeway along the Coyote Creek Channel.

2.2 Project Location and Setting

The Project begins at the existing Coyote Creek Bikeway, in the city of Cerritos in Los Angeles County, where the Coyote Creek North Fork Channel and the Coyote Creek Channel confluence. Construction of the bikeway is proposed continue east along the Coyote Creek Channel for approximately 2.7 miles where a connection to a segment of the Coyote Creek Bikeway at La Mirada Blvd. in the city of Buena Park exists. Project construction will occur in both Los Angeles and Orange Counties along the 2.7 mile stretch of Coyote Creek Channel. The majority of the property required for the project is owned by the Los Angeles County Flood Control District.

2.3 Purpose and Need for Project

The Project is a safety and mobility enhancement for Orange County and is included in the 2008 Coyote Creek Bikeway Master Plan (Rivers and Mountains Conservancy and Trails4All), 2009 OCTA Commuter Bikeway Strategic Plan, 2012 OCTA Fourth District Bikeways Strategy report, 2014 County of Orange General Plan, and the 2015 OC Loop Gap Feasibility Study (OC Parks).

The Project, as part of a comprehensive and complete bicycle network, will greatly benefit Orange County residents and visitors by enhancing safety and mobility for non-motorized users, advance efforts to achieve greenhouse gas reduction goals, improve aesthetics, access and maintenance to the flood control channel, and enhance public health.

2.4 Proposed Improvements

Proposed improvements that occur within the Coyote Creek Channel occur at two places, the under crossing at Valley View Street, and the undercrossing at Artesia Boulevard. The undercrossing at Valley View Street proposes to modify the channel cross section to include a 12’ wide concrete bike path “cut into” the northern (left side looking upstream) side of the channel, and the undercrossing at Artesia Boulevard proposes to install a hybrid bike path “cut into” the northern (left side looking upstream) side of the channel adjacent to the abutment with a cantilevered section to provide a complete 12’ wide bike path.

The channel cross section under Valley View will increase in cross sectional area in the locations where the bike path is constructed. The bike path will match the existing side slope of the channel on the inside edge of the bike path, and on the outside edge a vertical wall will be constructed from the bike path elevation to the elevation of the existing channel side slope. The maximum slopes down into and up out of the undercrossing are 5%. The vertical clearance from the top of the bike path to the bridge soffit is eleven (11) feet minimum.

The channel cross section under Artesia Boulevard will increase the sectional area in the locations where the bike path in constructed. The northern channel wall is vertical and where the bike path dips below the existing top of wall the channel will be widened and a new vertical wall constructed along the channel/bike path edge interface. As the bike path meanders into the channel cross section to avoid the existing abutments, it will cantilever over the channel for a portion of the bike path width, to provide a 13’ bike path. The maximum ingress and egress slopes into and out of the under crossing are 5%. The minimum vertical clearance from the top of the bike path to the bridge soffit is 9’-6” minimum.

3. Regulatory Setting

3.1 California's National Flood Insurance Program

FEMA is the nationwide administrator of the National Flood Insurance Program (NFIP), which is a program that was established by the National Flood Insurance Act of 1968 to protect lives and property, and to reduce the financial burden of providing disaster assistance. Under the NFIP, FEMA has the lead responsibility for flood hazard assessment and mitigation and offers federally backed flood insurance to homeowners, renters, and business owners in communities that choose to participate in the program. FEMA has adopted the 100-year floodplain as the base flood standard for the NFIP and issues the Flood Insurance Rate Maps (FIRMs) for communities that participate in the NFIP. These FIRMs present delineations of flood hazard zones.

In California, nearly all of the State's flood-prone communities participate in the NFIP, which is locally administered by the California Department of Water Resources' (DWR) Division of Flood Management. Under California's NFIP, communities have a mutual agreement with the State and Federal government to regulate floodplain development according to certain criteria and standards, which is further detailed in the NFIP. Typically, each county (or community) has a Flood Insurance Study (FIS), which is used to locally develop FIRMs and Base Flood Elevations (BFE).

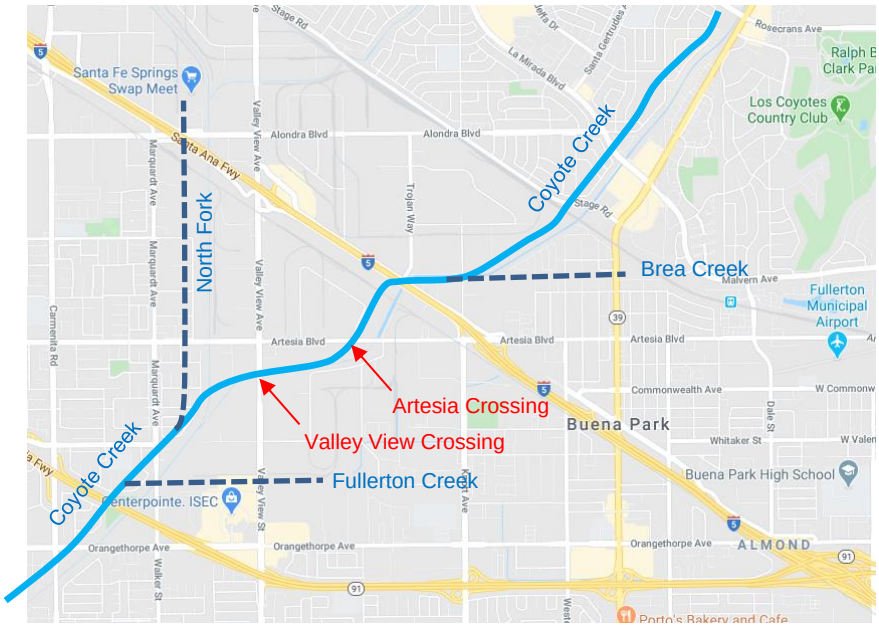
3.2 Coyote Creek between Valley View Street and Artesia Boulevard

According to the most current FIRM maps for the area 1,000' upstream and downstream of each of the two undercrossings, the areas are either unmapped and/or shown to have a 0.2% chance of flooding. Water surface and base flood elevations are not provided. Copies of the FIRM maps have been included in the Appendices for reference.

4. Hydraulic Analysis

4.1 Hydraulic Analysis Summary

Preparation of this hydraulic analysis has been completed in conjunction with the project improvement plans for OC Loop OPQ along Coyote Creek, in north Orange County, including evaluating channel encroachments at two under crossings at Valley View Street and Artesia Boulevard. Below is a summary of the various established sources and flow rates within Coyote Creek. To be conservative, and as required by the USACOE, the Design Discharges provided by the USACOE will be used (higher than OCPW High Confidence) in the HEC-RAS model at the undercrossing locations. The HEC-RAS analysis is being completed to establish existing water surface elevations for comparison against the proposed condition water surface elevations to determine the impact, if any, resulting from the proposed project. The proposed locations for study are shown on the map below.



4.2 Existing Information / Conditions

GHD conducted a search of available information from Orange County Public Works (OCPW), Orange County Flood Control District (OCFCD), Los Angeles County Flood Control District (LAFCD), FEMA, and the US Army Corps of Engineering (USACOE) to obtain as-built drawings, hydrology and hydraulics data and reports, and other miscellaneous information. The following list of information summarizes the results of the search and is a list of documents that provide data, flow rates, exhibits, calculations, and/or results, and is included in the Appendices.

- Plans for the Construction of Brea Channel, OCFCD Facility No. A02 – November, 1996
- US Army Corps of Engineer's – Plate 4, File No. 198/89 – Coyote Creek Channel Std. Discharges
- US Army Corps of Engineer's – Plate 10, File No. 373/120 – Coyote Creek Channel Std. Discharges

The following table summarizes the findings within the above information and other sources related to flow rates along project length within Coyote Creek. See Appendix B illustrating the locations denoted for each of the below flow rates.

Table 4.1 Existing Flow Rate Information

Concentration Point	LACFCD 1935 Plans – Theoretical Q (cfs)	USACE "Design Discharge" Q (cfs)	USACE 100-Year Q (CFS)	1949 Survey Report Q (cfs)	OCHM 100-Year Design Q - HC (cfs)	OCHM 100-Year EV Q (cfs)
CC Above Brea Creek	15,600	15,000		7,500		
Brea Creek D/S of Western		12,000		6,000	8,023	6,710
CC Below Brea Creek	19,500	**21,500**		13,000		
CC Below North Fork	23,300	37,000		23,000		
CC Below Fullerton Creek		40,000				
Fullerton Creek		13,500				7,700
CC Above San Gabriel River		50,000	38,000	30,000		

CC = Coyote Creek D/S = Downstream HC = High Confidence EV = Expected Value

4.3 Proposed Methodology

Table 4.1 illustrates the gaps in flow rates across multiple references. The Orange County Hydrology Manual permits the use of Expected Value numbers in the analysis of existing facilities, and for purposes of this project, the higher USACOE Design Discharge rates will be used to analyze the existing and proposed conditions 1,000 feet upstream and downstream of the Coyote Creek crossings at Artesia Boulevard and Valley View Street.

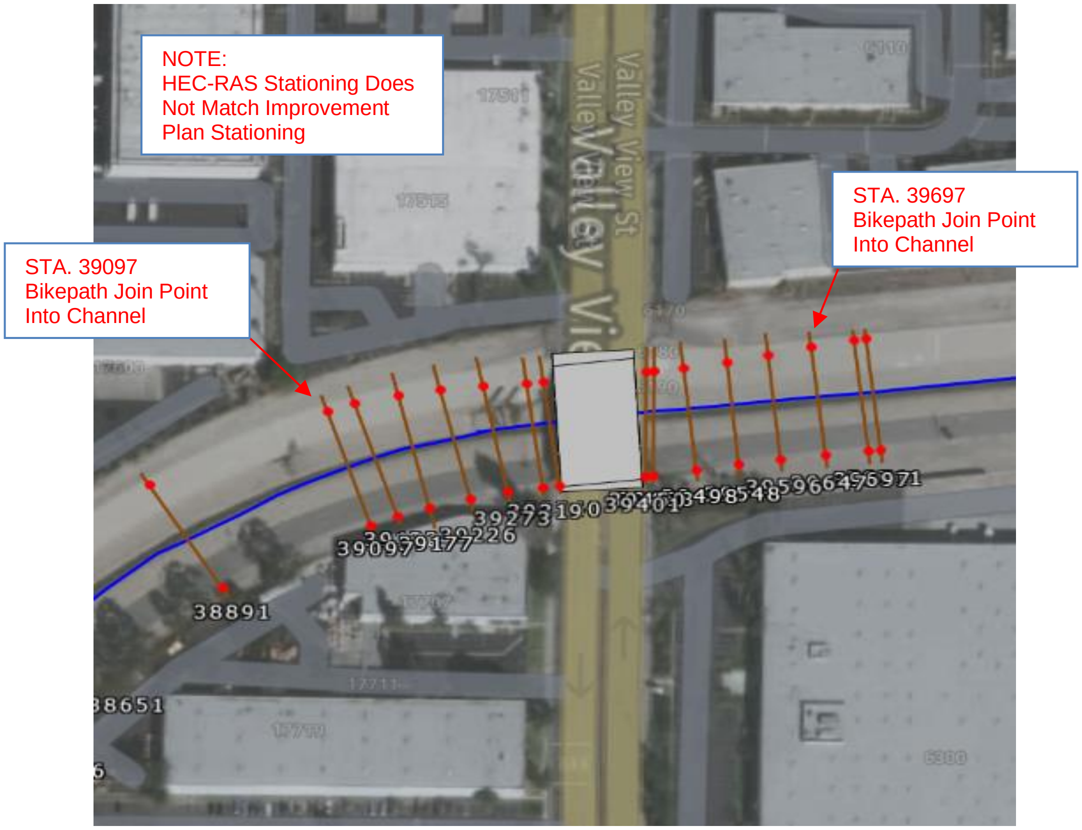
To calculate the water surface elevation within Coyote Creek GHD prepared a HEC-RAS model utilizing the Coyote Creek As-Built plans, and verified/updated the model with field survey cross sectional field data and detailed bridge survey data. Design Discharges were then modelled in HEC-RAS for cross sectional analysis to determine the water surface elevation within the existing channel. The downstream water surface elevation was determined by HEC-RAS utilizing normal depth and channel slope. Bridge decks, piers, sidewalls, and soffits were modeled using elevation obtained through field topographic survey.

5. Results

5.1 Results

Utilizing the USACOE Design Discharge rates listed in Table 4.1 resulted in HEC-RAS output illustrating that the flow rates are contained within the Coyote Creek right of way for the existing condition. Containment within the Coyote Creek right of way is consistent with the FIRM maps, and the unmapped area. A second HEC-RAS analysis was completed evaluating the proposed improvements. HEC-RAS does not provide a specific method for modelling a cantilever into a channel. As a result, cross sections in the Artesia Bridge location were modelled with a one (1') foot thick variable width cantilever "lid" at the locations where the bike path cantilevers over the channel. Cross sectional analysis 1,000 feet upstream and downstream of the Valley View Street and Artesia Boulevard is summarized below. HEC-RAS output has been included in the Appendices for reference. Below is a station map/exhibit illustrating where cross sectional analysis was completed, and a subsequent table illustrating the existing versus proposed water surface elevations.

GHD


NOTE:
HEC-RAS Stationing Does
Not Match Improvement
Plan Stationing
STA. 39697
Bikepath Join Point
Into Channel
STA. 39097
Bikepath Join Point
Into Channel
Valley View St
38891
38651

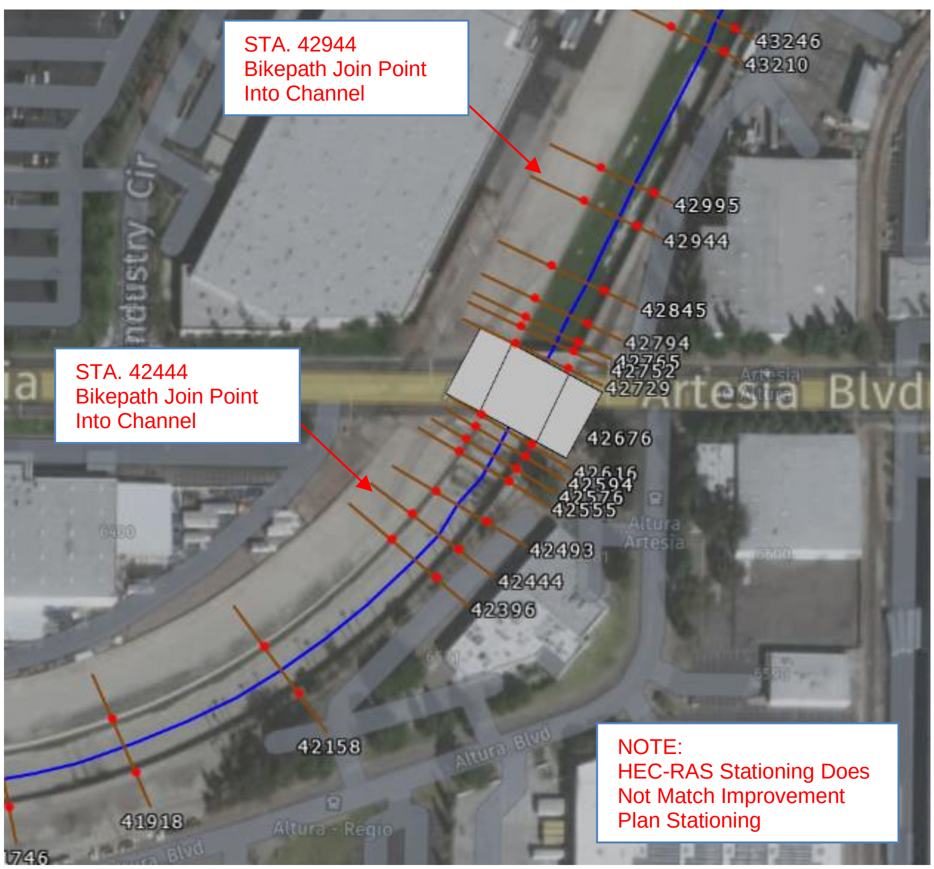

STA. 42944
Bikepath Join Point
Into Channel
43246
43210
42995
42944
42845
42794
42729
STA. 42444
Bikepath Join Point
Into Channel
Industry Cir
Artesia Blvd
42676
42555
42493
42444
42396
42158
41918
NOTE:
HEC-RAS Stationing Does
Not Match Improvement
Plan Stationing

Table 5.1 Cross Sectional Analysis Results

River Sta.	Flow Rate – Q (cfs)	Existing W.S. Elev	Proposed W.S. Elev.	Delta (Prop vs Ex.)	Location
43672	21,500	55.22	55.22	0.00	Channel
43531	21,500	54.82	54.82	0.00	Channel
43495	21,500	54.59	54.59	0.00	Channel
43246	21,500	54.37	54.37	0.00	Channel
43210	21,500	54.28	54.28	0.00	Channel
42995	21,500	53.65	53.65	0.00	Channel
42944	21,500	53.53	53.53	0.00	Bikepath
42845	21,500	56.11	55.35	-0.76	Bikepath
42794	21,500	56.09	55.62	-0.47	Bikepath
42765	21,500	55.49	55.59	0.10	Bikepath
42752	21,500	55.47	55.56	0.09	Bikepath
42729	21,500	55.43	55.54	0.11	Bikepath
42676	**Artesia Bridge**				
42616	21,500	55.72	55.85	0.13	Bikepath
42594	21,500	55.63	55.53	-0.10	Bikepath
42576	21,500	55.69	55.58	-0.11	Bikepath
42555	21,500	55.70	55.31	-0.39	Bikepath
42493	21,500	56.04	55.28	-0.76	Bikepath
42444	21,500	53.94	53.94	0.00	Bikepath
42396	21,500	53.76	53.76	0.00	Channel
42158	21,500	52.42	52.42	0.00	Channel
41918	21,500	52.02	52.02	0.00	Channel
41746	21,500	51.61	51.61	0.00	Channel
41649	21,500	49.55	49.55	0.00	Channel
41546	21,500	47.96	47.96	0.00	Channel
41449	21,500	47.77	47.77	0.00	Channel
41199	21,500	47.53	47.53	0.00	Channel
40950	21,500	47.23	47.23	0.00	Channel
40699	21,500	46.90	46.90	0.00	Channel
40446	21,500	46.76	46.76	0.00	Channel
40196	21,500	49.67	45.95	-3.72	Channel
39946	21,500	49.36	49.30	-0.06	Channel
39711	21,500	49.24	49.17	-0.07	Channel
39697	21,500	49.22	49.15	-0.07	Bikepath
39647	21,500	49.20	49.13	-0.07	Bikepath
39596	21,500	49.16	49.09	-0.07	Bikepath
39548	21,500	49.19	49.14	-0.05	Bikepath
39498	21,500	49.43	49.39	-0.04	Bikepath
39458	21,500	49.71	49.67	-0.04	Bikepath
39450	21,500	49.70	49.67	-0.03	Bikepath
39401	**Valley View Bridge**				
39340	21,500	49.46	49.48	0.02	Bikepath
39319	21,500	49.45	49.47	0.02	Bikepath
39273	21,500	49.41	49.43	0.02	Bikepath
39226	21,500	49.41	49.42	0.01	Bikepath
39177	21,500	49.37	49.37	0.00	Bikepath
39132	21,500	49.31	49.31	0.00	Bikepath
39097	21,500	49.30	49.30	0.00	Bikepath
38891	21,500	49.19	49.19	0.00	Channel
38651	21,500	49.10	49.10	0.00	Channel
38536	21,500	48.99	48.99	0.00	Channel
38404	21,500	48.94	48.94	0.00	Channel

6. Conclusions

Based upon the USACOE Design Discharge flow rate analysis within Coyote Creek Channel, the proposed improvements have minimal impact to the water surface elevation within the channel at the proposed under crossings. Implementation of the proposed improvements do not cause the water surface to impact existing infrastructure or tributary improvements.

Appendix A
FEMA – FIRM Maps

National Flood Hazard Layer FIRMette

FEMA

118°2'18"W 33°52'19"N

118°1'41"W 33°51'49"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

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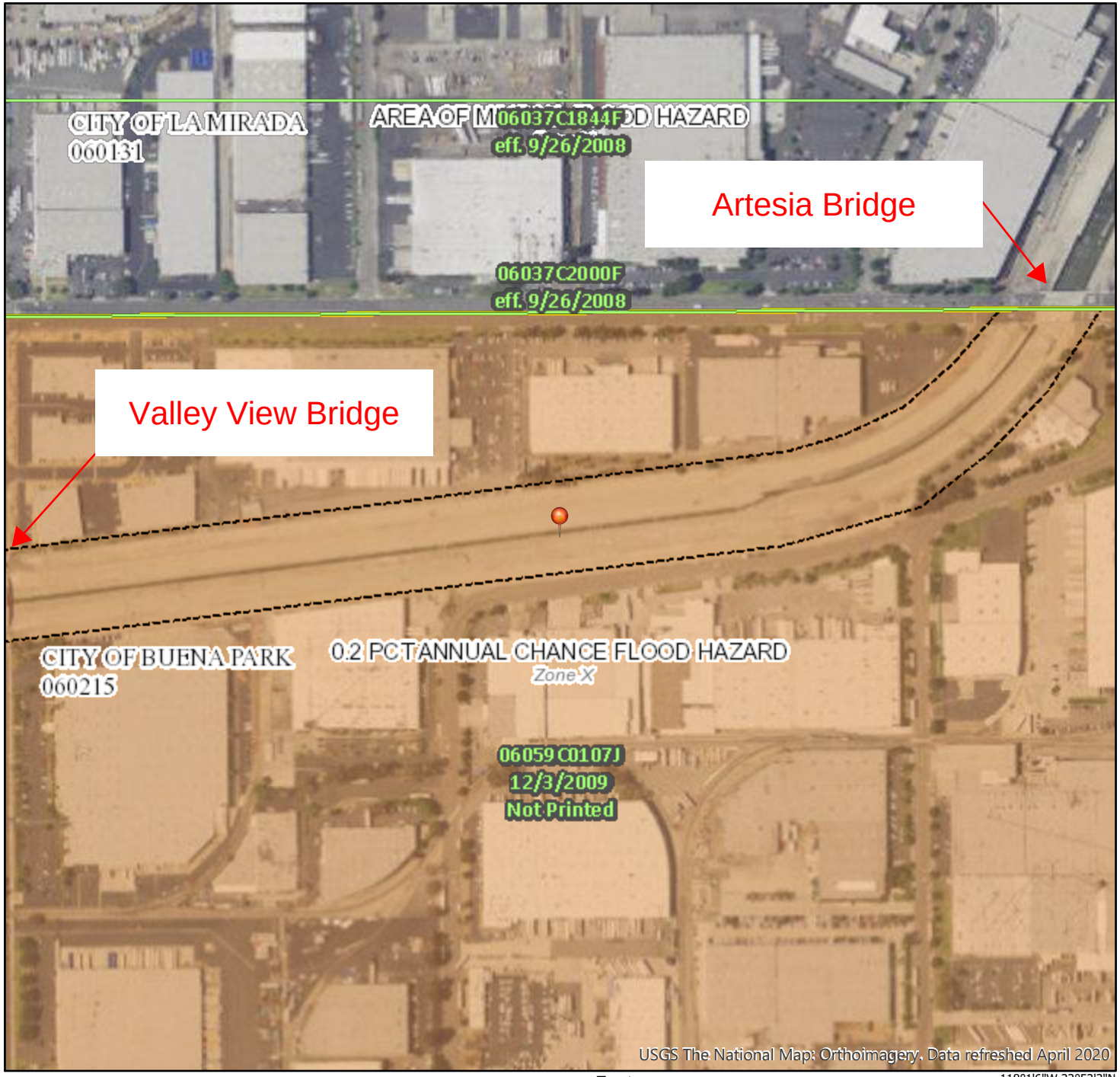
National Flood Hazard Layer FIRMette

FEMA

118°1'43"W 33°52'33"N



118°1'6"W 33°52'3"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
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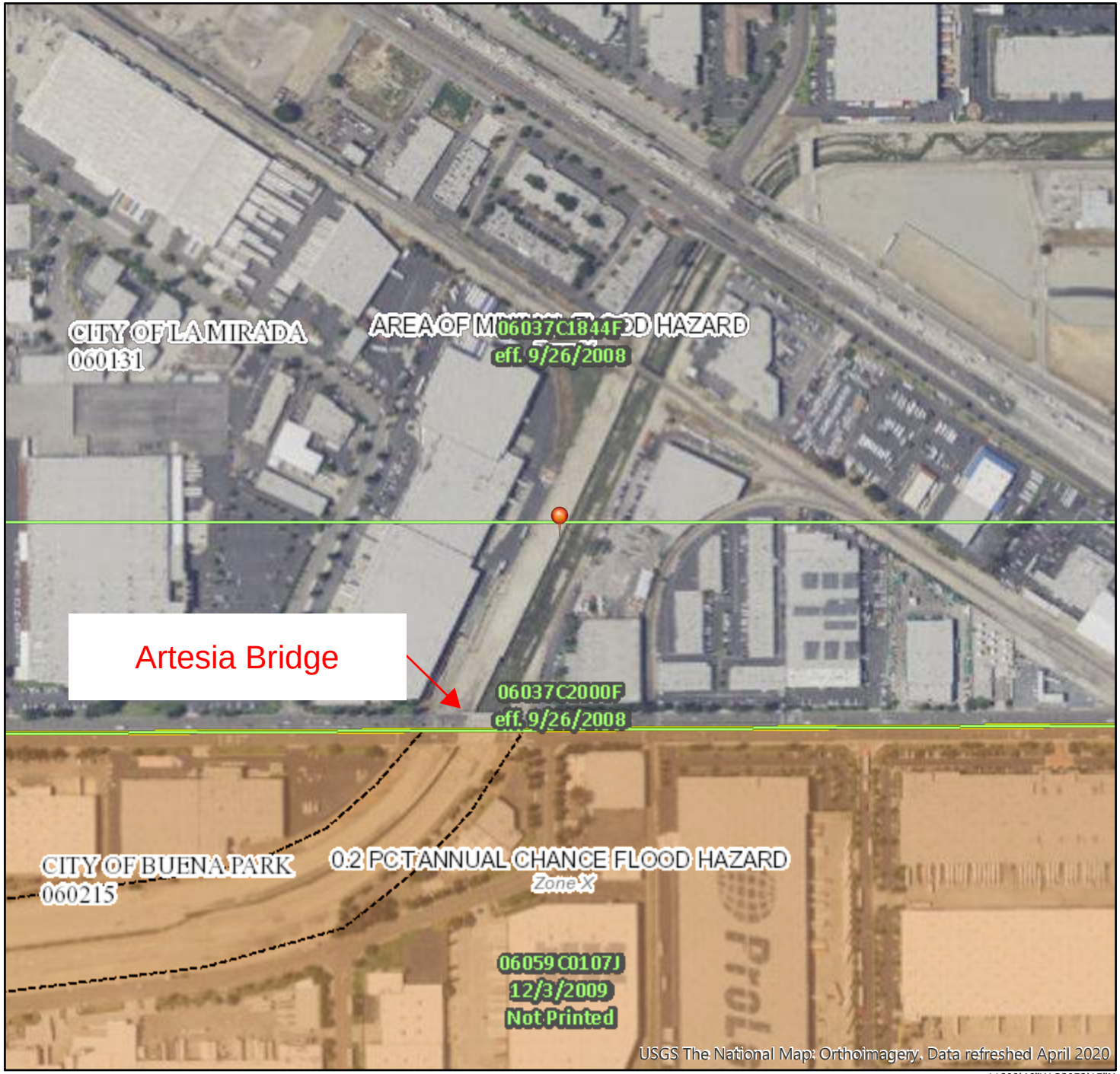
National Flood Hazard Layer FIRMette

FEMA

118°1'24"W 33°52'45"N



118°0'46"W 33°52'15"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
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MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

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Appendix B

Record Information

(Reference)

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS

LEGEND

- BOUNDARY OF PROJECT-UNIT DRAINAGE SUBAREA.
- BOUNDARY OF PROJECT-UNIT SIDE-DRAINAGE SUBAREA.
- PROJECT CHANNEL.
- EXISTING CHANNEL.
- PROPOSED CHANNEL BY LOCAL INTERESTS.
- (A) SIDE-DRAINAGE SUBAREA DESIGNATION.
- S.D. / 700 SIDE DRAINAGE DISCHARGE IN CUBIC FEET PER SECOND.
- 37,000 CHANNEL-DESIGN DISCHARGE IN CUBIC FEET PER SECOND.

LOS ANGELES COUNTY DRAINAGE AREA, CALIF.

COYOTE CREEK CHANNELS

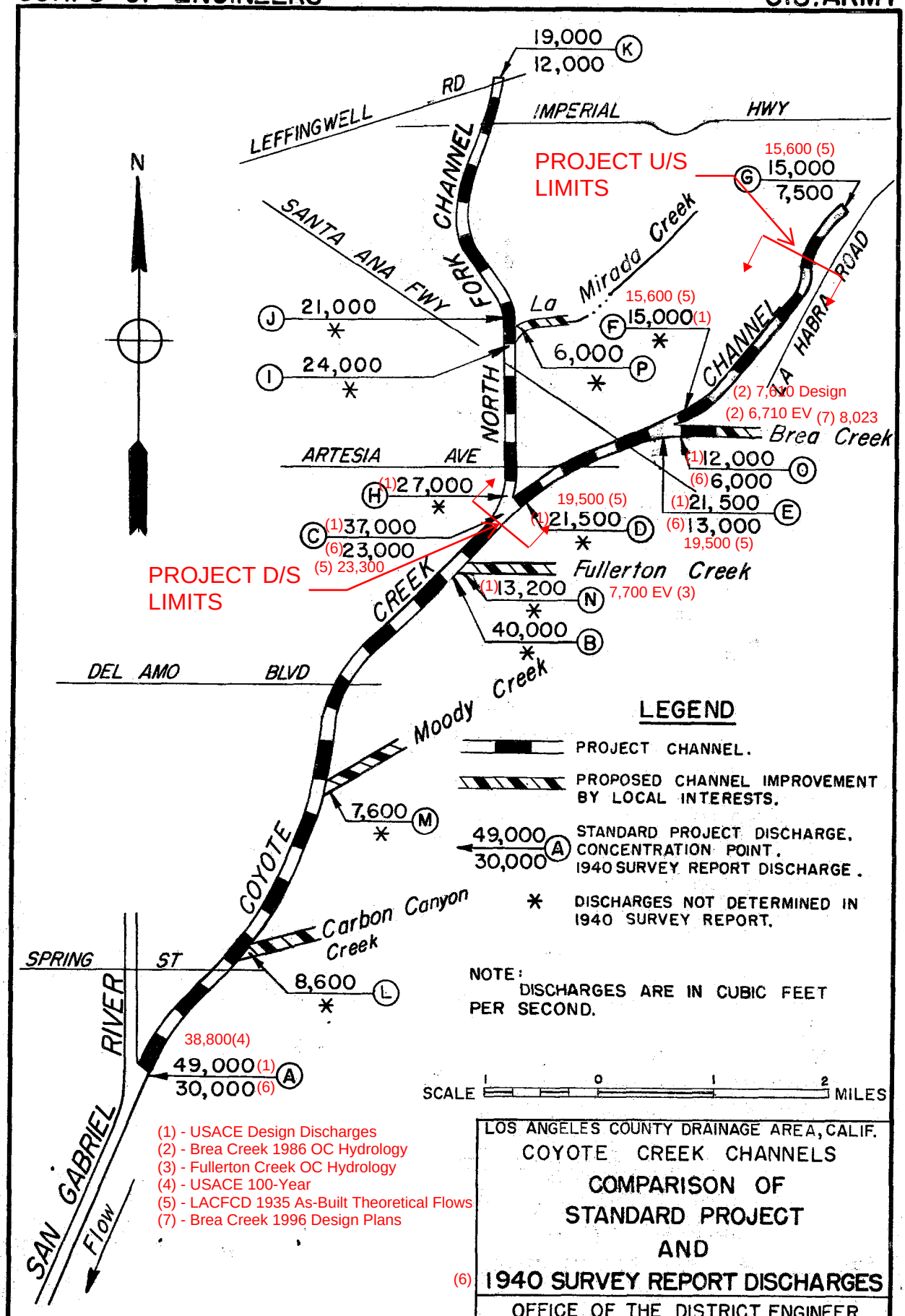
COYOTE CREEK CHANNEL UPSTREAM FROM NORTH FORK AND NORTH FORK CHANNEL

CHANNEL-DESIGN AND SIDE-DRAINAGE DISCHARGES

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS
DESIGN MEMO. NO. 3

FILE NO. 198/89 PLATE 4

CORPS OF ENGINEERS U.S.ARMY



(1) - USACE Design Discharges
(2) - Brea Creek 1986 OC Hydrology
(3) - Fullerton Creek OC Hydrology
(4) - USACE 100-Year
(5) - LACFCD 1935 As-Built Theoretical Flows
(7) - Brea Creek 1996 Design Plans

LOS ANGELES COUNTY DRAINAGE AREA, CALIF.

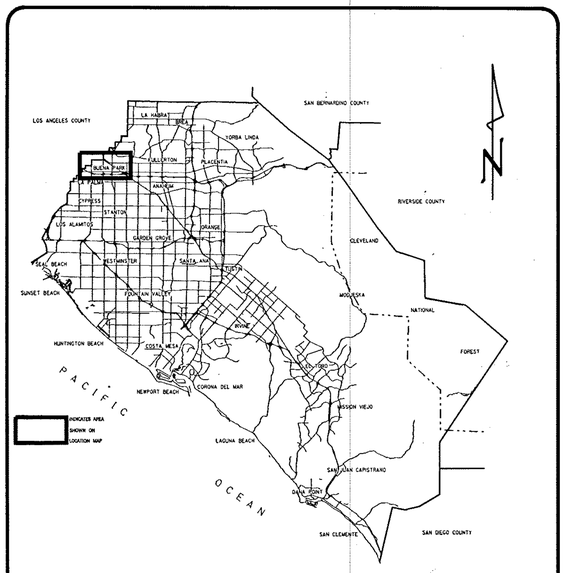
COYOTE CREEK CHANNELS

COMPARISON OF STANDARD PROJECT AND (6) 1940 SURVEY REPORT DISCHARGES

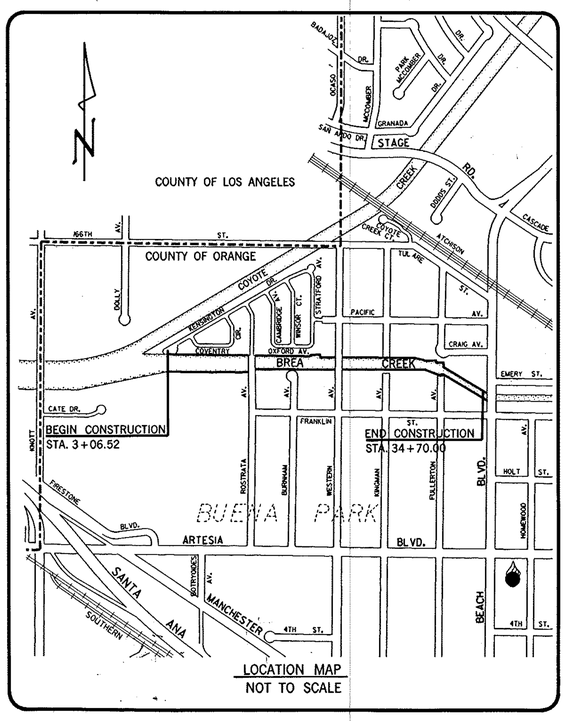
OFFICE OF THE DISTRICT ENGINEER
LOS ANGELES, CALIFORNIA
DESIGN MEMO NO. 1 DATED: FEB., 1959

FILE NO. 373/120 PLATE 10

A02-101-5R 1 of 26



VICINITY MAP



LOCATION MAP
NOT TO SCALE

ORANGE COUNTY
ENVIRONMENTAL MANAGEMENT AGENCY

SANTA ANA, CALIFORNIA

JOHN W. SIBLEY, ACTING DIRECTOR

PLANS FOR CONSTRUCTION OF

BREA CREEK CHANNEL

O.C.F.C.D. FACILITY NO. A02

FROM

RECORD DRAWING

250 FT. U/S OF COYOTE CREEK CHANNEL

TO

150 FT. D/S OF BEACH BLVD.

NOVEMBER 1996

FUNDED BY: ORANGE COUNTY FLOOD CONTROL DISTRICT

MAINTAINED BY: ORANGE COUNTY FLOOD CONTROL DISTRICT

INDEX OF SHEETS

UTILITY OWNER	PHONE NO.	CONTACT
1. SOUTHERN CALIFORNIA GAS CO.	(714) 634-3040	RONALD E. REED
2. SOUTHERN CALIFORNIA EDISON CO.	(714) 934-0846	A. J. APARICIO
3. COMCAST CABLE	(714) 582-7655	MIKE BOUNDS
4. CITY OF BUENA PARK (WATER & SEWER)	(714) 562-3685	NABIL HENEIN
5. COUNTY SANITATION DIST. OF O.C.	(714) 962-2411 X5052	CHUCK WINSOR
6. UNDER GROUND SERVICE ALERT (U.S.A.)	(800) 422-4133	

BENCH MARK: 404 – 23 – 86

206 FT. SOUTHEASTERLY ALONG THE ATCHISON TOPEKA AND SANTA FE RAILWAY FROM ITS INTERSECTION WITH THE CENTERLINE PROLONGATION TO THE NORTH OF STANTON STREET.

ADJ. 1976 ELEV. 86.493'

BASIS OF BEARINGS:

THE BASIS OF BEARINGS SHOWN HEREON ARE BASED ON THE BEARING BETWEEN O.C.S. HORIZONTAL CONTROL STATIONS G.P.S. NO. 3580 AND G.P.S. NO. 3579, BEING N 00°29'15" E PER RECORDS ON FILE IN THE OFFICE OF THE ORANGE COUNTY SURVEYOR. SAID BEARING IS ALSO THE BEARING OF THE CENTERLINE OF WESTERN AVE.

CITY OF BUENA PARK

APPROVED: Donald L. Jensen CITY ENGINEER 10/8/96 DATE

EMA – PUBLIC WORKS

SUBMITTED: Hany S. Henein for FLOOD CONTROL DIVISION MANAGER 10/8/96 DATE

REGISTERED PROFESSIONAL ENGINEER Hany S. Henein 33090 Exp. 6-30-98 CIVIL STATE OF CALIFORNIA

RECOMMENDED: James A. Miller ACTING DESIGN DIVISION MANAGER 10-3-96 DATE

REGISTERED PROFESSIONAL ENGINEER JAMES A MILLER No. 27177 Exp. 2-21-97 CIVIL STATE OF CALIFORNIA

APPROVED: W. L. Jam DIRECTOR OF PUBLIC WORKS 10-15-96 DATE

RECORD DRAWINGS

CONTRACTOR : BEL CZAK
INSPECTOR : GEORGE ZAUN
RESIDENT ENGINEER : HERNAN PELAEZ
START DATE : NO DATE
COMPLETION DATE : 09-05-1997

AGREEMENTS

CITY OF BUENA PARK AGREEMENT NO. D96-124

COUNTY SANITATION DIST. OF O.C. AGREEMENT NO. D96-125

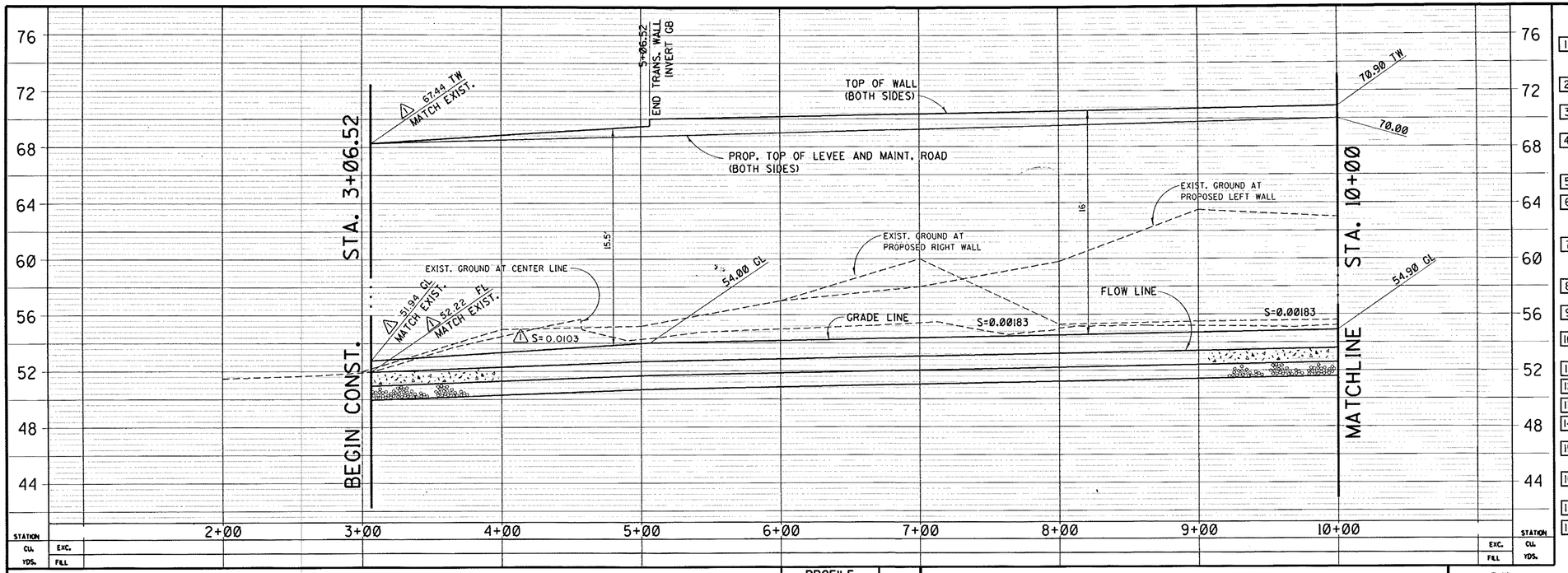
NO.	DESCRIPTION	SHT.	APPROVED	DATE

REVISIONS

W. O. NO. EF07169
DWG. NO. A02-101-5R

SHEET 1 OF 26

2 of 26



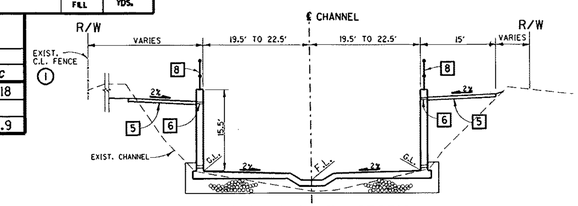
CONSTRUCTION NOTES

1. CONSTRUCT R.C. RECT. CHANNEL PER PLAN, PROFILE, TYPICAL SECTION ON SHEETS 2, 3, 4, 5, 6 AND STRUCTURAL DETAILS ON SHEET 7.
2. CONSTRUCT R.C. TRANSITION WALL PER PLAN, PROFILE AND DETAILS ON SHEET 8.
3. CONSTRUCT R.C. ACCESS RAMP PER PLAN, TYPICAL SECTION AND DETAILS ON SHEETS 9, 10 & 11.
4. CONSTRUCT JUNCTION STRUCTURE TYPE V MODIFIED WITH FLAP GATE PER PLAN, PROFILE, DETAIL SHEET 13 AND OCEMA STD. PLAN 1314.
5. CONSTRUCT 6" UNTREATED BASE MAINTENANCE ROAD.
6. CONSTRUCT 4" DIA. SCUPPER DRAIN 50' O.C. (AS NEEDED) ON CHANNEL WALL PER TYPICAL SECTION AND DETAIL SHEET 13.
7. CONSTRUCT 6' C.L. FENCE AND/OR GATE PER PLAN ON SHEETS 2, 3, 4, 5 & 6 AND OCEMA STD. PLAN 600-0-0C AND DETAIL SHEET 8.
8. CONSTRUCT 3.5' GUARD CABLE FENCE PER OCEMA STD. PLAN 1413.
9. CONSTRUCT R.C. CUTOFF WALL PER PLAN, PROFILE ON SHEET 6 AND DETAILS ON SHEET 8.
10. REMOVE EXISTING TRANSITION WALLS AND INVERT PER PLAN.
11. REMOVE EXISTING CHANNEL LINING.
12. REMOVE AND SALVAGE EXISTING RIPRAP.
13. GRADE TO DRAIN.
14. FURNISH AND PLACE PROJECT INFORMATION SIGN PER OCEMA STD. PLAN 1418.
15. CONSTRUCT DRIVEWAY APPROACH PER PLAN AND DETAIL SHEET 8 WITH W=14', X=2.5' AND OCEMA STD. PLAN 1209.
16. CONSTRUCT TRANSVERSE EXPANSION JOINT PER OCEMA STD. PLAN 1318.
17. CONSTRUCT 6" P.C.C. LANDING PER DETAIL SHEET 8.
18. CONSTRUCT 3" AIR PLACED CONCRETE SLOPE PROTECTION WITH 6"X6" WI.4 W.W.M.

PROFILE
HORIZ. 1"= 40'
VERT. 1"= 4'

HYDRAULIC DATA

Station to Station	Q	Section b	Section z	S	n=0.015 Dn	n=0.015 Vn	F	n=0.015 Dc	n=0.015 Vc
0+00 - 3+06.52	8069	39	0	.0045	9.18	22.53	1.31	11.0	18.18
3+06.52 - 5+06.52	8023	39-45	0	.0103	TRANSITION				
5+06.52 - 10+00	8023	45	0	.00183	11.06	16.12	0.85	9.96	17.9



TYPICAL CHANNEL SECTION
FROM STA. 3+06.52 TO STA. 5+06.52
N.T.S.

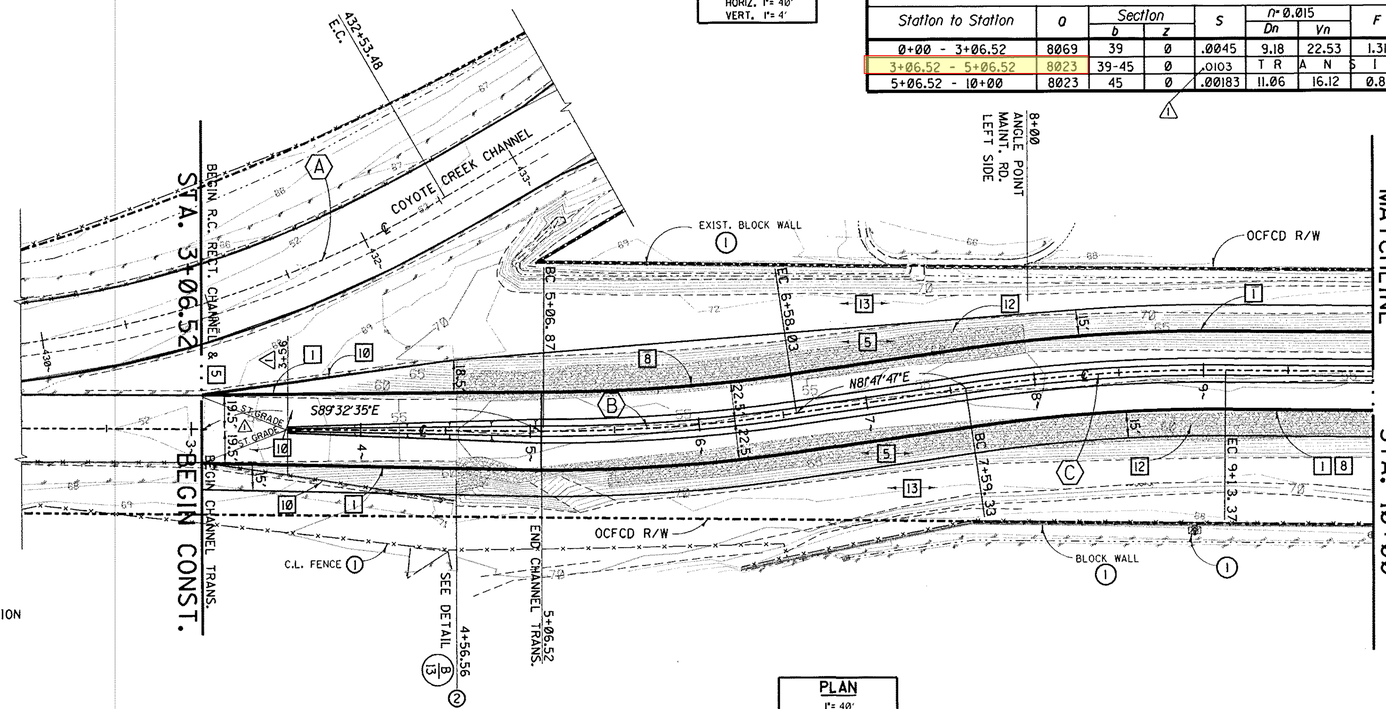
TYPICAL CHANNEL SECTION
FROM STA. 5+06.52 TO STA. 10+00
N.T.S.

CURVE DATA

- (A) Δ=13°31'21" R=1500.00' L=354.02'
- (B) Δ=08°39'38" R=1000.00' L=151.16'
- (C) Δ=08°49'32" R=1000.00' L=154.04'

LEGEND

1. PROTECT IN PLACE
2. REMOVE
3. REMOVE INTERFERING PORTION
4. RELOCATE BY OTHERS
5. RELOCATE
6. REMOVE AND SALVAGE



PLAN
1"= 40'

RECORD DRAWING

MARK	DATE	DESCRIPTION
1	6-98	RECORD DRAWINGS

PREPARED UNDER THE SUPERVISION OF
REGISTERED CIVIL ENGINEER
Henry S. Henein
33090
Exp. 6-30-98
STATE OF CALIFORNIA
10-3-96
DATE

ORANGE COUNTY ENVIRONMENTAL MANAGEMENT AGENCY

BREA CREEK CHANNEL (A02)

PLAN AND PROFILE

STA. 3+06.52 TO STA. 10+00.00

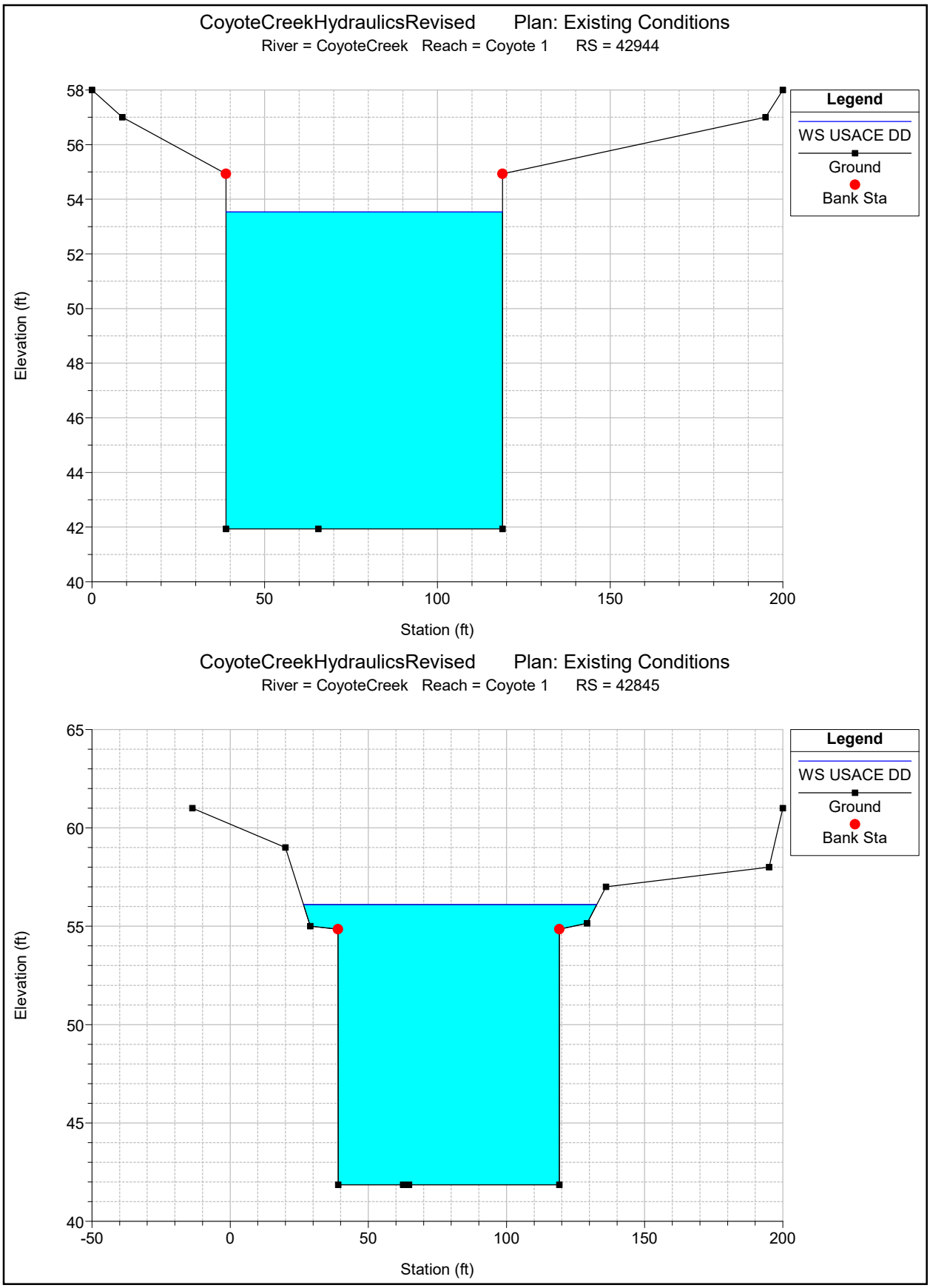
DESIGNED MOUHSEN HABIB
DRAWN THUY GUTIERREZ CHECKED H. HENEIN

SCALE	DATE	DRAWING NO.	SHEET
AS SHOWN	NOV. 96	A02-101-5R	2 OF 26

A02-101-5R

tg168/a02beach.pp/a02beach.ipt

Appendix C
Existing Conditions
Cross Sections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River = CoyoteCreek Reach = Coyote 1 RS = 42944
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
58
56
54
52
50
48
46
44
42
40
0
50
100
150
200
CoyoteCreekHydraulicsRevised Plan: Existing Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42845
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
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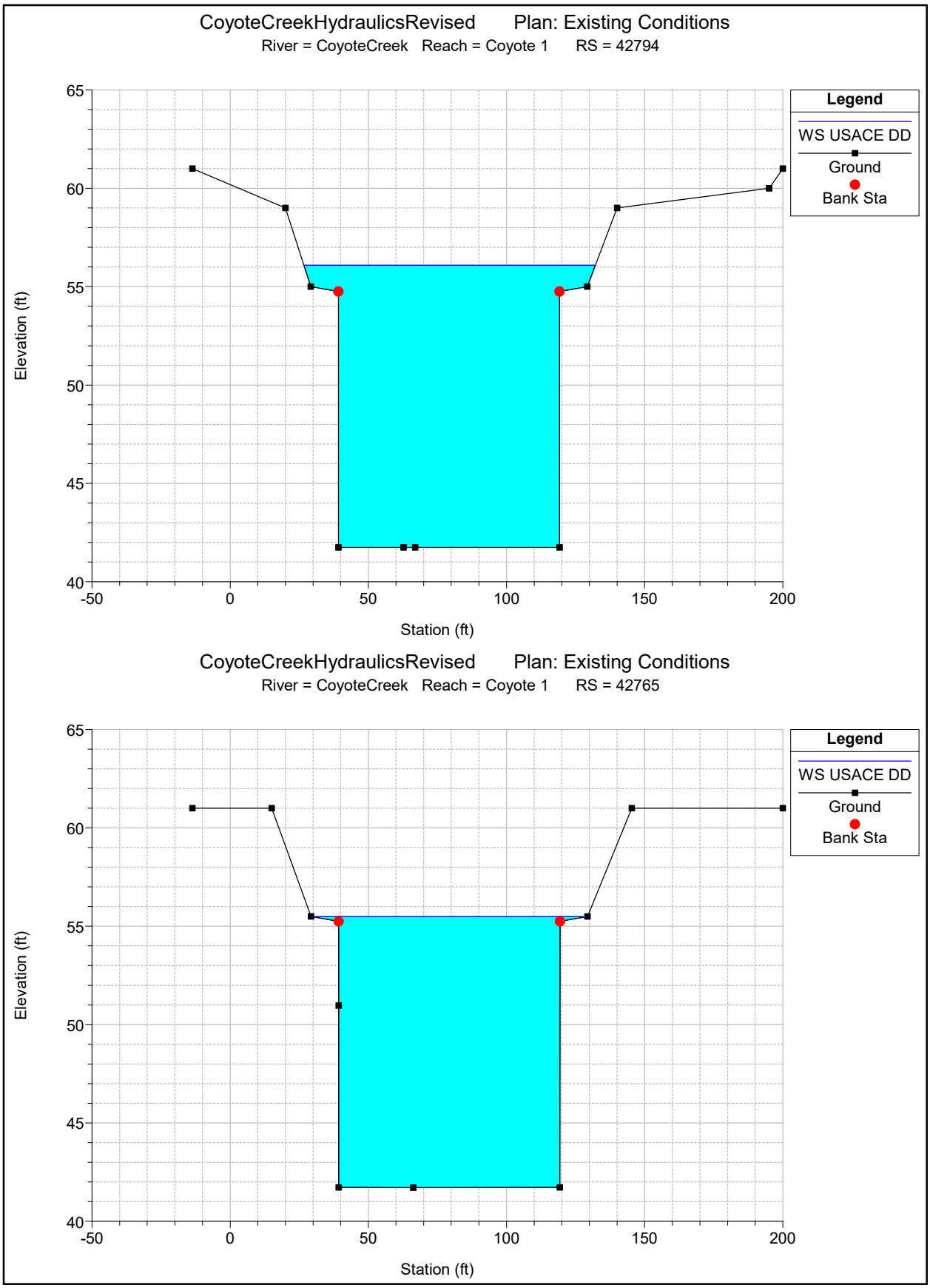
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River = CoyoteCreek Reach = Coyote 1 RS = 42794
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Ground
Bank Sta
Elevation (ft)
Station (ft)
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60
55
50
45
40
-50
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50
100
150
200
CoyoteCreekHydraulicsRevised Plan: Existing Conditions
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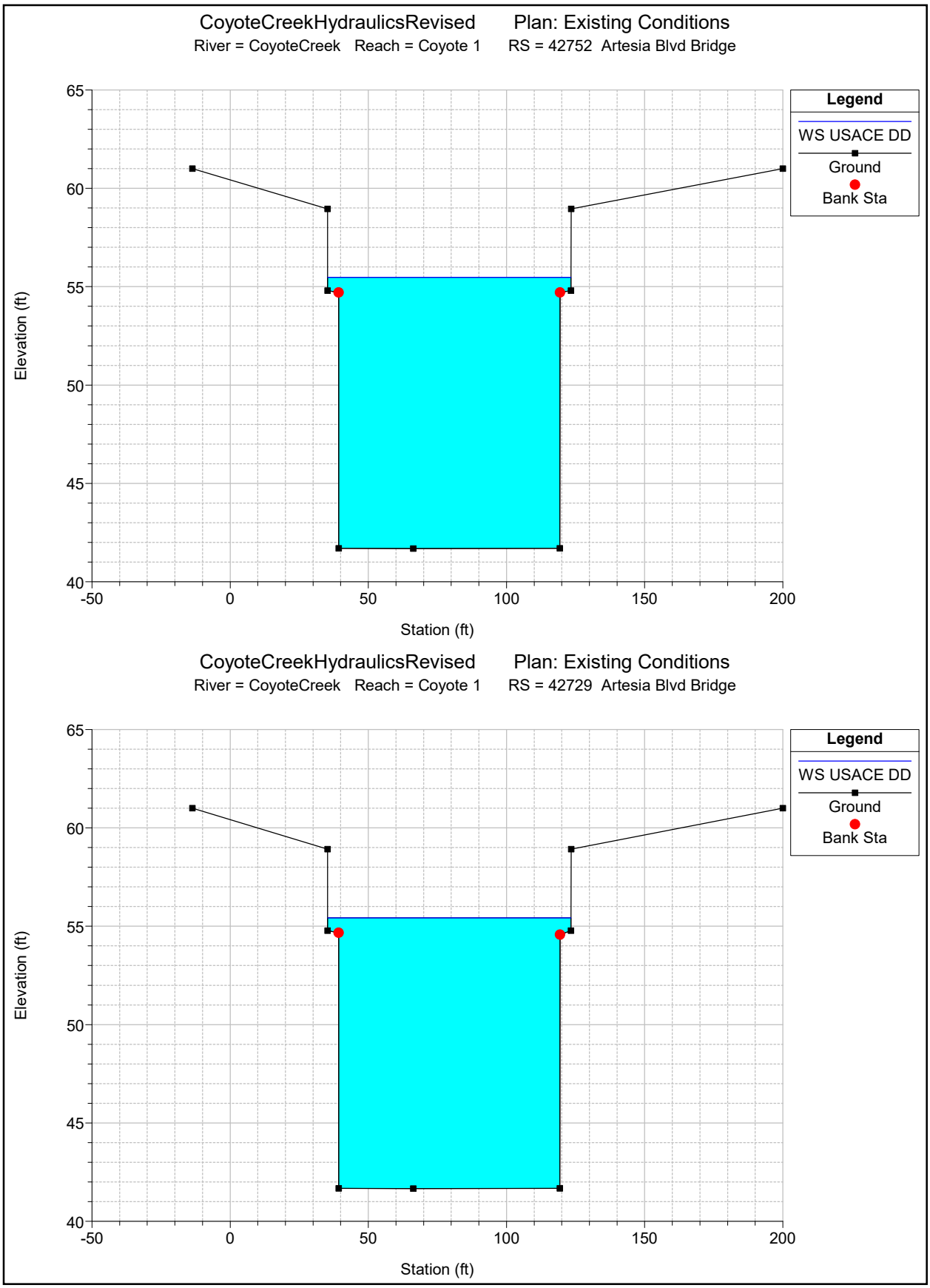
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)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River = CoyoteCreek Reach = Coyote 1 RS = 42752 Artesia Blvd Bridge
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Ground
Bank Sta
Elevation (ft)
Station (ft)
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50
45
40
-50
0
50
100
150
200
CoyoteCreekHydraulicsRevised Plan: Existing Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42729 Artesia Blvd Bridge
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)

CoyoteCreekHydraulicsRevised Plan: Existing Conditions
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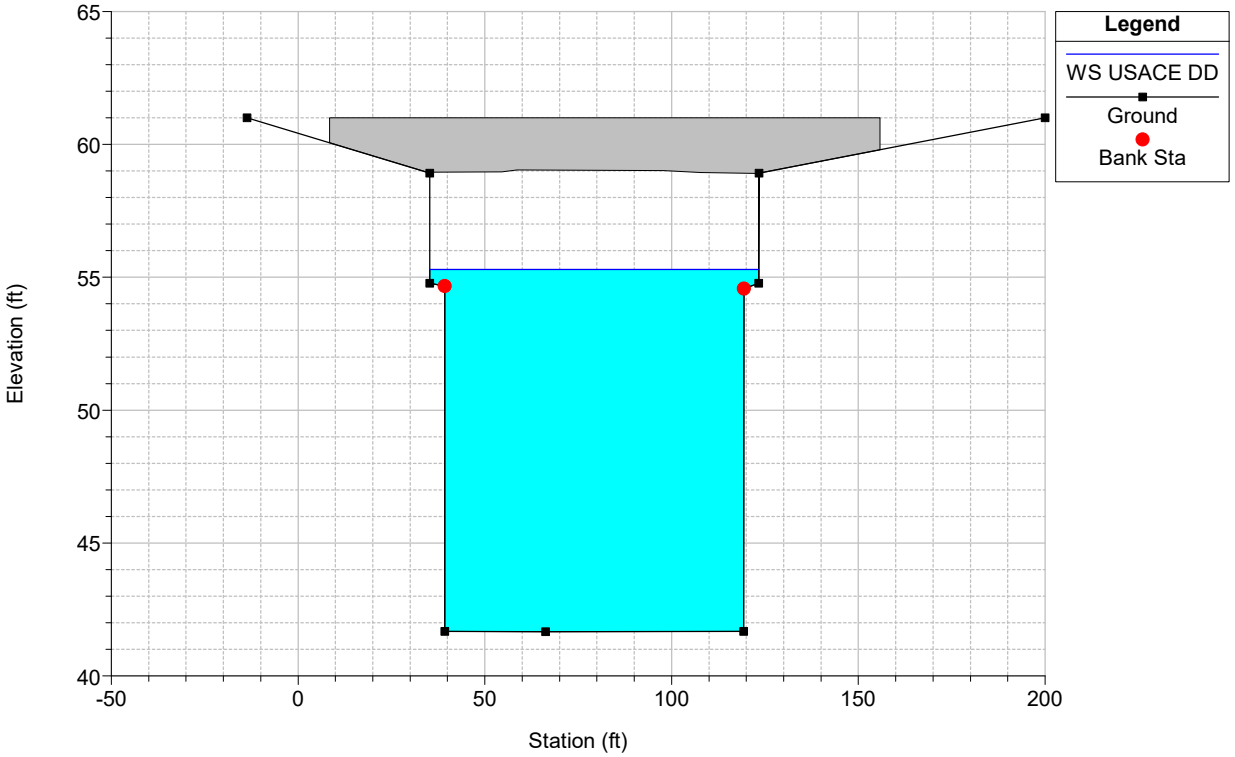

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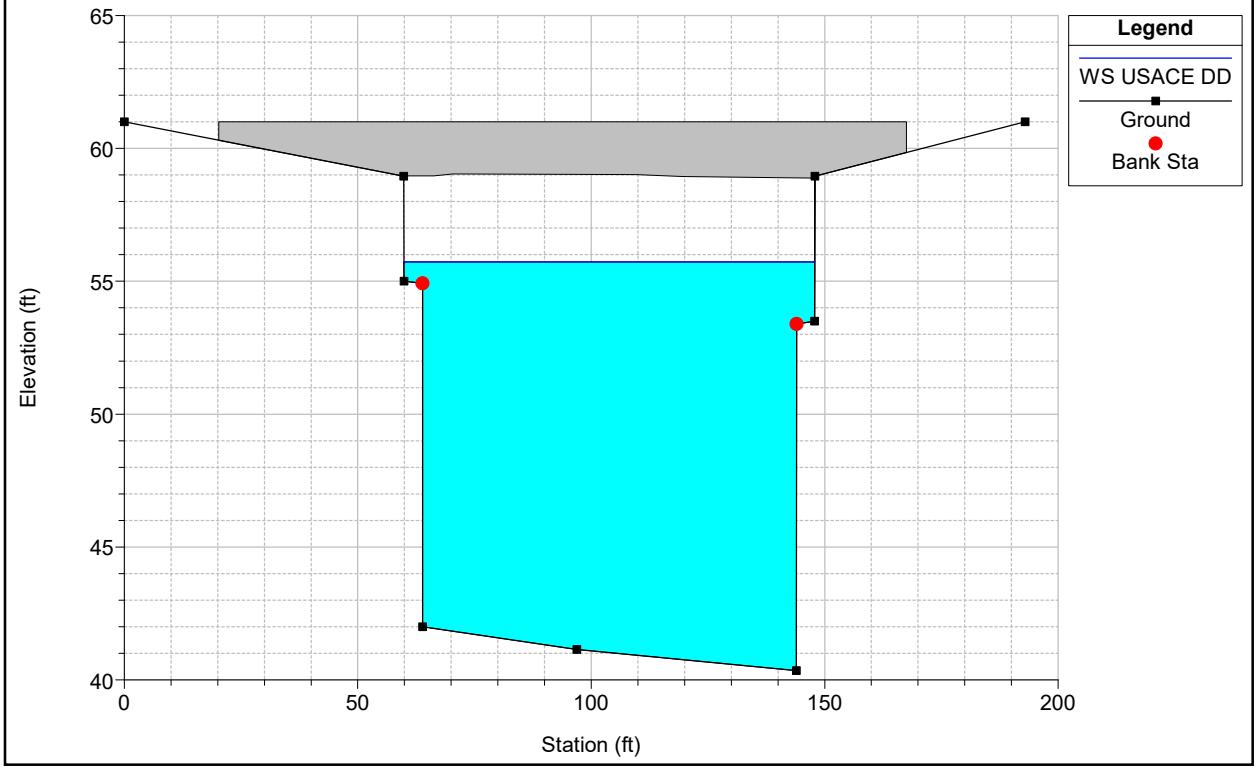

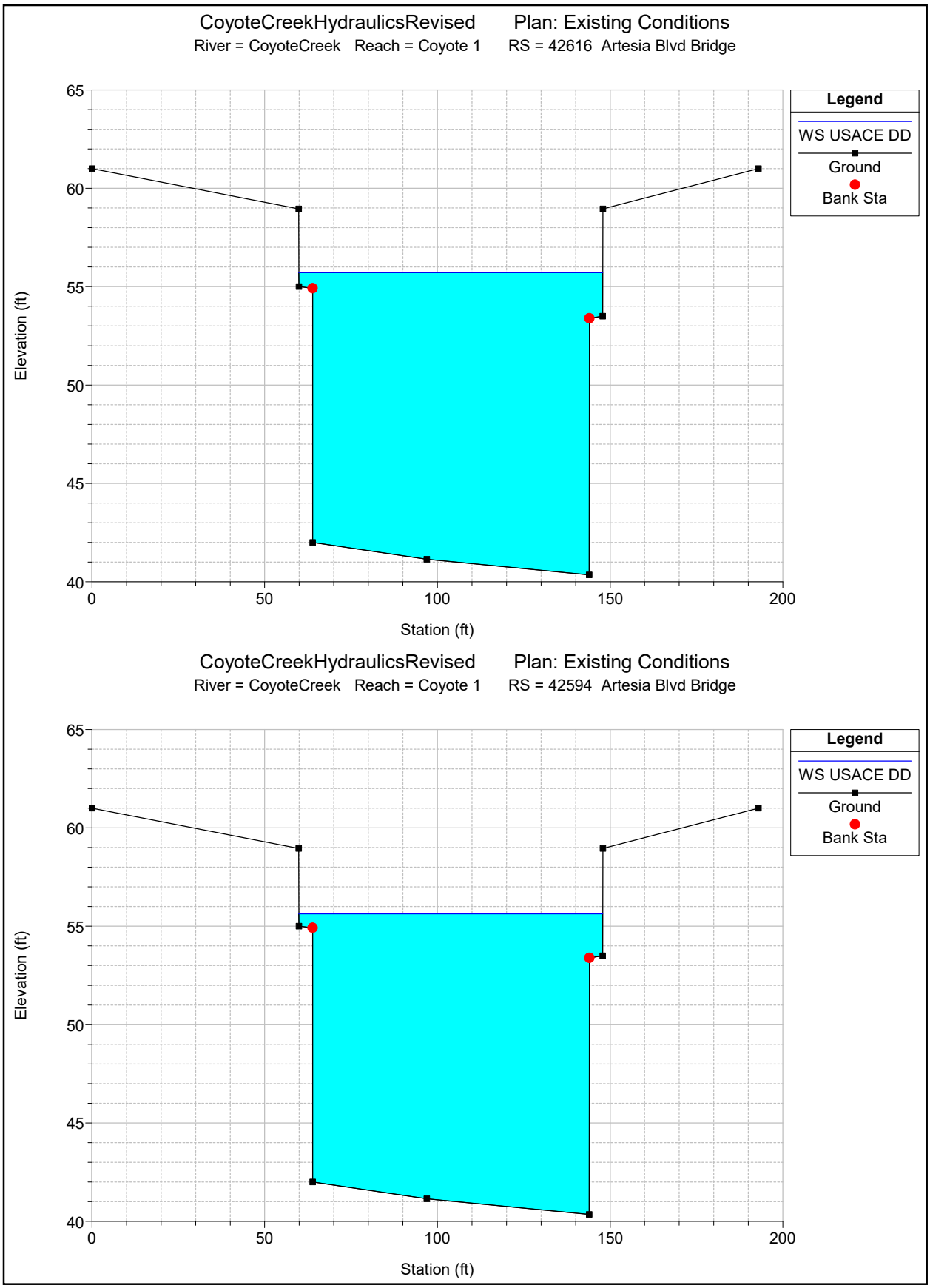
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Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
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60
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CoyoteCreekHydraulicsRevised Plan: Existing Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42594 Artesia Blvd Bridge
Legend
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Ground
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Station (ft)
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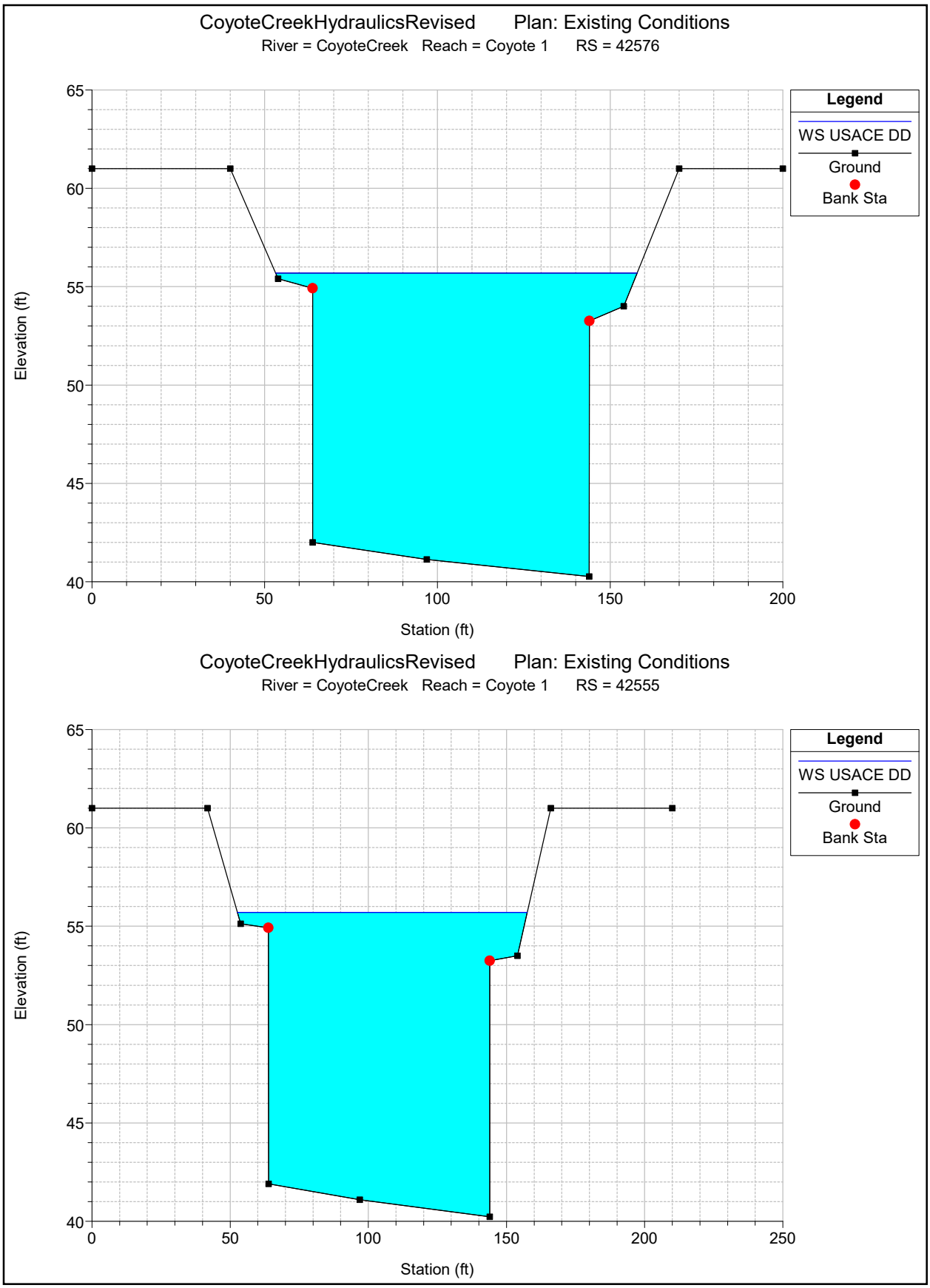
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Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
65
60
55
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45
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150
200
CoyoteCreekHydraulicsRevised Plan: Existing Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42555
Legend
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Ground
Bank Sta
Elevation (ft)
Station (ft)
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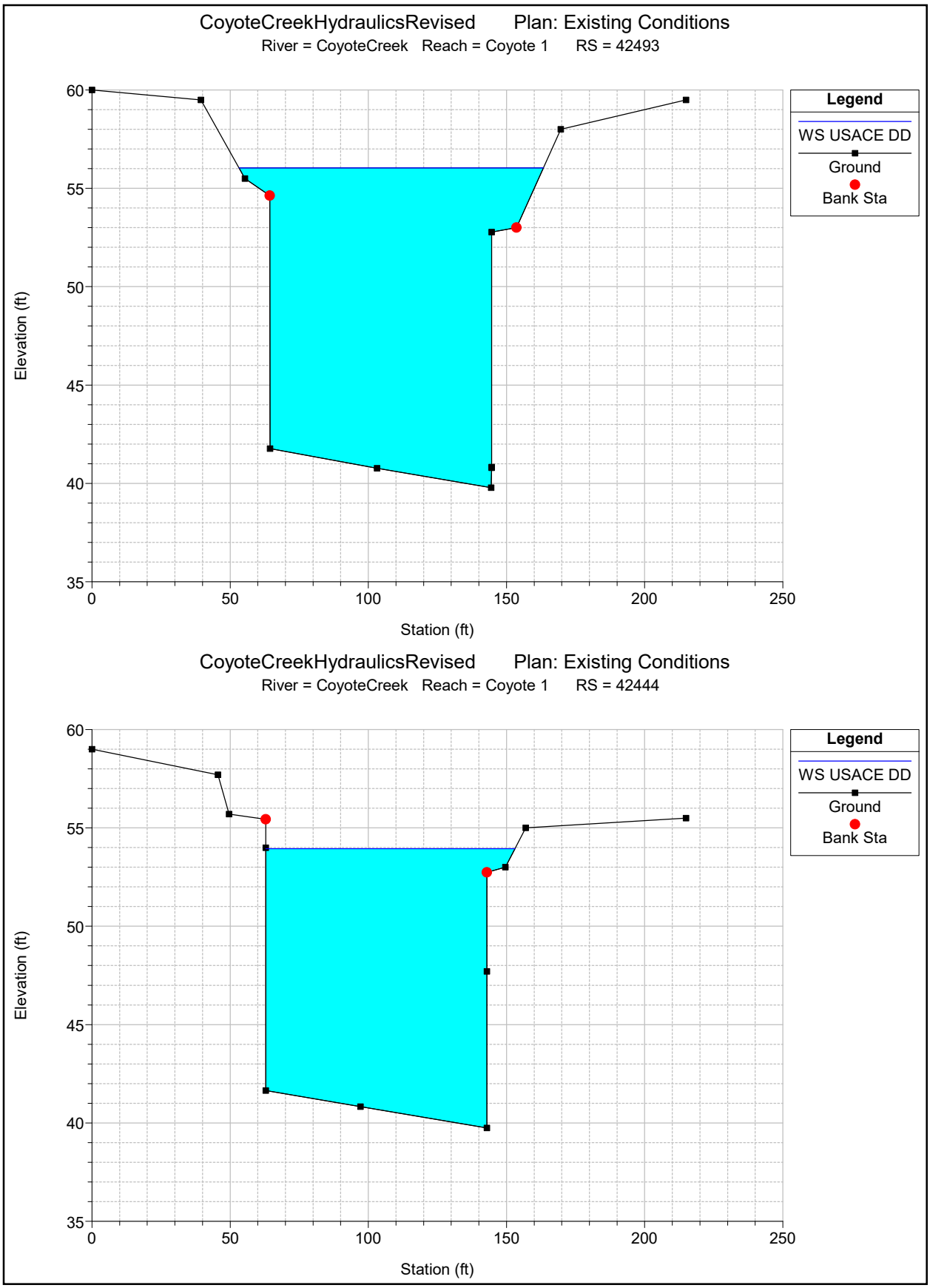
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Ground
Bank Sta
Elevation (ft)
Station (ft)
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55
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100
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200
250
CoyoteCreekHydraulicsRevised Plan: Existing Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42444
Legend
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Ground
Bank Sta
Elevation (ft)
Station (ft)
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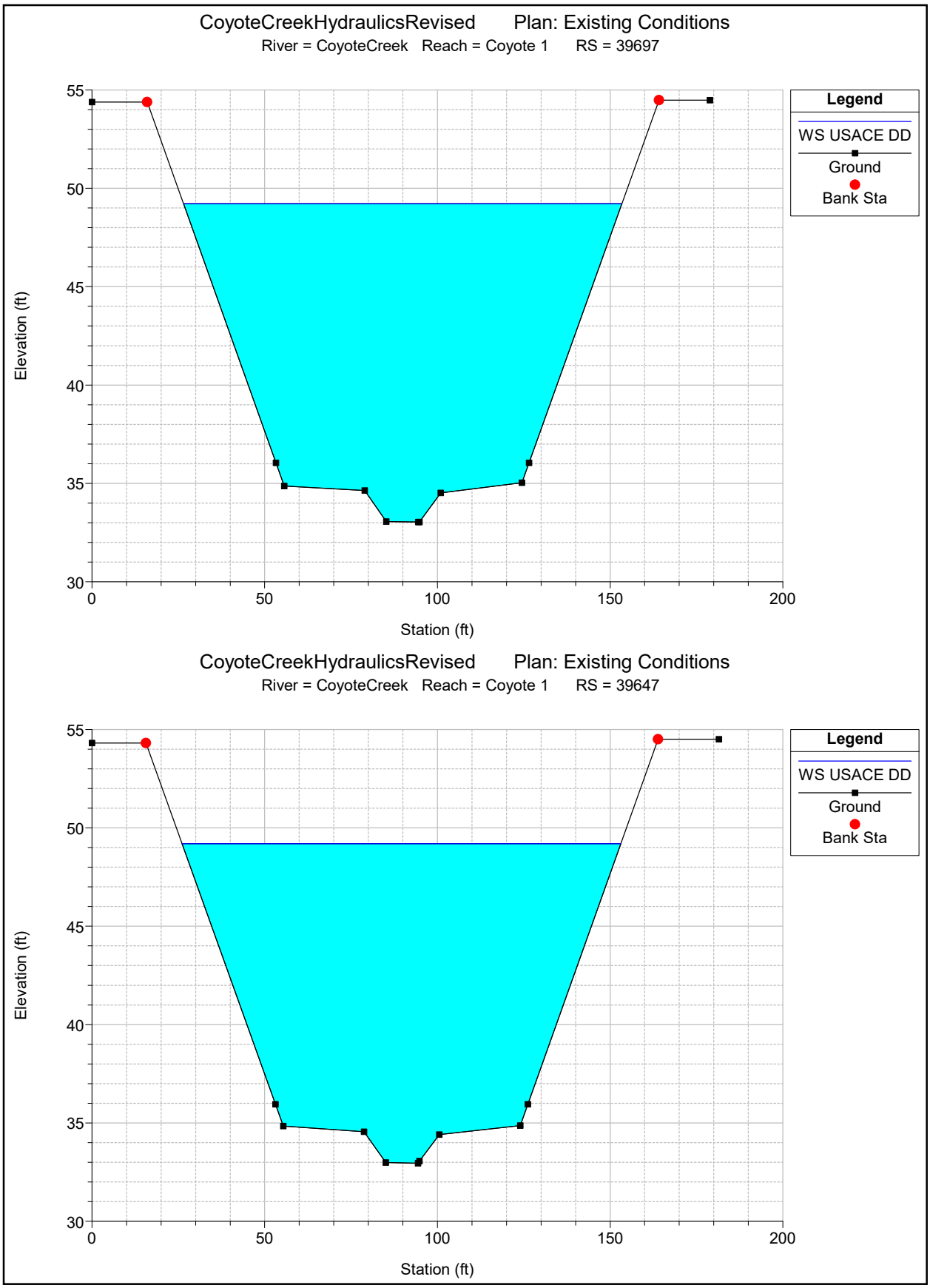
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Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
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CoyoteCreekHydraulicsRevised Plan: Existing Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39647
Legend
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Ground
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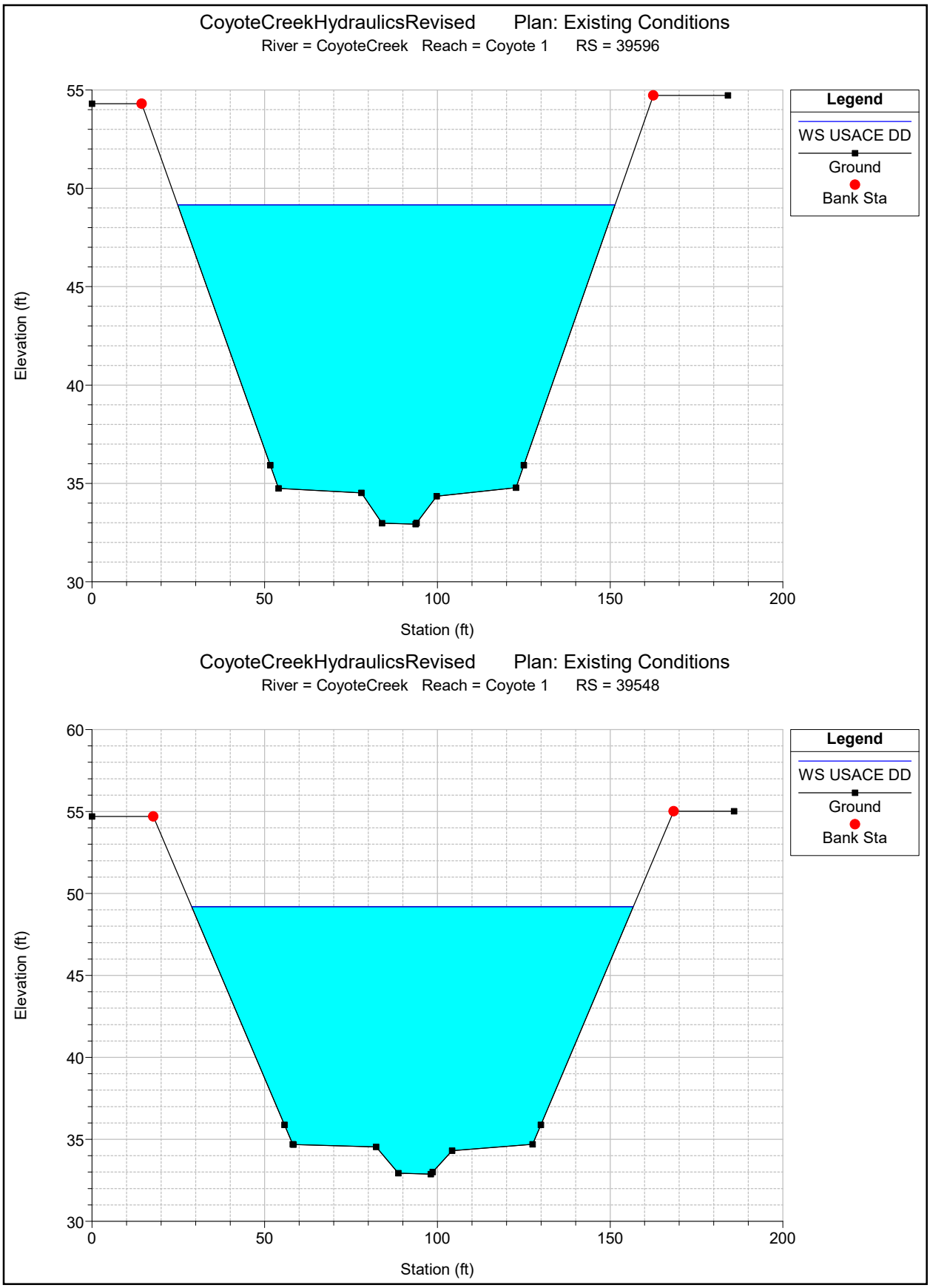
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River = CoyoteCreek Reach = Coyote 1 RS = 39596
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Ground
Bank Sta
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Station (ft)
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CoyoteCreekHydraulicsRevised Plan: Existing Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39548
Legend
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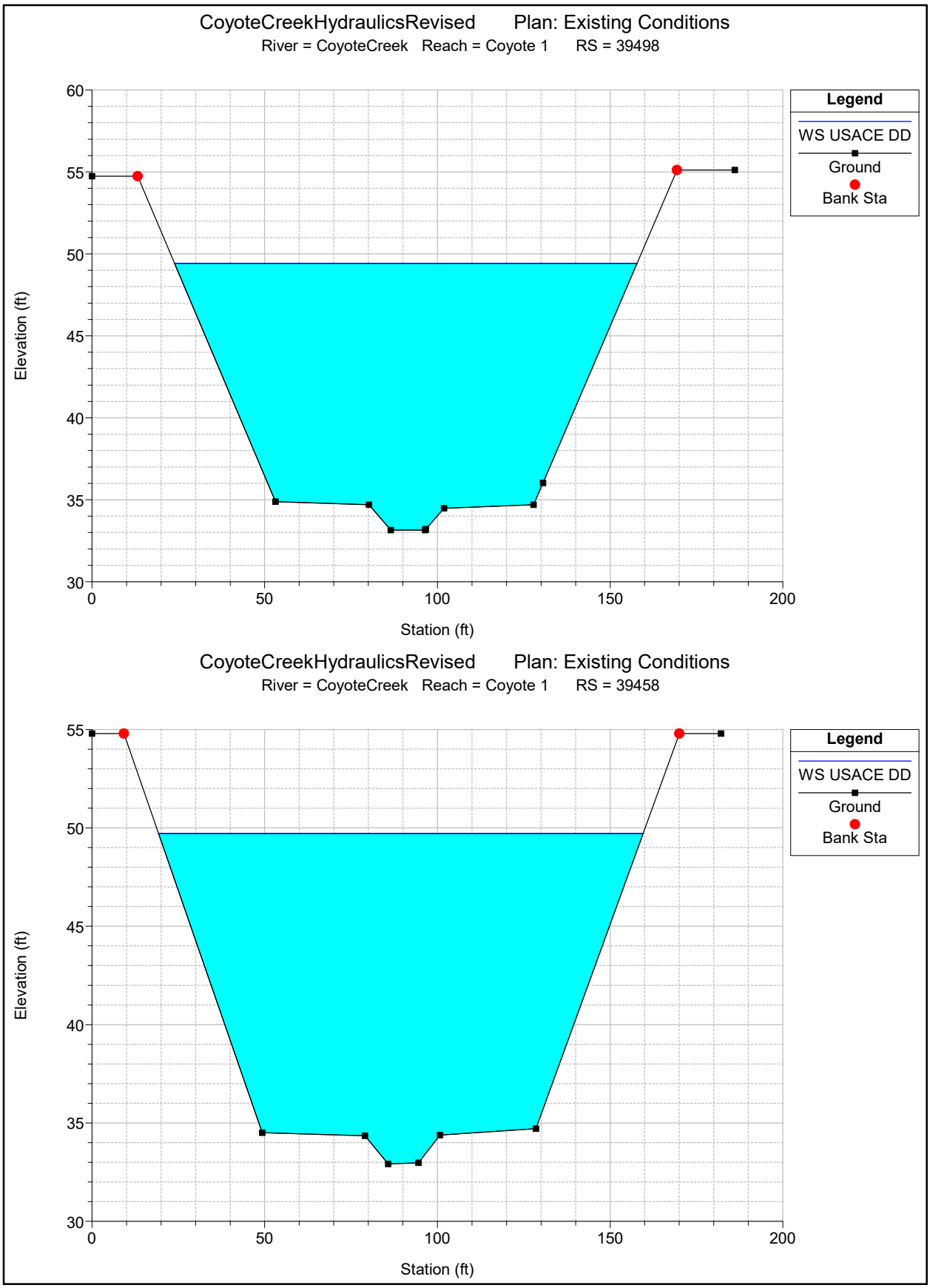
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Ground
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Elevation (ft)
Station (ft)
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Legend
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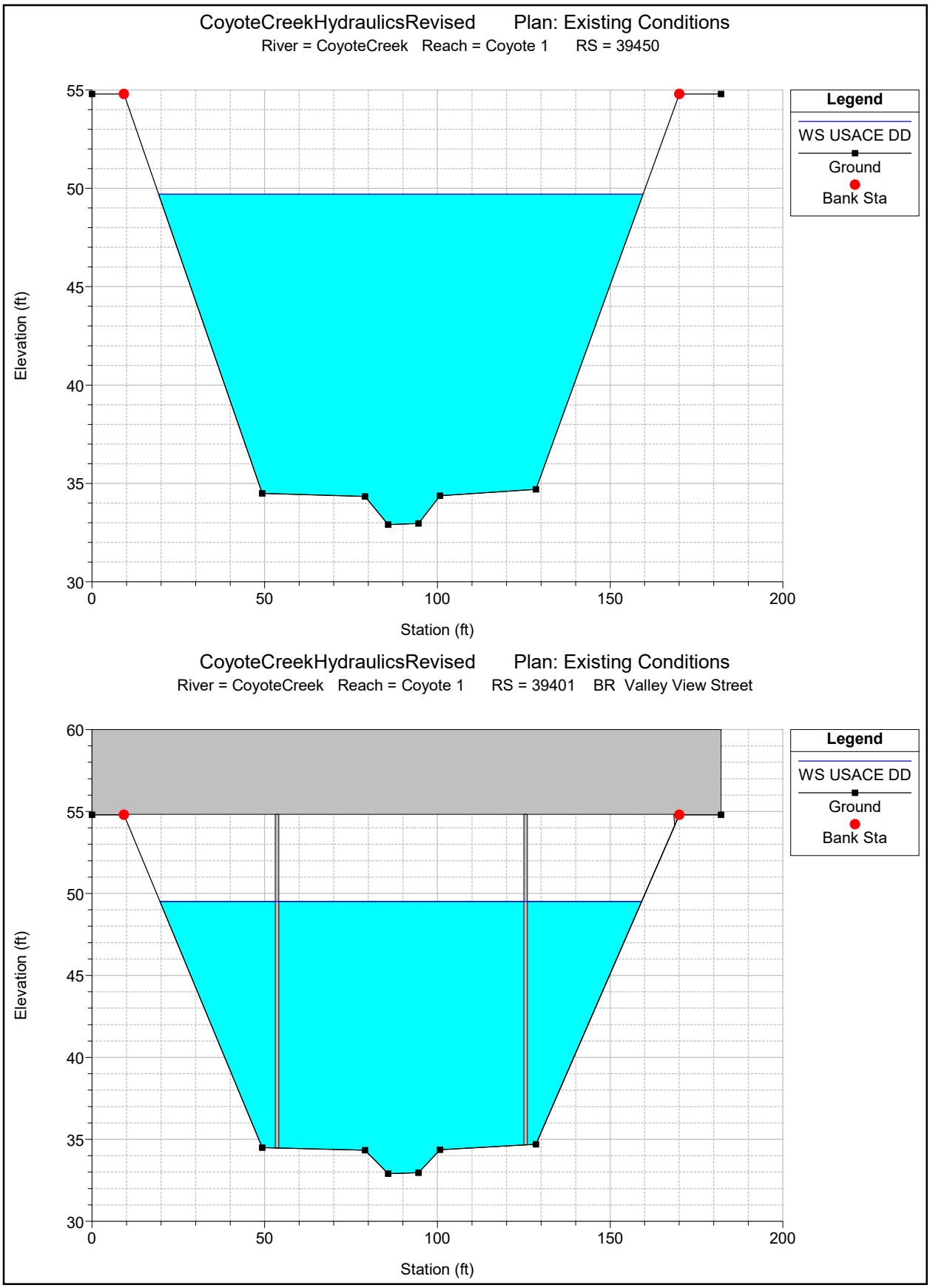
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Ground
Bank Sta
Elevation (ft)
Station (ft)
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River = CoyoteCreek Reach = Coyote 1 RS = 39401 BR Valley View Street
Legend
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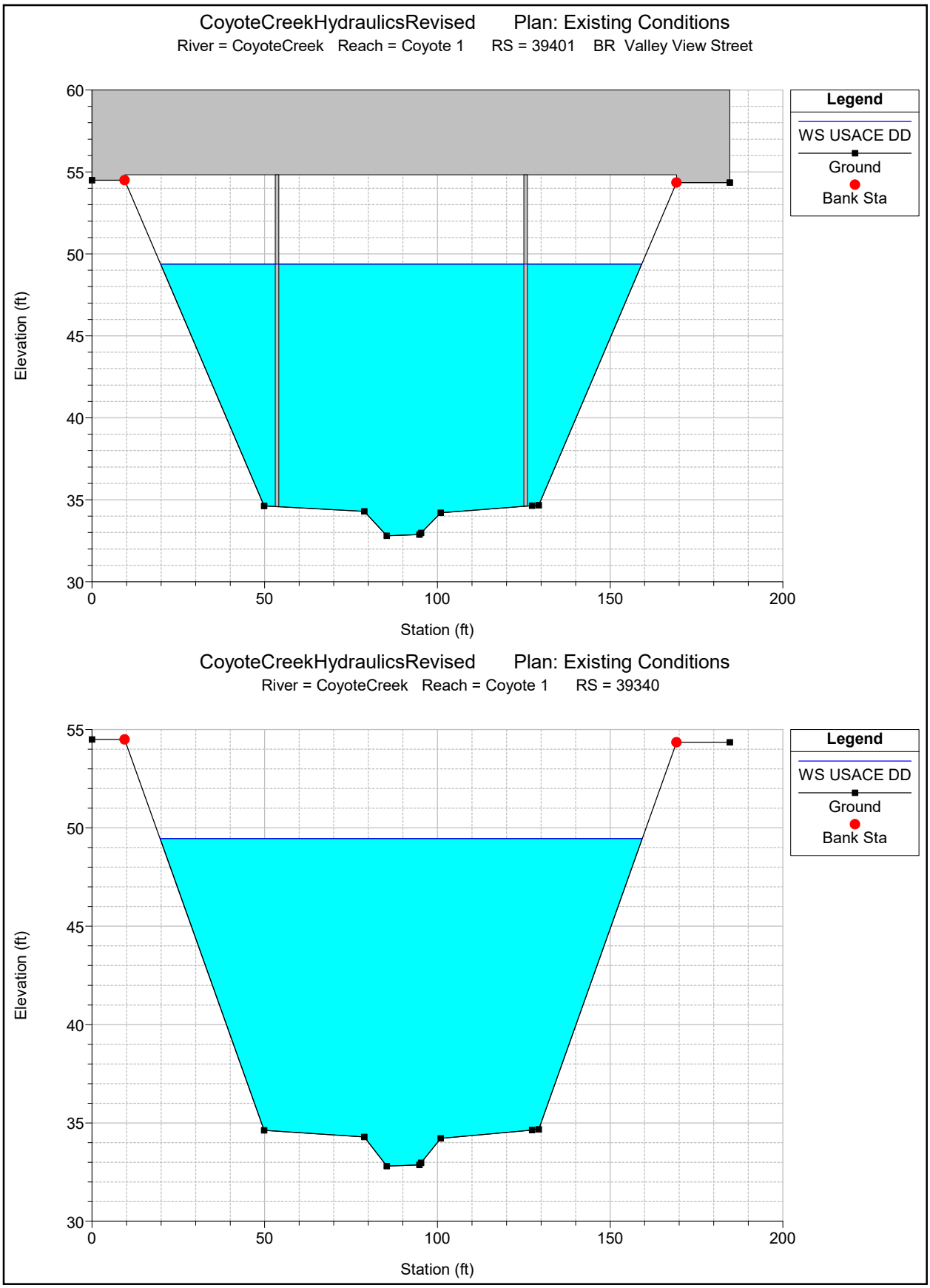
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Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
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River = CoyoteCreek Reach = Coyote 1 RS = 39340
Legend
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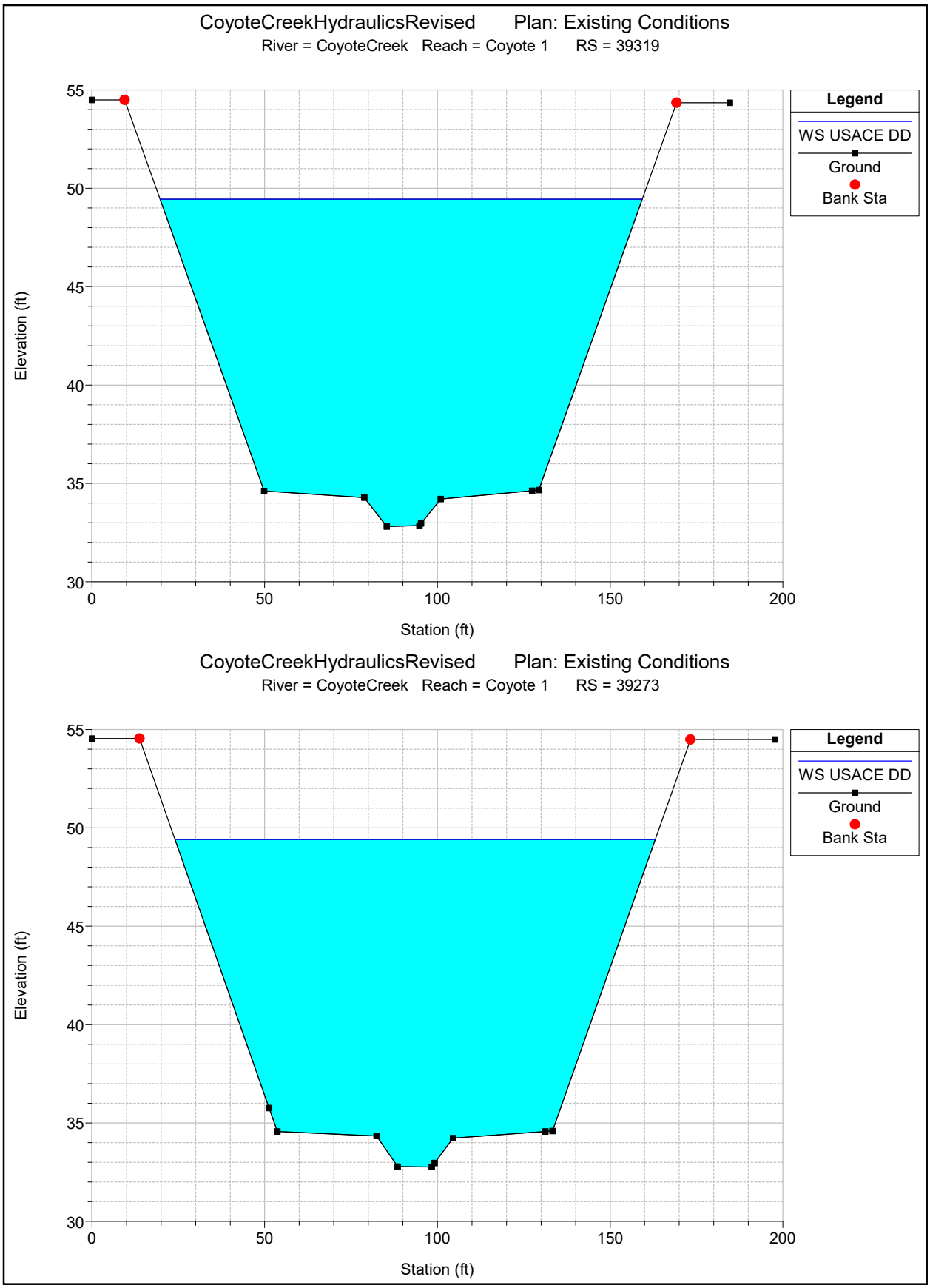
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Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
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CoyoteCreekHydraulicsRevised Plan: Existing Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39273
Legend
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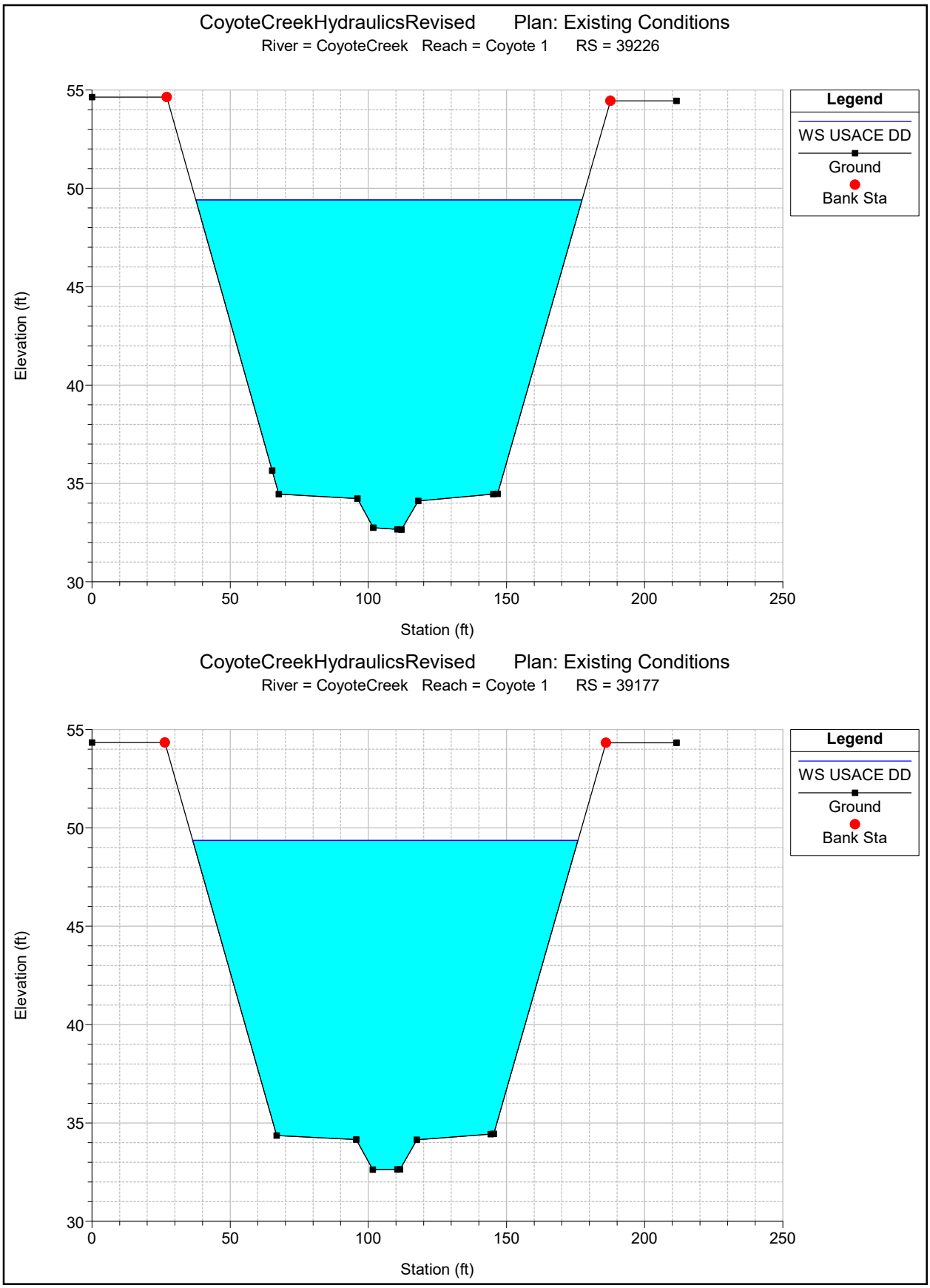
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Ground
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Station (ft)
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250
CoyoteCreekHydraulicsRevised Plan: Existing Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39177
Legend
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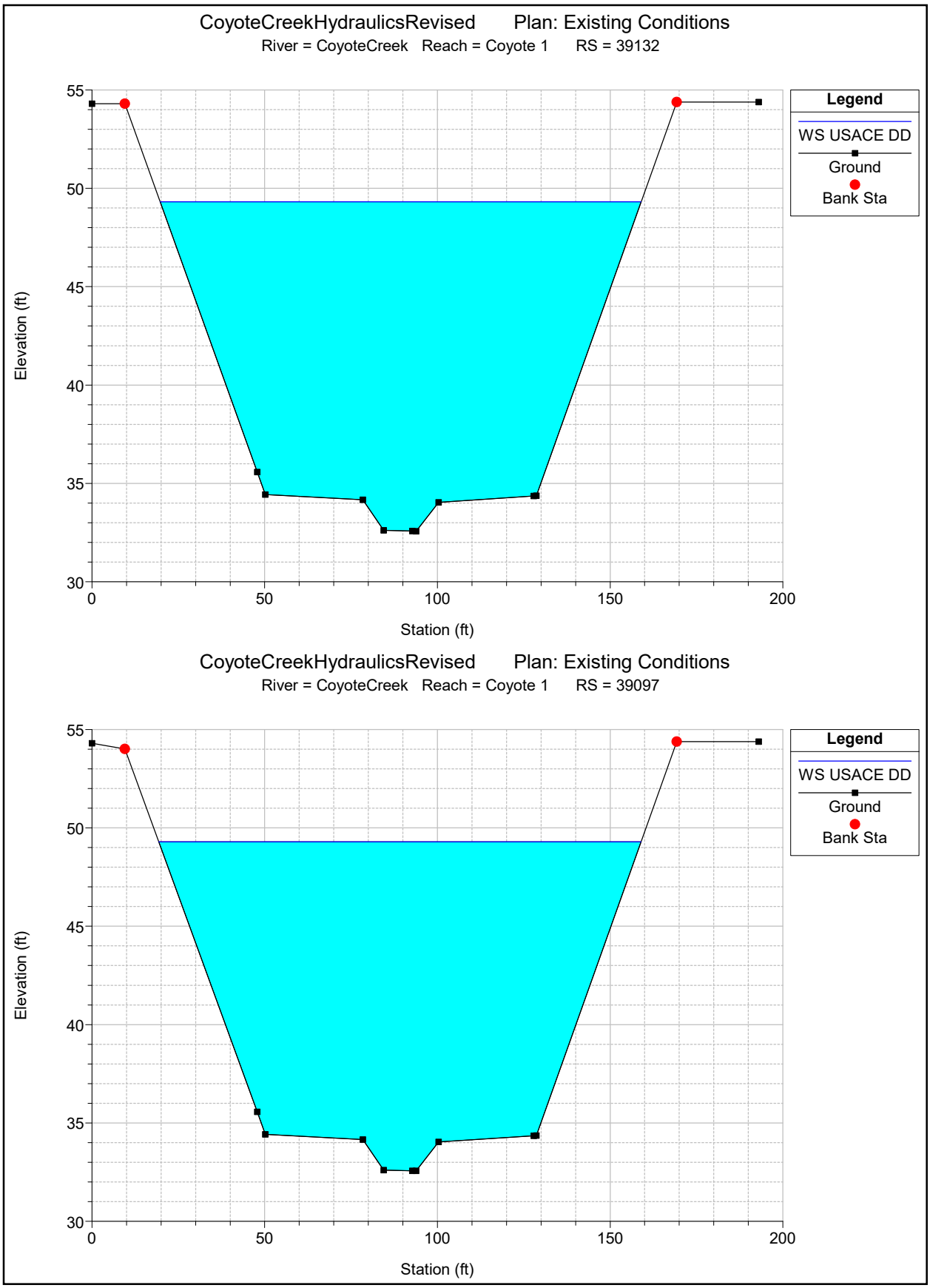
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Ground
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Elevation (ft)
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CoyoteCreekHydraulicsRevised Plan: Existing Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39097
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
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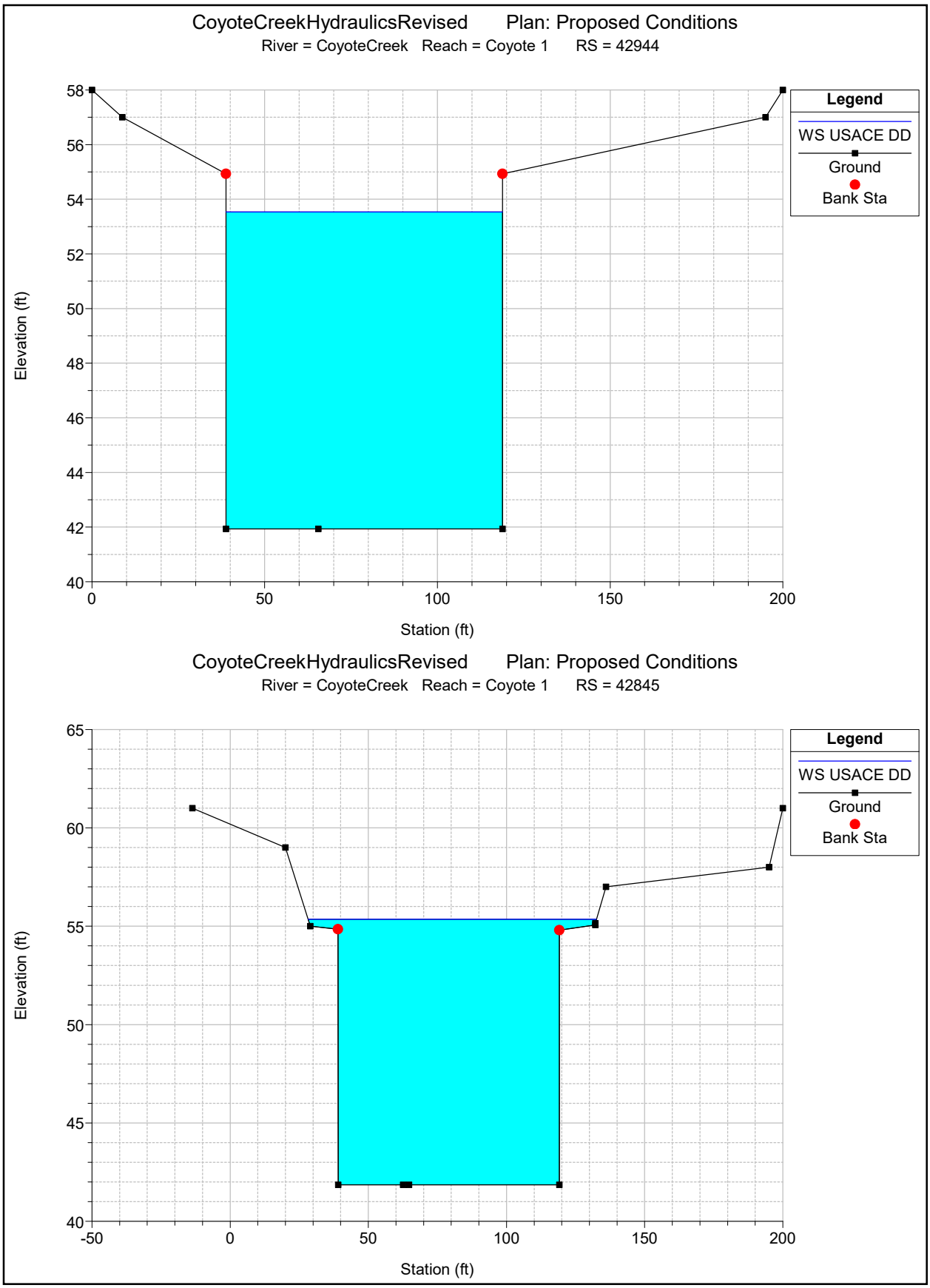
Appendix D
Proposed Conditions
Cross Sections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Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
58
56
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CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42845
Legend
WS USACE DD
Ground
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Station (ft)
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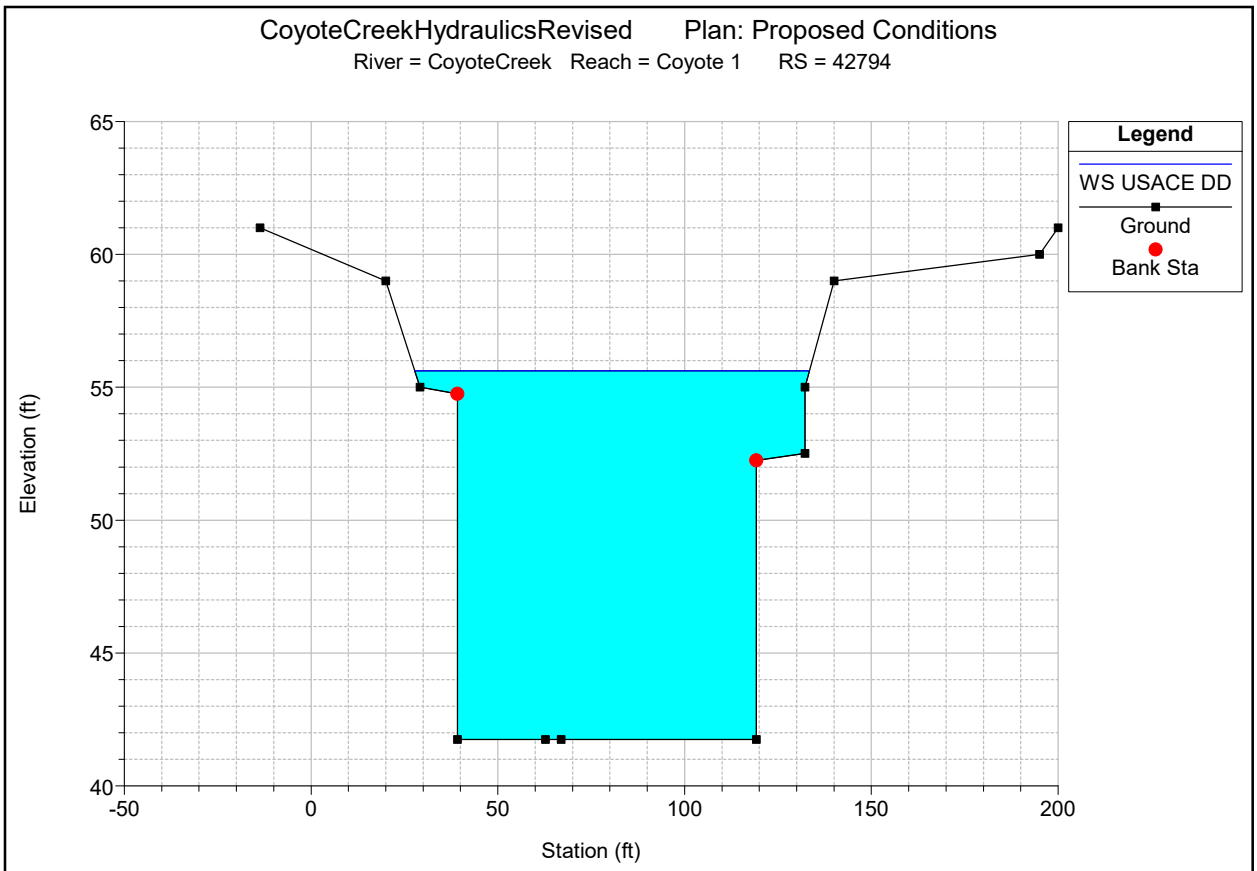
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Legend
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Station (ft)
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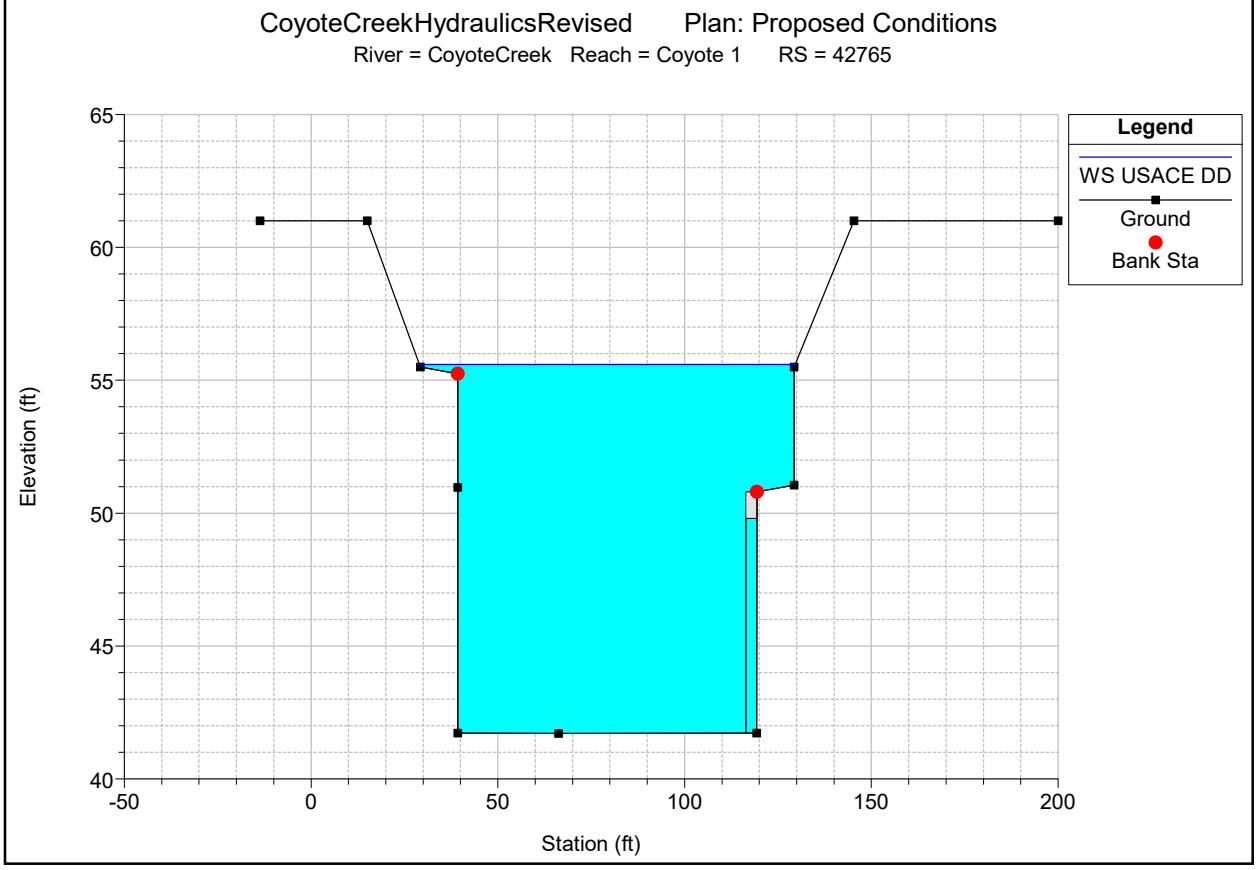
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River = CoyoteCreek Reach = Coyote 1 RS = 42765
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
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-50
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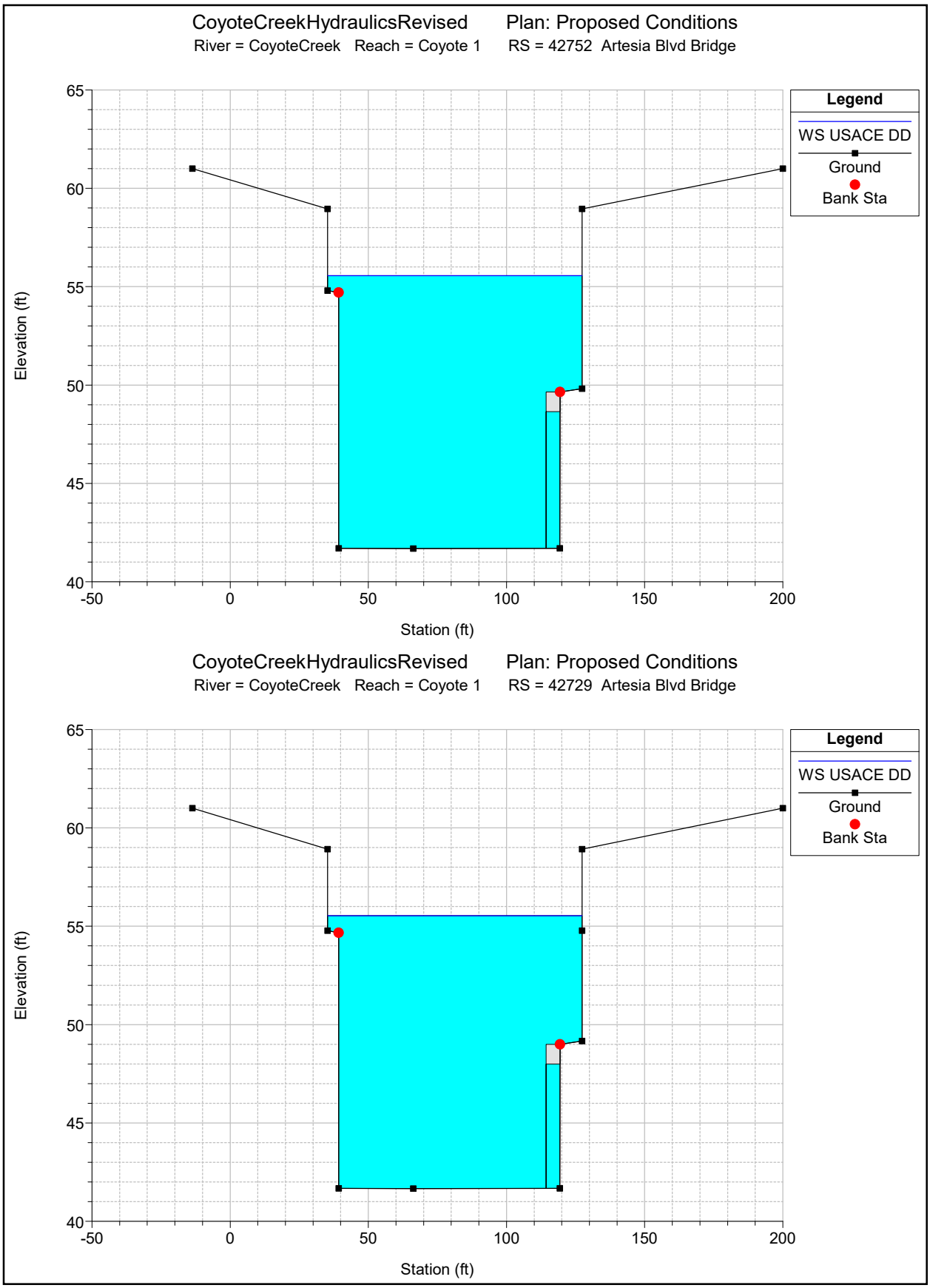
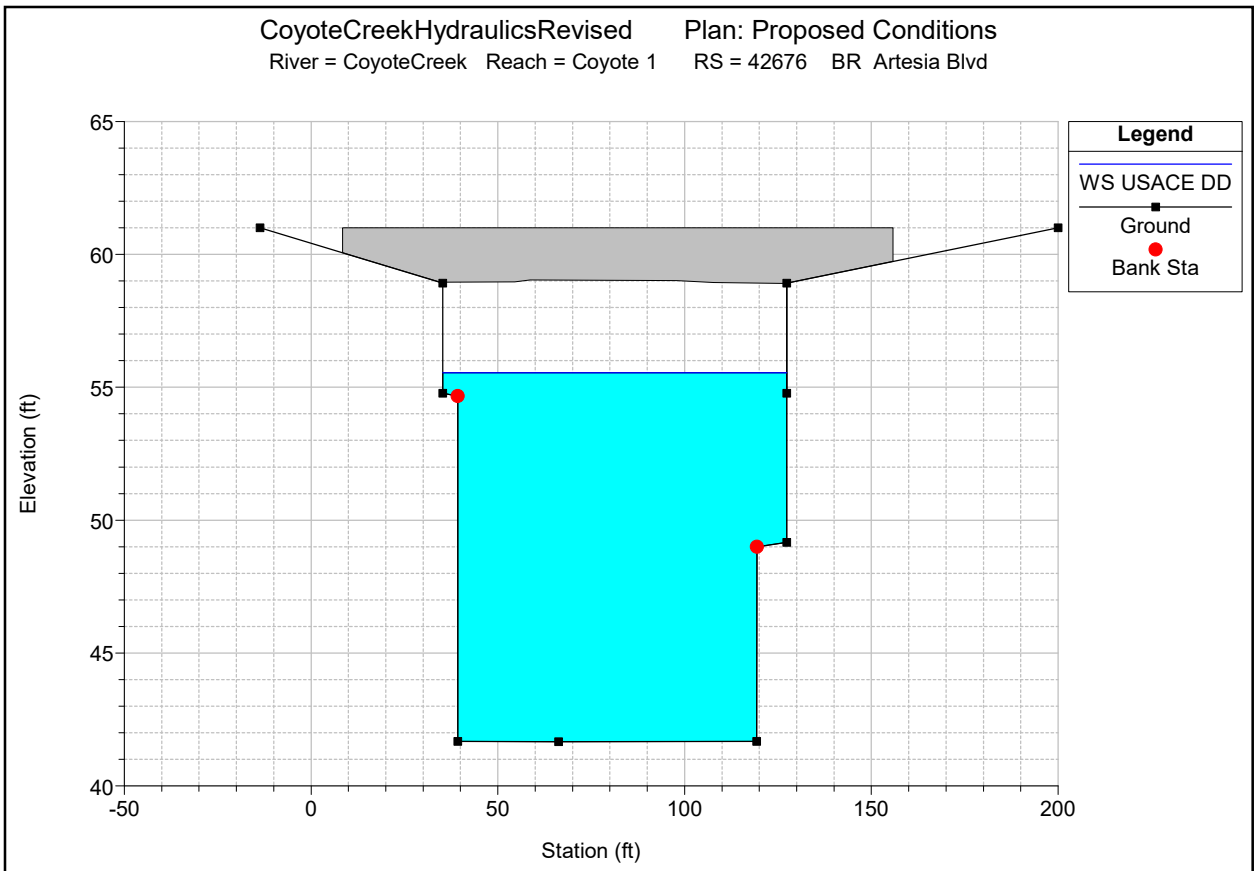
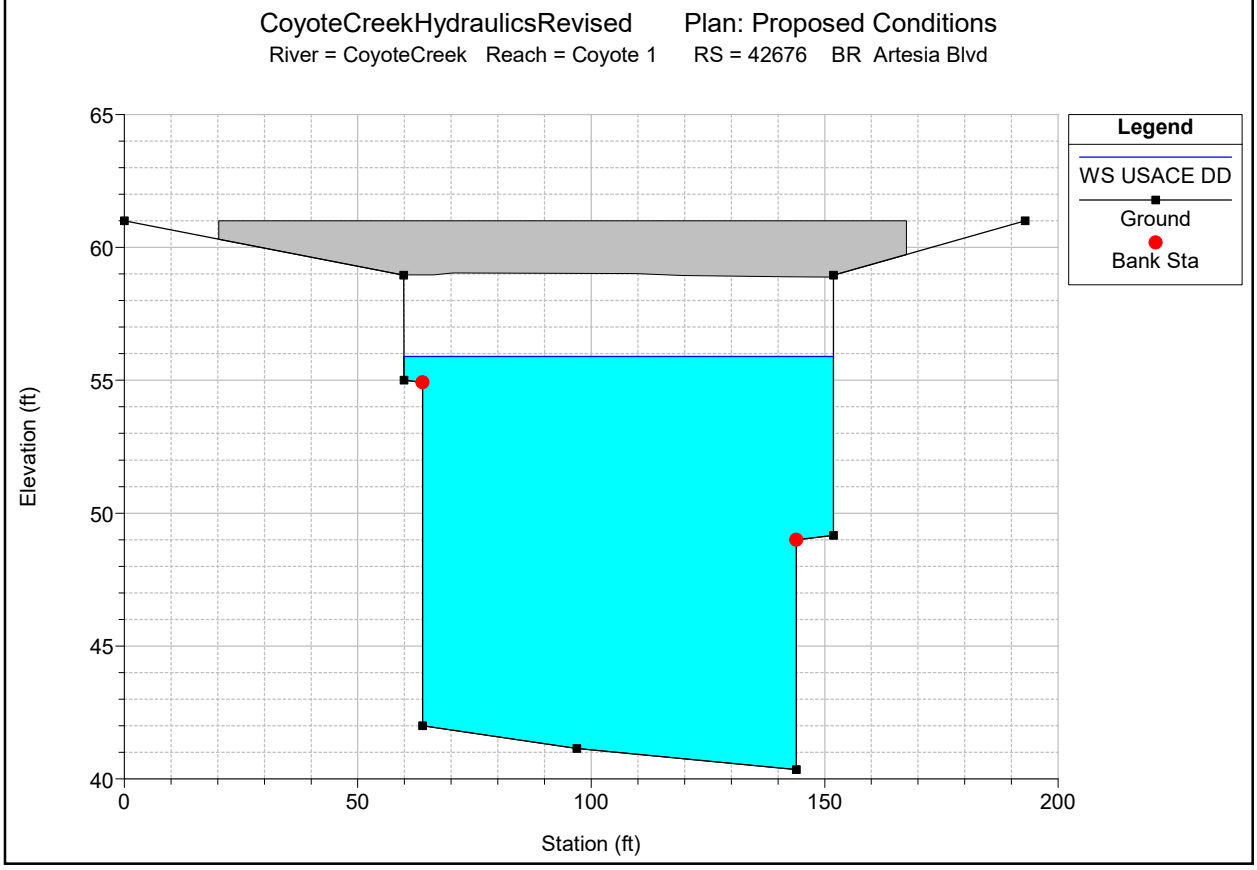
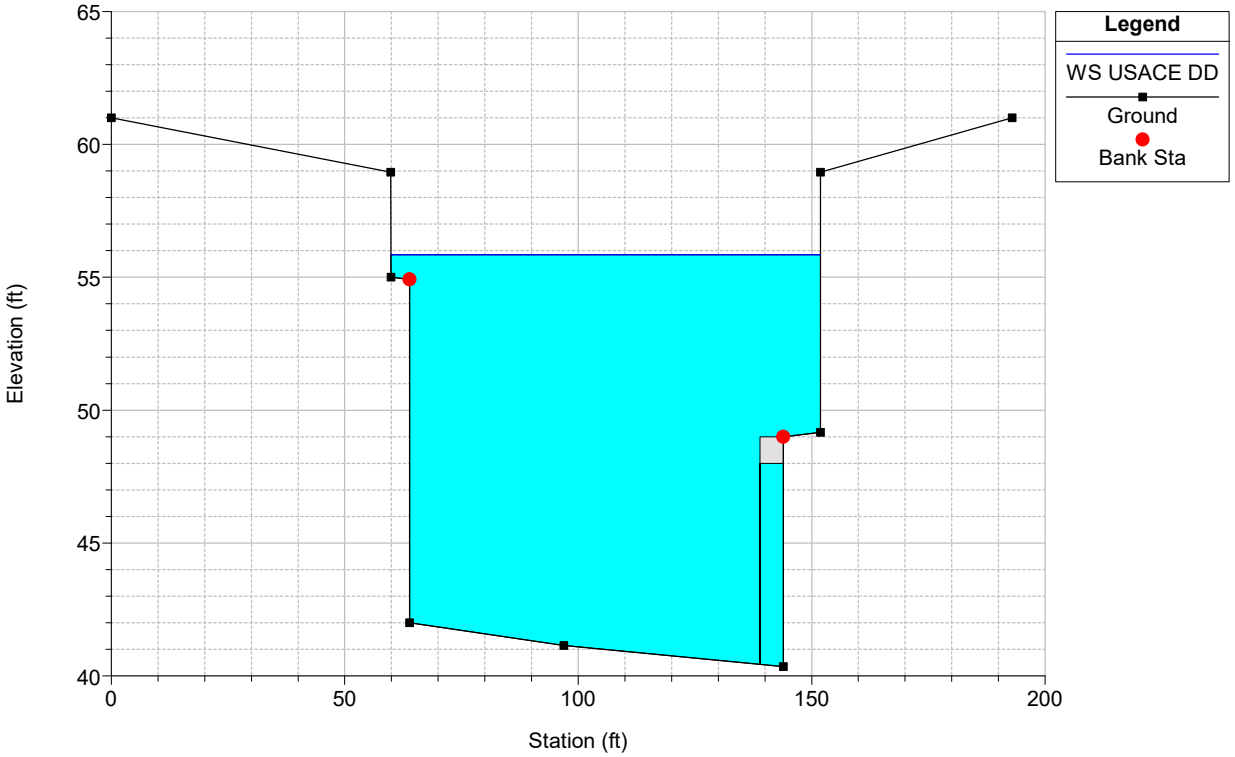
150
200


CoyoteCreekHydraulicsRevised
Plan: Proposed Conditions
River = CoyoteCreek
Reach = Coyote 1
RS = 42752
Artesia Blvd Bridge
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
65
60
55
50
45
40
-50
0
50
100
150
200
CoyoteCreekHydraulicsRevised
Plan: Proposed Conditions
River = CoyoteCreek
Reach = Coyote 1
RS = 42729
Artesia Blvd Bridge
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)

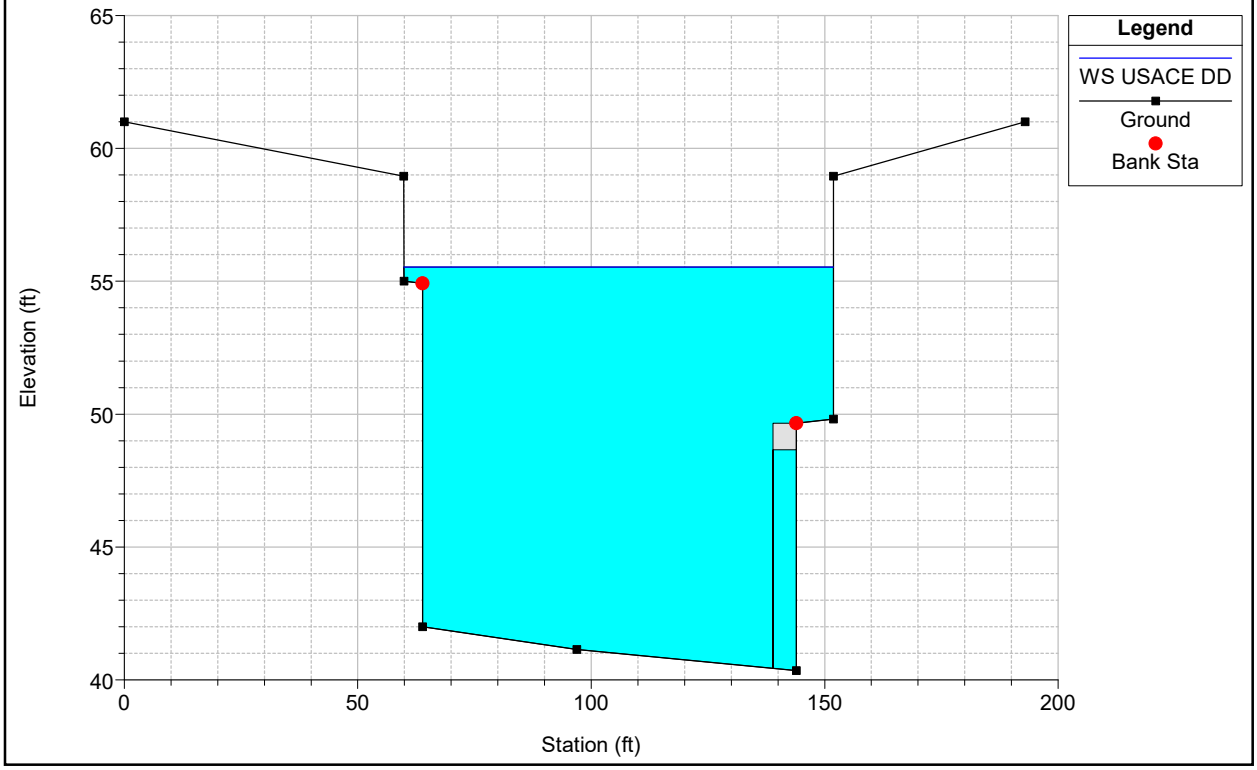

CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42676 BR Artesia Blvd
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
65
60
55
50
45
40
-50
0
50
100
150
200

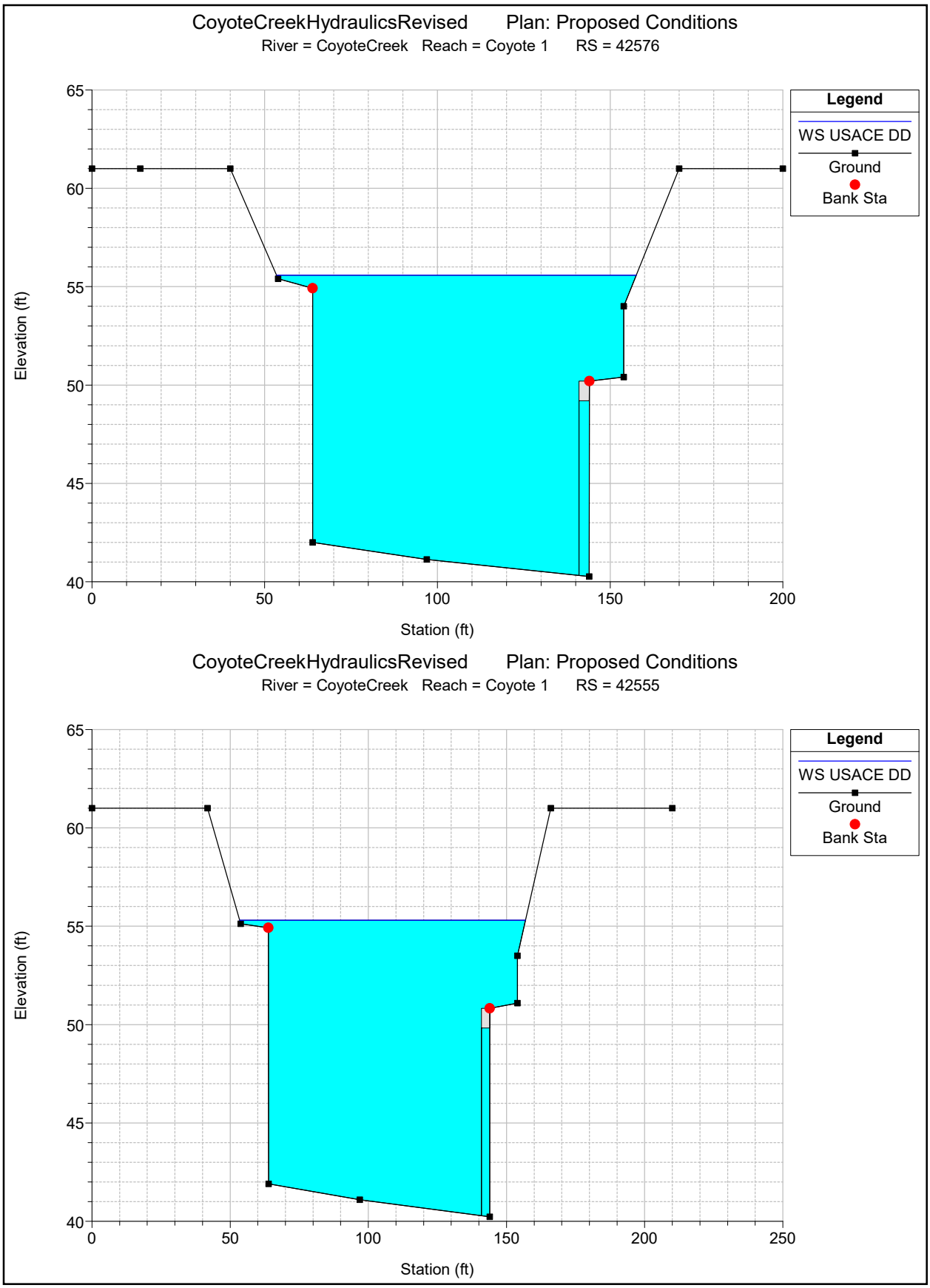

CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42676 BR Artesia Blvd
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
65
60
55
50
45
40
0
50
100
150
200

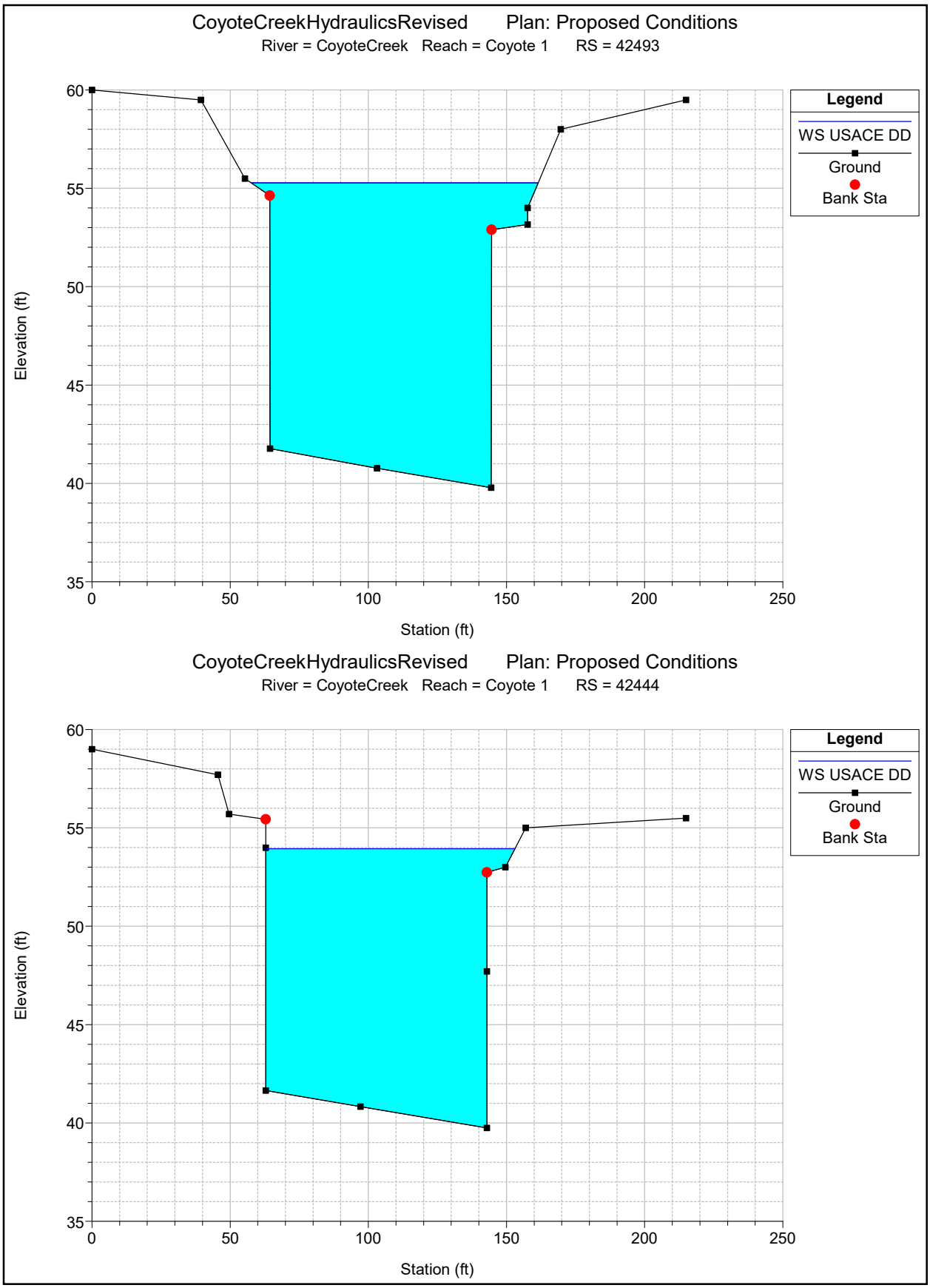
CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42616 Artesia Blvd Bridge

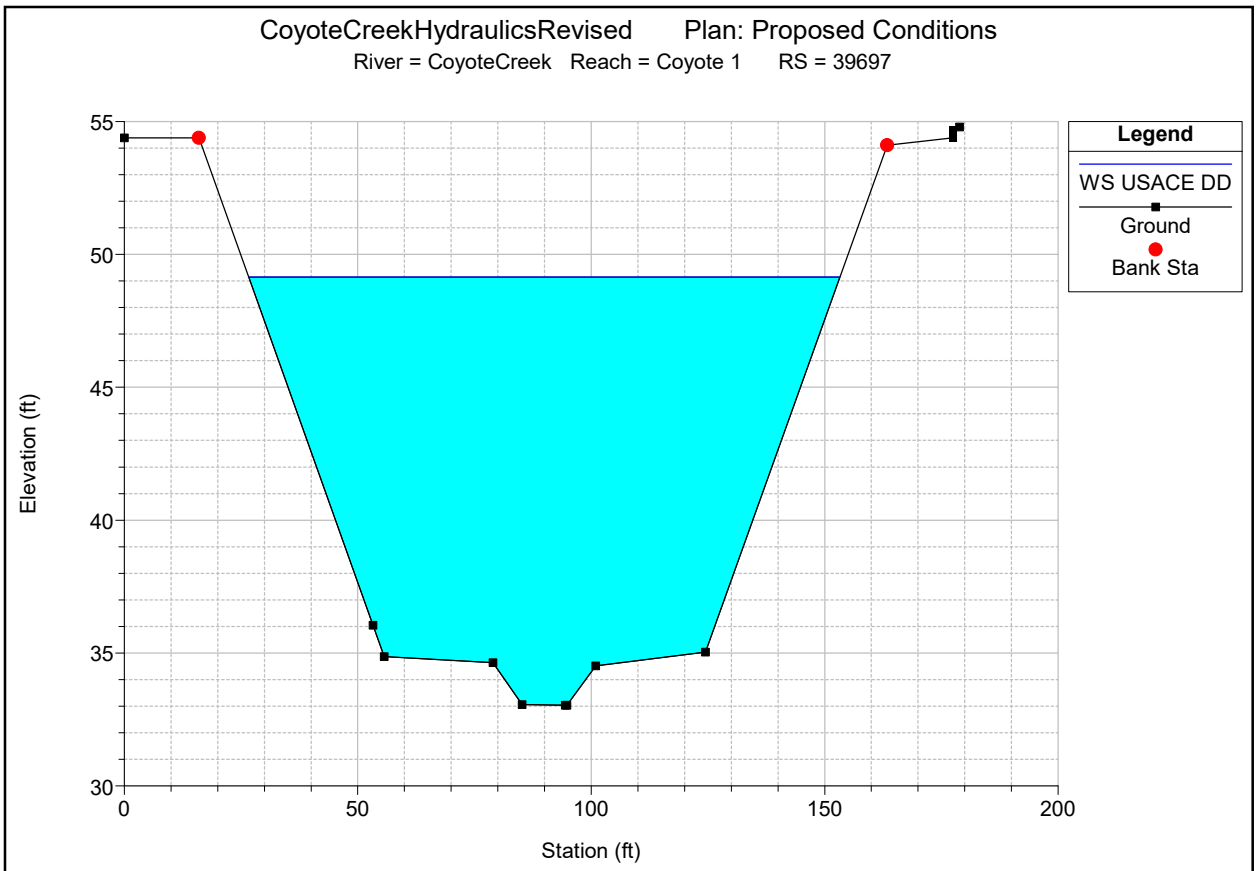


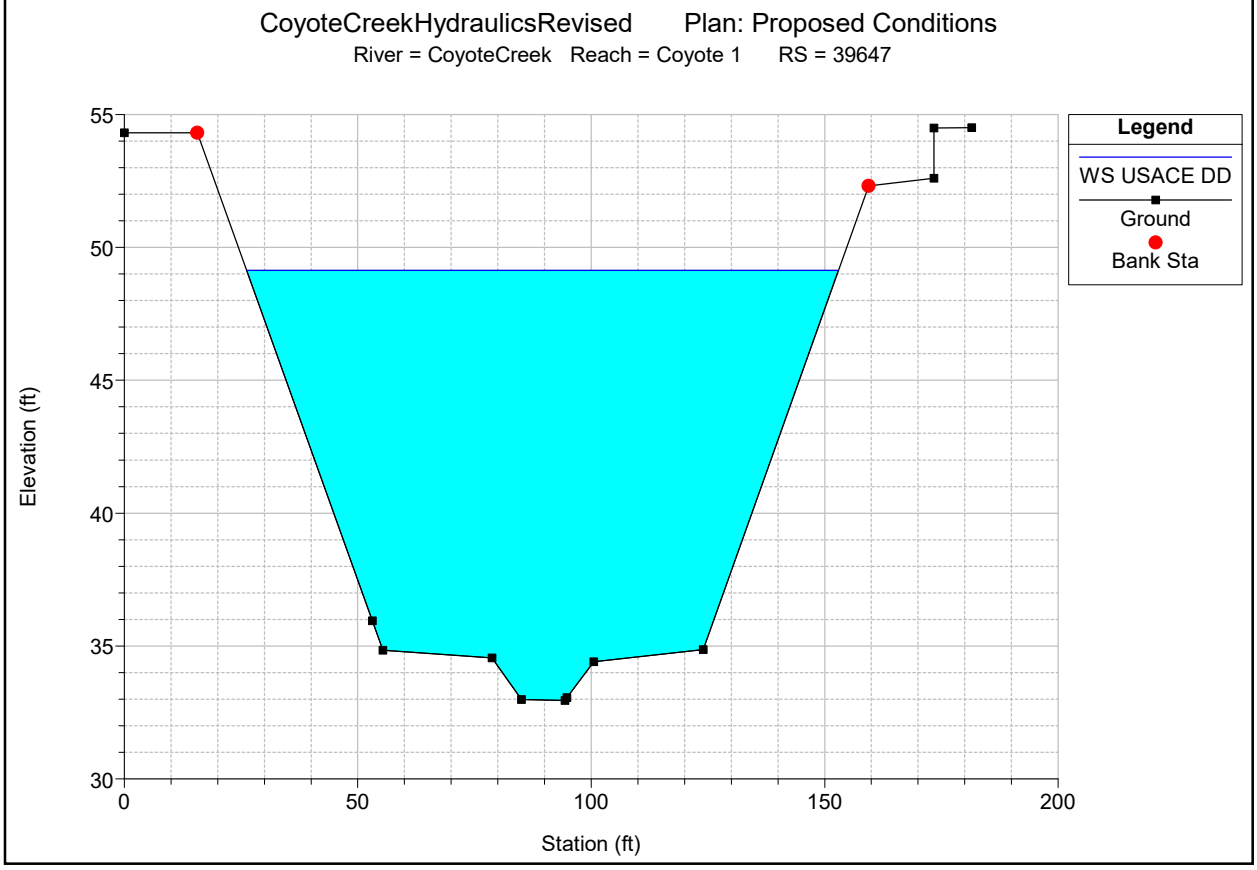
CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42594 Artesia Blvd Bridge

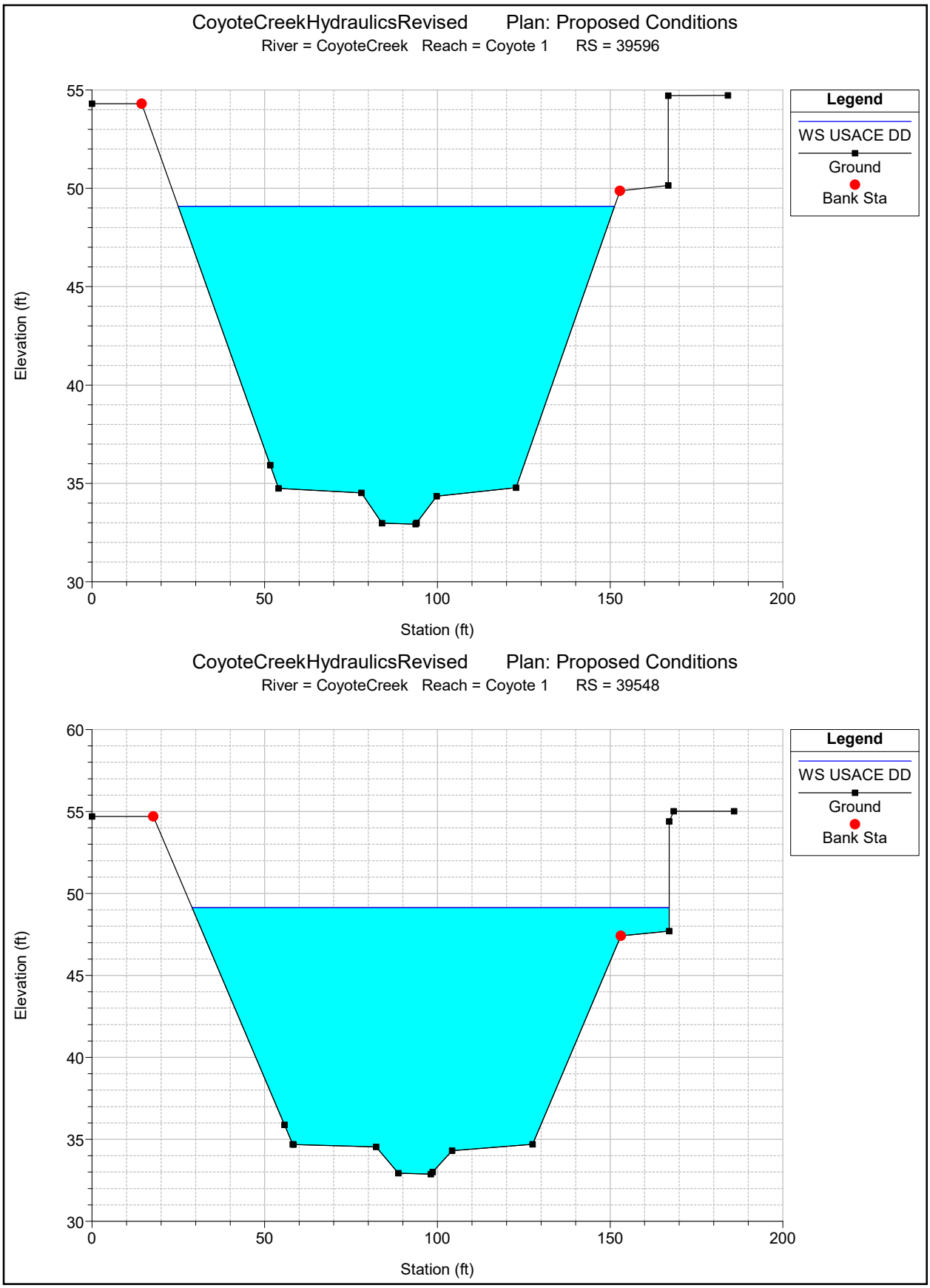


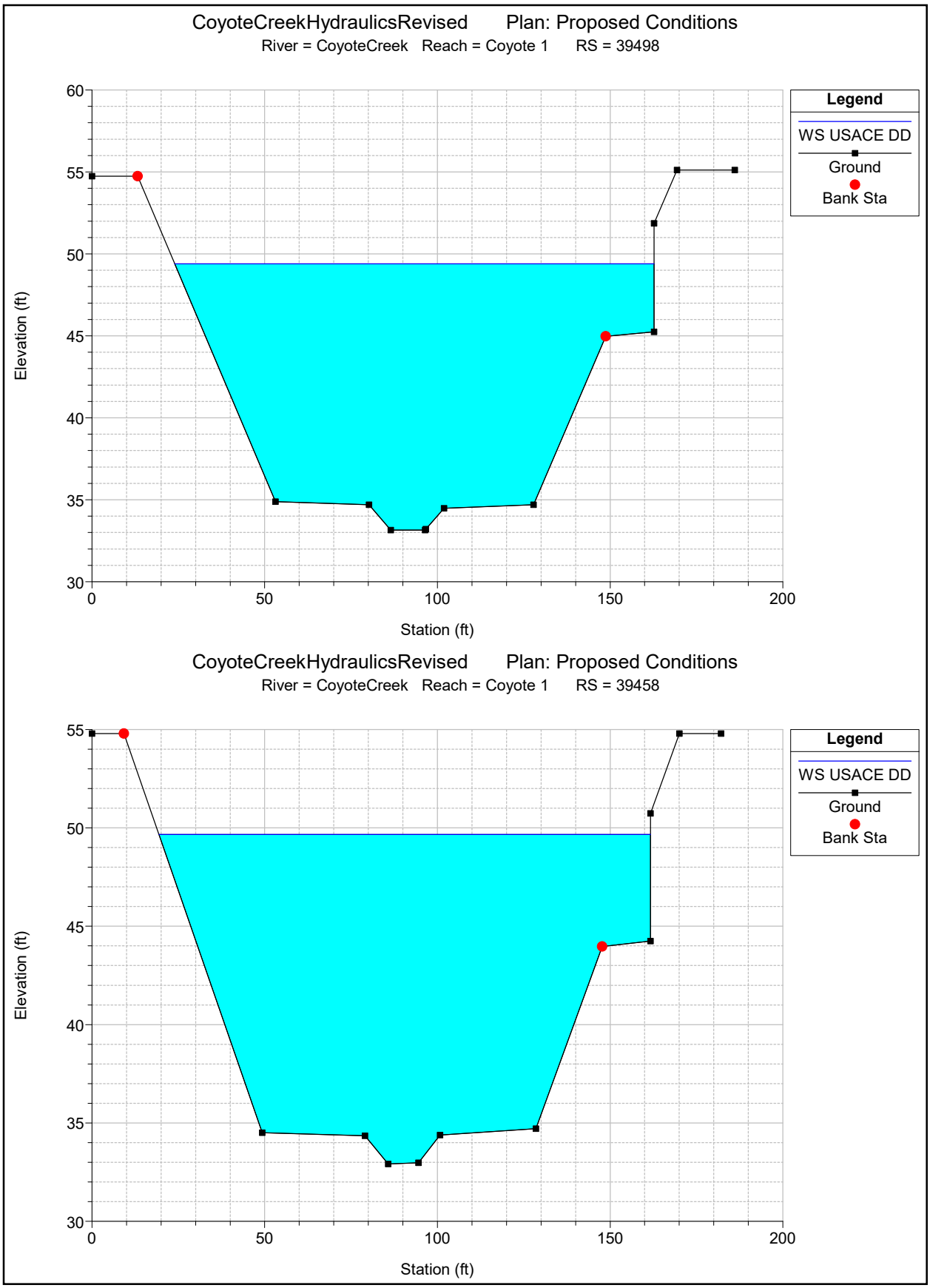

CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42576
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
65
60
55
50
45
40
0
50
100
150
200
CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42555
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
65
60
55
50
45
40
0
50
100
150
200
250

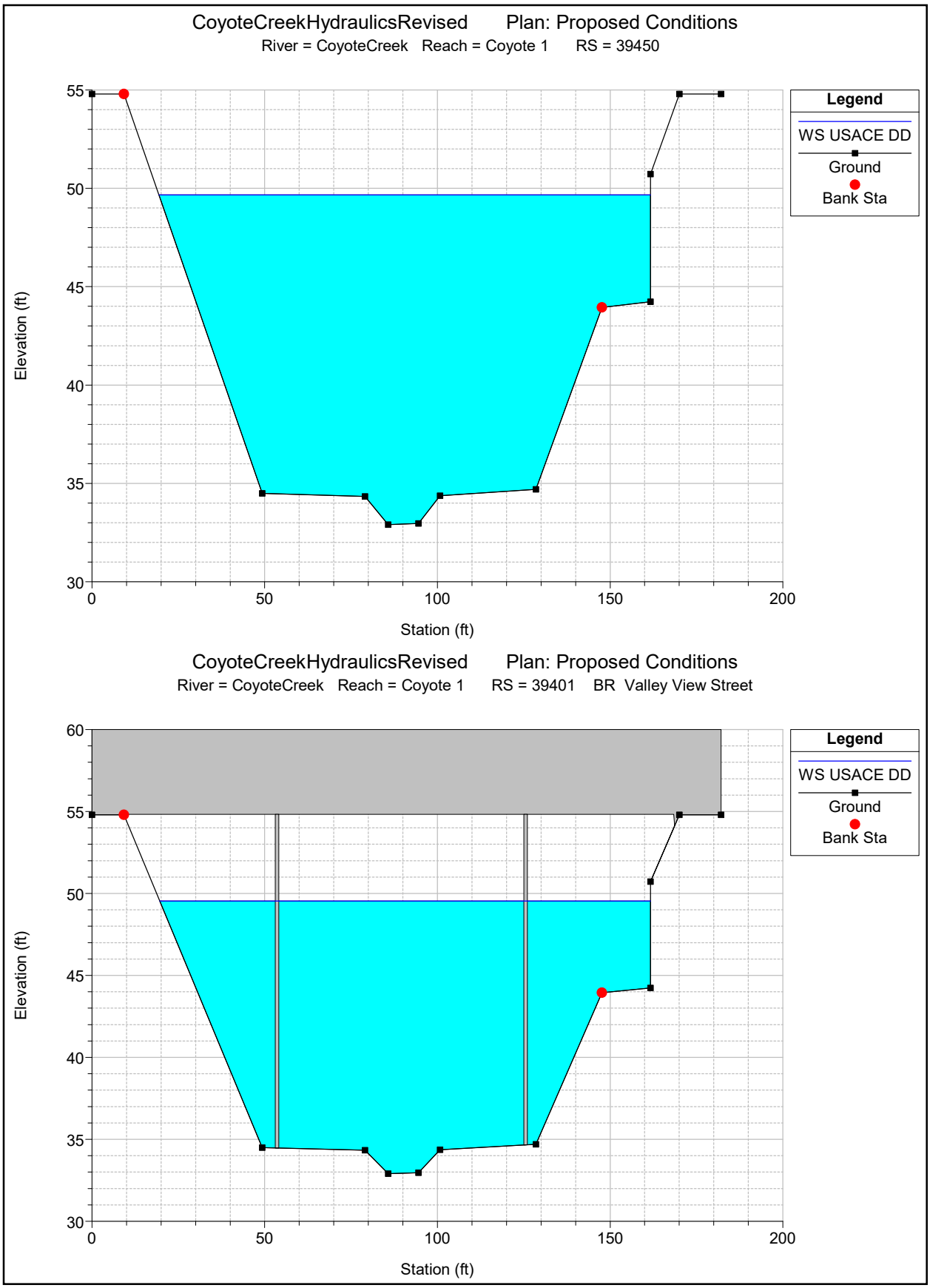

CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42493
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
60
55
50
45
40
35
0
50
100
150
200
250
CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 42444
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
60
55
50
45
40
35
0
50
100
150
200
250

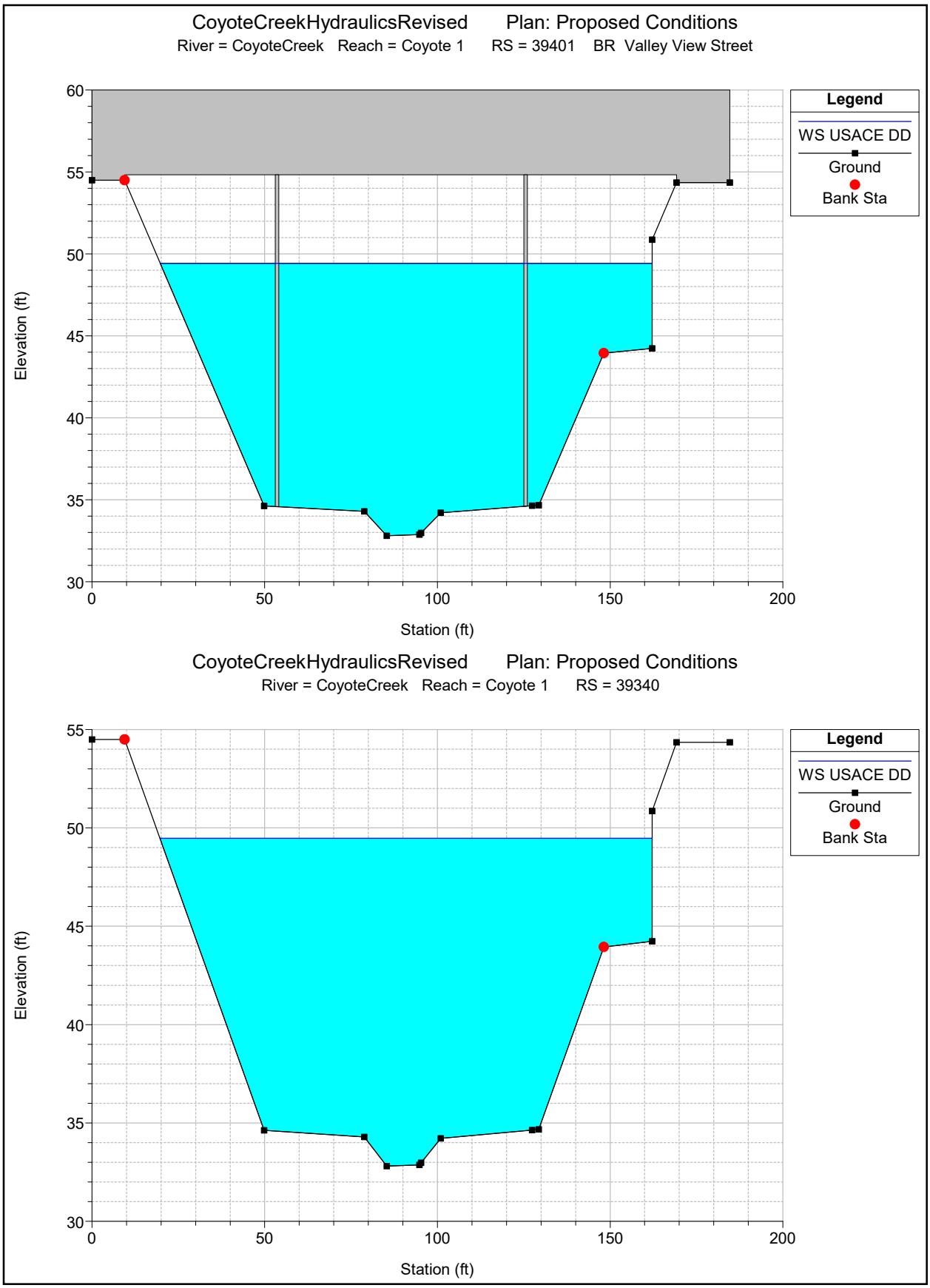

CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39697
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
50
100
150
200


CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39647
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
50
100
150
200


CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39596
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
50
100
150
200
CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39548
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
60
55
50
45
40
35
30
0
50
100
150
200


CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39498
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
60
55
50
45
40
35
30
0
50
100
150
200
CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39458
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
50
100
150
200


CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39450
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
50
100
150
200
CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39401 BR Valley View Street
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
60
55
50
45
40
35
30
0
50
100
150
200


CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39401 BR Valley View Street
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
60
55
50
45
40
35
30
0
50
100
150
200
CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39340
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
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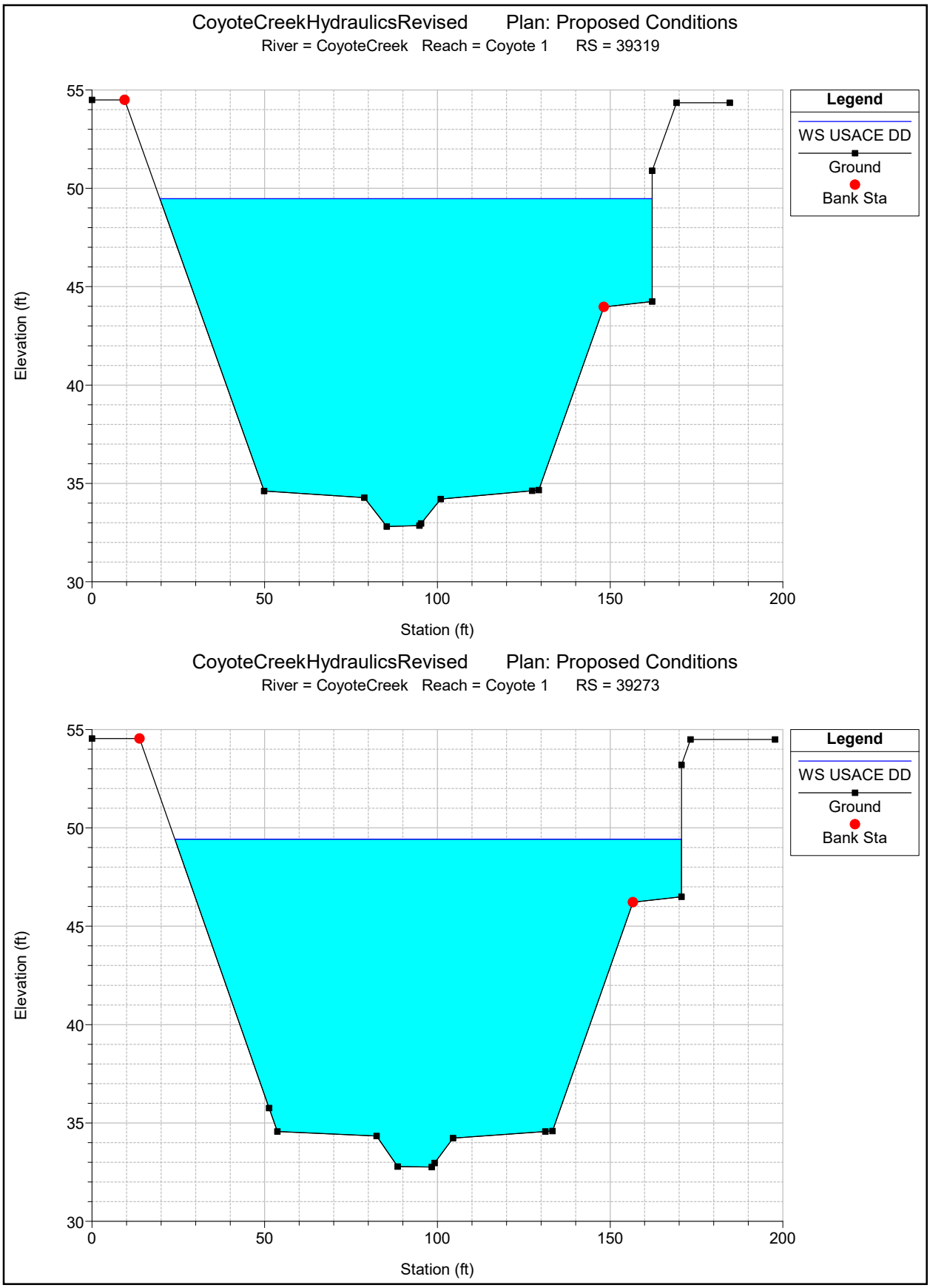
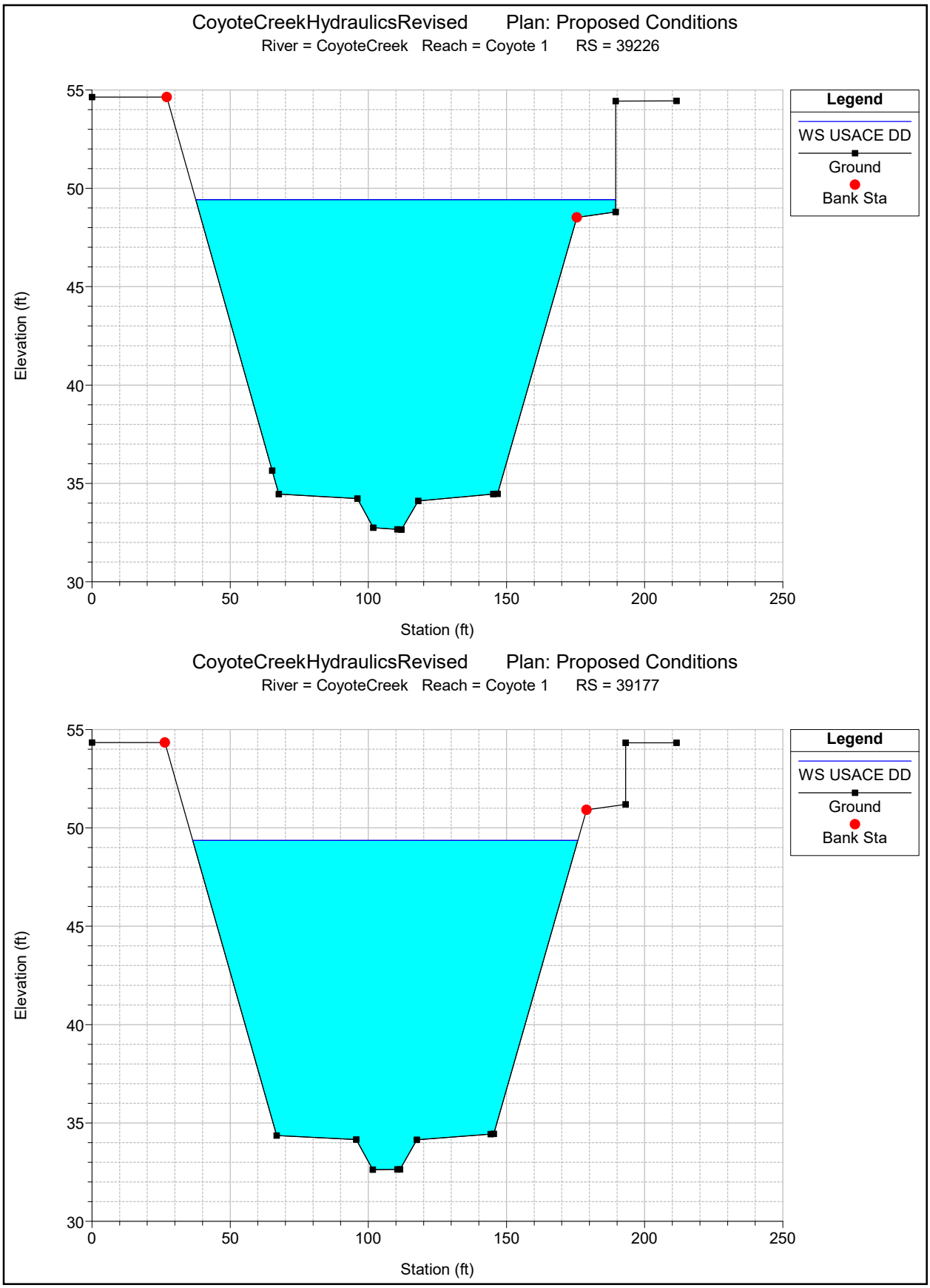
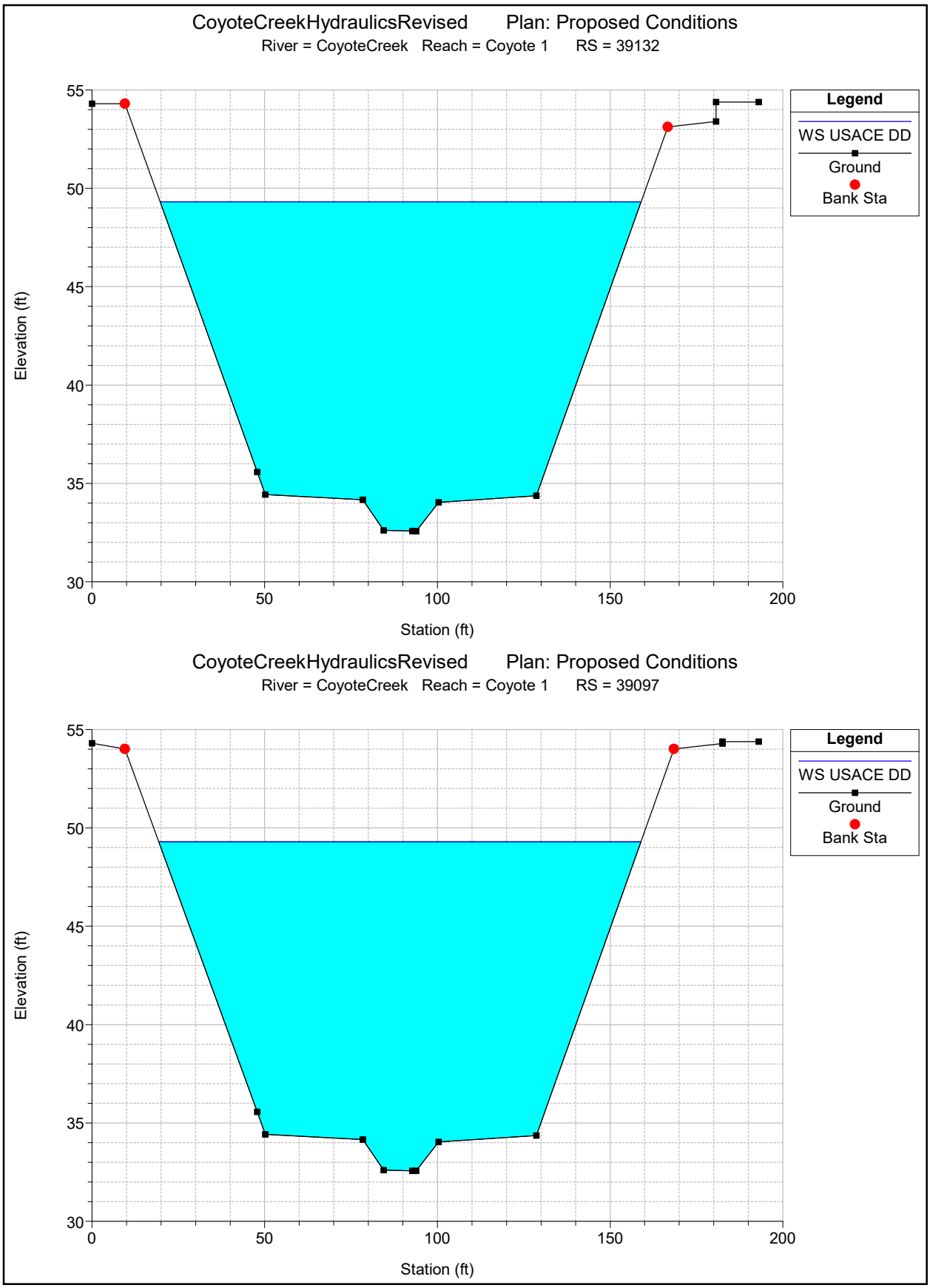
100
150
200


CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39319
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
50
100
150
200
CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39273
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
50
100
150
200


CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39226
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
50
100
150
200
250
CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39177
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
50
100
150
200
250


CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39132
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
50
100
150
200
CoyoteCreekHydraulicsRevised Plan: Proposed Conditions
River = CoyoteCreek Reach = Coyote 1 RS = 39097
Legend
WS USACE DD
Ground
Bank Sta
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
50
100
150
200

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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