MUDDY RIVER LOGANDALE LEVEE
CONDITIONAL LETTER OF MAP REVISION (CLOMR)

500-887

June 2013

Prepared for:

Clark County Public Works
500 S. Grand Central Parkway
Las Vegas, Nevada 89155-4000
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G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

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G. C. WALLACE HOLDINGS, INC.

Writer's Contact Information:

J.Pruitt - 804-2011

500-887

June 24, 2013

LOMC Clearinghouse
7390 Coca Cola Drive, Suite 204
Hanover, Maryland 21076

Subject: CLOMR for the Muddy River Logandale Levee

Attention: LOMC Manager

G. C. Wallace, Inc. (GCW) has been contracted by Clark County Public Works (CCPW) to complete a Conditional Letter of Map Revision (CLOMR) for the Logandale Levee along the Muddy River within Logandale, Clark County, Nevada. The levee project encompasses the reach of the Muddy River between the Wells Siding and Waite Avenue tying into the existing upstream and downstream river. The mapping from Wells Siding to Waite Avenue is approximately 3,400 feet long. The purpose of this CLOMR is to lay the groundwork for a Letter of Map Revision (LOMR) in order to revise the existing Community Panel to reflect the proposed levee to protect downstream property and facilities and to revise the FEMA designated Zones AE and A Special Flood Hazard Areas (SFHAs). The CLOMR methodology is in accordance with *Guidelines and Specifications for Flood Hazard Mapping Partners* (Reference 1).

The current FIRM panel indicates the subject reach of the Muddy River is located within Zones AE and A SFHAs. The affected Community Panel Map Number is 32003C1105F dated November 16, 2011. See Figures 1 and 2 for the project vicinity and location. The Effective FIRM is shown on Figure 3. There have been no flood control improvements within this reach of the Muddy River since the effective FIRM was completed.

The following information supporting this request for a CLOMR is enclosed. This request is based on the proposed levee improvements consisting of reconstruction of a levee system that confines Muddy River flows from the Wells Siding to Waite Avenue. This request is also based on additional survey data dated January 11, 2011 and 2-foot aerial photography dated November 11, 2009.

- Figure 1 – Vicinity Map
- Figure 2 – Location Map
- Figure 3 – Effective FIRM
- Figure 4 – Work Map: HEC-RAS Model
- Figure 5 – Revised FIRM Map
- Figure 6 – Annotated FIRM Map
- FEMA Forms
- A copy of the check in the amount of $6,050.00 payable to the National Flood Insurance Program has been included with this submittal. The actual check has been sent to the FEMA Fee Charge System Administrator.
- Hydraulic Modeling Computations
- Geotechnical Analysis of Levee
- Site Photographs
- Field Survey Information
- Operation and Maintenance Plan

- Topography
- Environmental Analysis to Ensure Compliance with Endangered Species Act (ESA)
- References
- Electronic Files on disk (Aerial topography, Survey data, GIS Files, HEC-RAS Models)

Proposed Improvements

Note that all channel improvements modeling and mapping in support of this CLOMR are based on the NAVD88 Datum. See Figure 4 for the location of the proposed improvements included in the attached Section 1.0 Figures and Affected FIRM Panels.

Hydrology

Hydrologic data was referenced from the *1995 Flood Insurance Study Restudy for the Muddy River* (Reference 6, hereinafter referred to as the *1995 FIS Restudy*). According to the *1995 FIS Restudy*, the Muddy River main wash effective flow rate is 21,400 cfs during the 100-year storm event. The reference information is included in Section 5.0 Reference Material.

Aerial Topography and Survey Data

Topographic mapping with a contour interval of 2-foot was generated by AeroTech Mapping (flight date November 11, 2009). In addition, supplemental surveys of the cross sections were performed dated January 11, 2011. The vertical control is based on North American Vertical Datum of 1988 (NAVD 1988), and horizontal control is based on Nevada State Plane Coordinate System (NAD 1983/94). In addition to topographic mapping, field surveys were performed to obtain as-built information as needed.

Hydraulic Modeling

The hydraulic analyses for the project were performed to determine the limits, height, and stability of the proposed levee system. Cross sections data for the River were surveyed along the project reach from Wells Siding Diversion Structure to Waite Avenue. This survey data was supplemented with the existing 2-ft topography. As indicated in the hydrologic analysis, the 100-year design flow rate is 21,400 cfs.

The *1995 FIS Restudy* serves as the starting point for the hydraulic analysis for this project, and that study's modeling used 4-foot topographic contours and HEC-2 software. The tasks performed in this study for the existing conditions analysis included two HEC-RAS models (Section 3.0 Engineering Analysis): (1) conversion of the FEMA Effective HEC-2 model (Effective Model) to a HEC-RAS model (Duplicate Effective Model), and (2) re-analyzing and extending the Duplicate Effective Model using field surveyed cross section data performed in January 2011 for the project site (Corrected Effective Model). The areas outside the limits of the survey data are reflected by 2-foot contours that were flown and generated in November 2009.

The cross section orientation, location, reach lengths, roughness factors and other modeling parameters remain the same as the original FEMA-approved FIS Restudy model. The reference

information is included in Section 5.0 Reference Materials. The output from the HEC-RAS models is included in Section 3.0 Engineering Analysis.

Duplicate Effective Model

The original FEMA approved Effective 1995 FIS model based on 4-foot topographic contours and the HEC-2 analysis was converted using HEC-RAS. The HEC-RAS and HEC-2 results are identical. Table 1 includes a comparison of the WSE results from the Effective Model and Duplicate Effective Model. HEC-RAS Duplicate Effective Model is included in Section 3.0 Engineering Analysis.

TABLE 1

Modeling Results Summary (Duplicate Effective)

River Cross Section*	Q Total	W.S. Elevation		DIFF
		Effective Model (ft)	Duplicate Effective Model (ft)	Duplicate Effective - (ft)
No.	(cfs)			
Muddy River				
88	21400	1416.4	1416.4	0.0
87	21400	1409.6	1409.6	0.0
86	21400	1401.8	1401.8	0.0
85.5	21400	1401.0	1401.0	0.0
85	21400	1400.3	1400.3	0.0
84	21400	1399.5	1399.5	0.0

Corrected Effective Model

The Corrected Effective Model serves as the existing condition model for the project and was created modifying the Duplicate Effective Model. A cross section (85.5) was removed from the Duplicate Effective Model, and a few cross sections (85.4, 86.4, 87.4, 89 to 91.4) were added to correctly reflect the existing condition, better define the water surface profile, and to extend to the upstream limit of the levee. The added cross sections RS 88-91.4 and the cross section orientation, location, reach lengths, roughness factors and other modeling parameters for these cross sections are referenced from the *Flood Hazard Mapping Study Muddy River Levee* (Reference 7). The reference information is included in Section 5.0 Reference Information. The surveyed cross section data supplemented with 2-foot topography was used in the Corrected Effective Model.

Table 2, shown below, includes a comparison of the WSE from the Corrected Effective Model and Duplicate Effective. Hydraulic models are included in Section 3.0 Engineering Analysis.

TABLE 2
Modeling Results Summary (Corrected Effective)

River Cross Section*	Q Total	W.S. Elevation		DIFF
		Duplicate Effective Model	Corrected Effective Model	Corrected Effective - Duplicate
No.	(cfs)	(ft)	(ft)	(ft)
Muddy River				
91.4	21400	N/A	1428.7	N/A
91	21400	N/A	1428.3	N/A
90.5	21400	N/A	1428.2	N/A
90	21400	N/A	1425.6	N/A
89.5	21400	N/A	1424.1	N/A
89	21400	N/A	1423.3	N/A
88	21400	1416.4	1415.7	-0.7
87.4	21400	N/A	1411.6	N/A
87	21400	1409.6	1411.0	1.4
86.4	21400	N/A	1408.0	N/A
86	21400	1401.8	1402.7	0.9
85.5	21400	1401.0	N/A	N/A
85.4	21400	N/A	1401.5	N/A
85	21400	1400.3	1400.2	-0.1
84	21400	1399.5	1399.5	0.0

A comparison of typical cross sections between the Duplicate and Corrected Effective Models shows that the Corrected Effective Model with current available data has a generally higher bed elevation.

Post Project Model

The review of the results from the Corrected Effective Model showed that levee conditions exist in the reach of the Muddy River from the Wells Siding Diversion Structure (River Station 91.4) to near the Waite Avenue Alignment (River Station 85.4). The existing WSE in the Muddy River main channel is higher than the existing ground on the backside or landside of the levee bank. The levee improvements are proposed where this condition occurs. Note that there are additional improvements proposed outside of the defined levee area for adjacent property owners and Clark County's convenience, for instance the access turnaround at the north end of the project, the extension of the access road to Waite Avenue, and the concrete slope paving along the railroad on the west side of the river. Please limit your review and comments accordingly.

Based on the results presented in the subsequent sections, levee improvements are recommended. These proposed improvements were incorporated into the Corrected Effective Model in order to develop the Post Project Model. A few cross sections were added to the Post Project Model to correctly reflect the proposed condition and better define the water surface profile. The results from this model show a decrease of WSE (compared to Corrected Effective Model Results) in the range of 0.0 to 2.7 ft. and an increase of 0.2 ft at one location. Table 3, shown below, compares the WSE from the Post Project Model and Corrected Effective Model. Hydraulic models are included in Section 3.0 Engineering Analysis.

TABLE 3
Modeling Results Summary (Post Project)

River Cross Section*	Q Total	W.S. Elevation		DIFF
No.	(cfs)	Corrected Effective Model (ft)	Post Project Model (ft)	Post Project - Corrected (ft)
Muddy River Logandale Levee - Concrete Lining				
91.4	21400	1428.7	1426.9	-1.8
91	21400	1428.3	1426.4	-1.9
90.5	21400	1428.2	1425.5	-2.7
90	21400	1425.6	1423.6	-2.0
89.5	21400	1424.1	1422.8	-1.3

89	21400	1423.3	1422.0	-1.3
88.5	21400	N/A	1417.5	N/A
88.4	21400	N/A	1416.9	N/A
88	21400	1415.7	1415.6	-0.1
87.9	21400	N/A	1413.1	N/A
87.4	21400	1411.6	1411.8	0.2
87.3	21400	N/A	1411.0	N/A
87	21400	1411.0	1410.1	-0.9
86.5	21400	N/A	1407.2	N/A
86.4	21400	1408.0	1407.0	-1.0
86.3	21400	N/A	1406.2	N/A
86	21400	1402.7	1402.7	0.0
85.4	21400	1401.5	1401.4	-0.1
85	21400	1400.2	1400.2	0.0
84	21400	1399.5	1399.5	0.0

* See Figure 4

Manning's "n" Values and Losses

Manning's "n" roughness values, expansion and contraction coefficients for the Muddy River cross sections and transitions have been utilized in the model according to and consistent with the 1995 Muddy River FIS Restudy and the *HEC-RAS River Analysis System Hydraulic Reference Manual* (Reference 5, hereinafter referred to as the HEC-RAS Manual). The HEC-RAS Manual has been included in the attached Section 5.0 Reference Material showing coefficients for gradual transitions. Contraction and expansion coefficients at all of the cross sections assume values of 0.1 and 0.3, respectively, for gradual transitions under subcritical flow conditions.

Boundary Condition and Floodplain Tie-in Locations

Downstream: The floodplain tie-in location is approximately 3,200 feet downstream of the Wells Siding Diversion Structure. This is at Cross Section 84 which matches the 1995 Muddy River FIS Restudy cross section geometry and water surface elevation.

Upstream: The floodplain tie-in location is at the downstream end of the existing Wells Siding Diversion Structure. This is near Cross Section 91.4. This cross section is an added detailed section and does not match the approximate Zone A floodplain delineation. Since the analysis that generated the effective Zone A floodplain is not available, this location was selected because it is at the upstream end of the proposed "levee condition" improvements, downstream of the Wells Siding Diversion Structure, and allows a reasonable graphically tie-in to the approximate Zone A delineation generally following contours. The "levee condition" is defined by areas of the embankment that the water surface elevation is above the land side toe of the

embankment. The Corrected Effective Model results indicate that the flow regime is subcritical. The 100-year water surface elevation is 1428.7.

The Post Project Model results indicate that the flow regime is still subcritical. The 100-year water surface elevation is 1.8 feet lower at 1426.9 due to the downstream improvements.

Mapping

The 100-year floodplain, floodway, and base flood elevations (BFE) are based on HEC-RAS modeling for subcritical flow. The floodplain and BFE were delineated on topographic maps based on the proposed improvements. The top widths calculated in the HEC-RAS model will be contained within the proposed levee from Wells Siding to Waite Avenue. The area protected by the proposed levee on the landside previously delineated as Zone A will be revised to Shaded Zone X.

The Proposed FIRM revisions are shown on Figure 5 and the Annotated FIRM is shown on Figure 6.

GCW trusts that this submittal will provide the required information needed to support a CLOMR for the subject project.

If you have any questions or require additional information, please do not hesitate to call us at (702) 804-2000.

Cordially,

G. C. WALLACE, INC.

Grant Tokumi, PE
Project Manager
Flood Control Division

Jerry E. Pruitt, PE
Vice President
Flood Control Division

Encl.
cc: John Catanese, CCPW
Andrew Trelease, CCRFCD
Calvin Black, GCW
Ryan Belsick, GCW

REFERENCES

1. Federal Emergency Management Agency. *Guidelines and Specifications for Flood Hazard Mapping Partners.* April 2003.
2. U.S. Army Corps of Engineers, *HEC-RAS River Analysis System*. January 2010 Version 4.1.0.
3. Clark County Regional Flood Control District (CCRFCD) *Hydrologic Criteria and Drainage Design Manual.* August 1999.
4. FEMA, Department of Homeland Security, *Code of Federal Regulations - Emergency Management and Assistance.* Accessed: October 13, 2011.
5. U.S. Army Corps of Engineers, *HEC-RAS River Analysis System Hydraulic Reference Manual.* January 2010 Version 4.1.
6. G.C. Wallace, *Flood Insurance Study Restudy Muddy River, Clark County, Nevada.* July 1995.
7. G.C. Wallace, *Flood Hazard Mapping Study Muddy River Levee*. March 2010.
8. FEMA, *Flood Insurance Study Clark County, Nevada and Incorporated Areas*, November 2011.

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SUPPORTING DOCUMENTATION FOR CLOMR

1. FIGURES AND AFFECTED FIRM PANELS (HARD COPY AND ON CD)

- Figure 1 - Vicinity Map
- Figure 2 - Location Map
- Figure 3 - Effective FIRM
- Figure 4 - Work Map: HEC-RAS
- Figure 5 - Revised FIRM Map
- Figure 6 - Annotated FIRM Map

2. FEMA FORMS (HARD COPY AND ON CD)

- MT-2 Form 1: Overview & Concurrence Form
- MT-2 Form 2: Riverine Hydrology & Hydraulics Form
- MT-2 Form 3: Riverine Structures Form
- Payment Information Form

3. ENGINEERING ANALYSIS

3.1 HYDRAULIC MODELING COMPUTATIONS (HARD COPY AND ON CD)

- HEC-RAS Model: Duplicate Effective Model with CheckRAS
- HEC-RAS Model: Corrected Effective Model with CheckRAS
- HEC-RAS Model: Post Project Model with CheckRAS

4. SUPPORTING INFORMATION (ON CD)

- Site Investigation Photographs
- Field Survey Information
- Operation and Maintenance Plan
- ESA Compliance
- Topography
- Geotechnical Report

5. REFERENCE MATERIALS (ON CD)

- Excerpts from the *Flood Insurance Study,* 1995
- *Muddy River Levee Flood Hazard Mapping Study, 2010*
- *Flood Insurance Study Clark County and Incorporated Areas, 2011*
- Flap Valve Manufacturer's Specifications (Rodney Hunt and Troy Valve)
- *HEC-RAS River Analysis System Hydraulic Reference Manual*, 2008

6. IMPROVEMENT PLANS (HARD COPY AND ON CD)

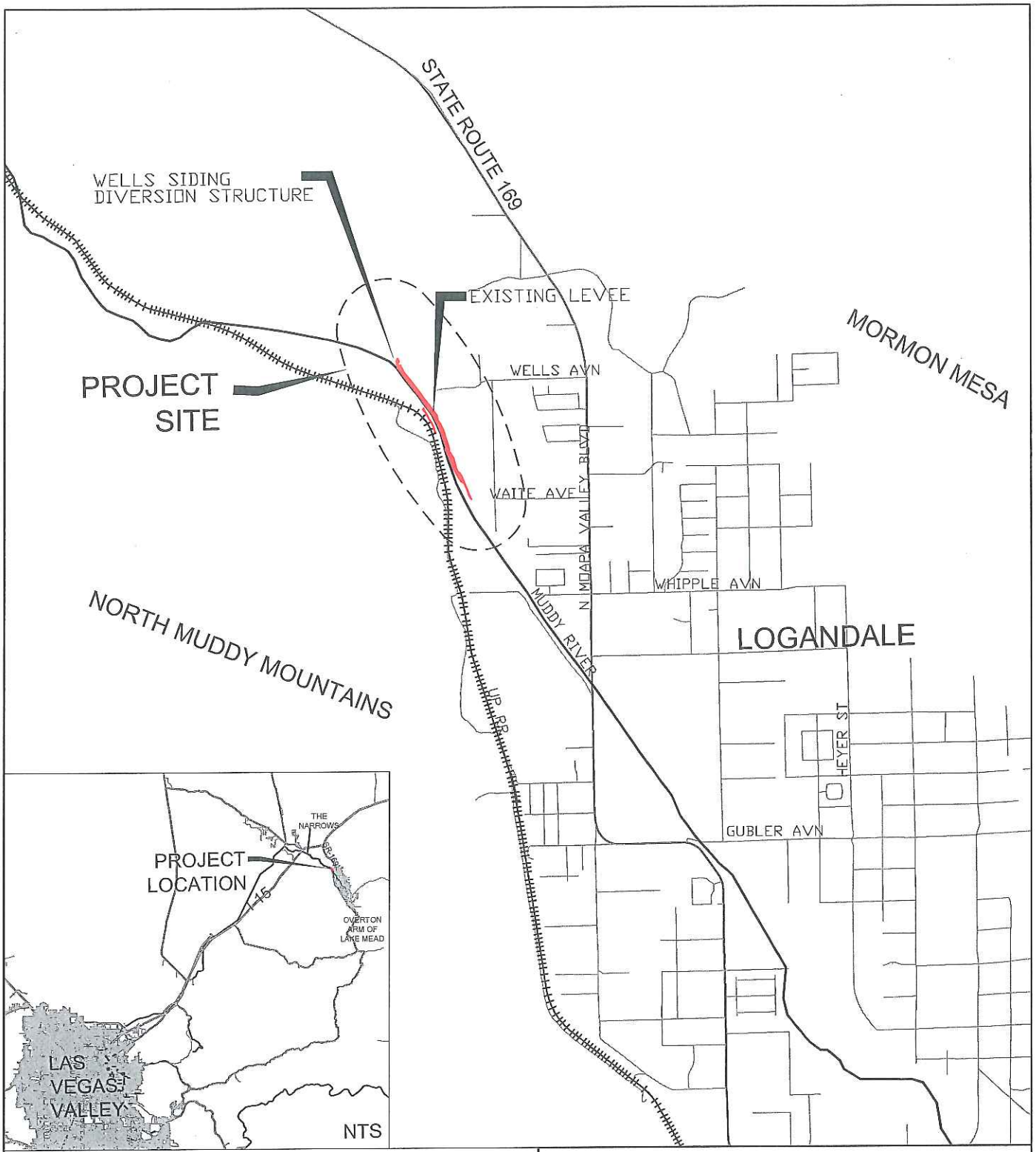
- Muddy River Logandale Levee

7. ADDITIONAL ELECTRONIC FILES

- Report PDF
- HEC-RAS Model
- Supporting Information
- Reference Materials
- GIS Shape Files

1. FIGURES AND AFFECTED FIRM PANELS

Figure 1 - Vicinity Map
Figure 2 - Location Map
Figure 3 - Effective FIRM
Figure 4 - Work Map: HEC-RAS/WSPGW Model
Figure 5 - Revised FIRM Map
Figure 6 - Annotated FIRM Map



NORTH

GRAPHIC SCALE

3000 0 1500 3000

(IN FEET)

1 inch = 3000 ft.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

MUDDY RIVER LOGANDALE LEVEE

FIGURE 1

VICINITY MAP

G. C. WALLACE COMPANIES
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1555 S. RAINBOW BOULEVARD · LAS VEGAS, NV 89146
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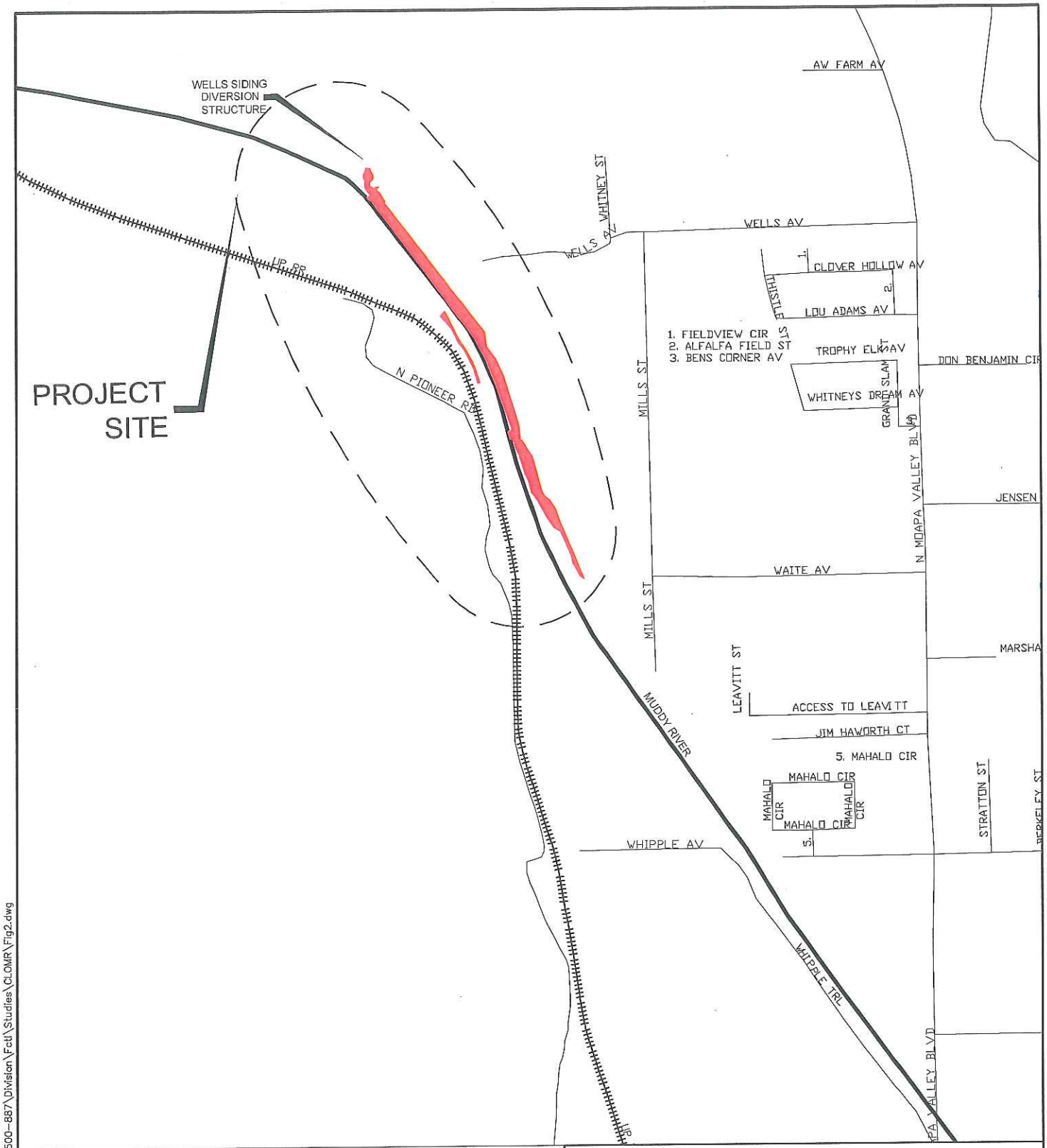

GRAPHIC SCALE

1000 0 500 1000

(IN FEET)

1 inch = 1000 ft.

NORTH

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

MUDDY RIVER LOGANDALE LEVEE

FIGURE 2

LOCATION MAP

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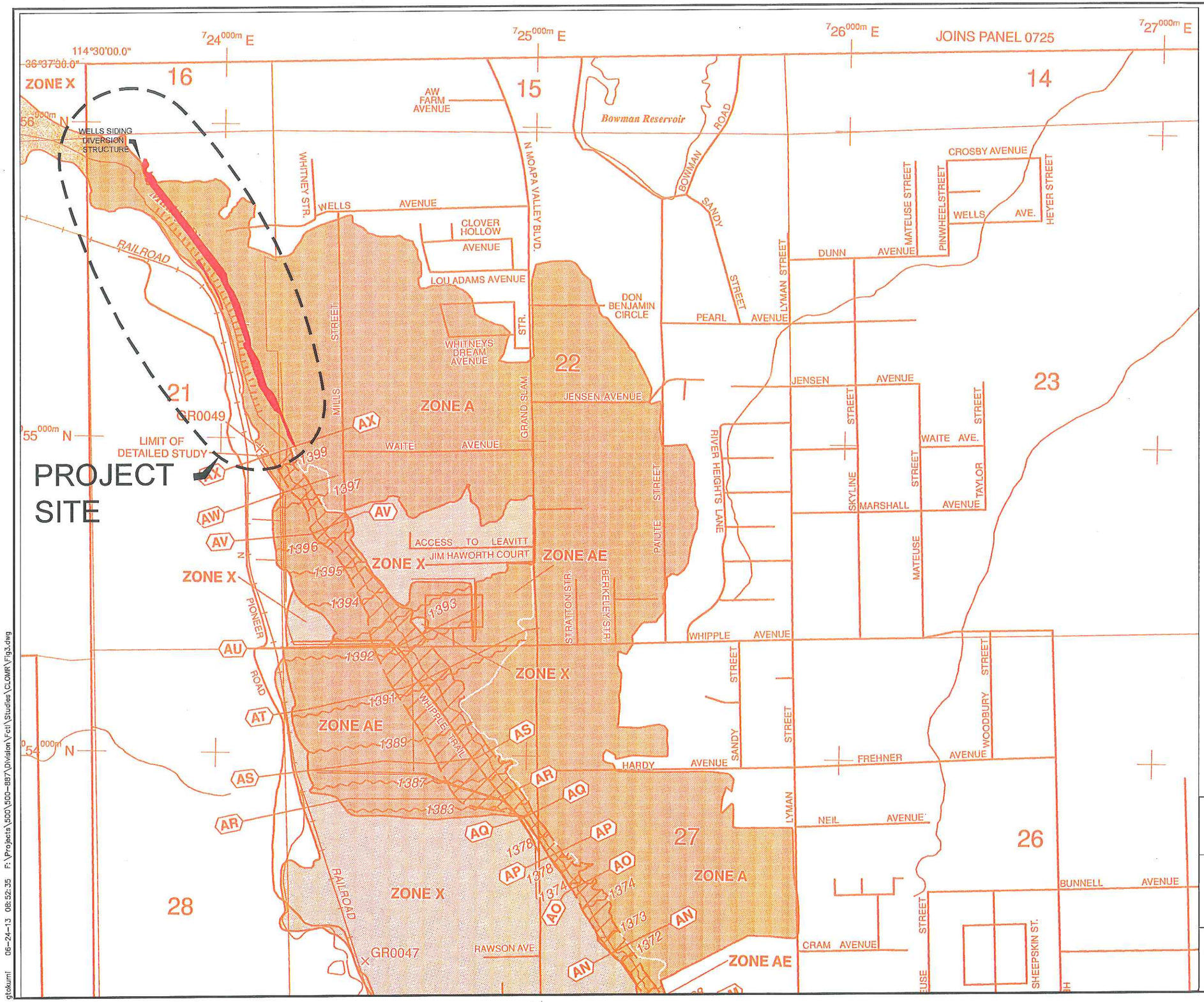

GRAPHIC SCALE

1000 0 500 1000

(IN FEET)

1 inch = 1000 ft.

NORTH

NFIP

PANEL 1105F

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

CLARK COUNTY, NEVADA

AND INCORPORATED AREAS

PANEL 1105 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLARK COUNTY	320003	1105	F

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER 32003C1105F

MAP REVISED NOVEMBER 16, 2011

Federal Emergency Management Agency

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

MUDDY RIVER LOGANDALE LEVEE

FIGURE 3

EFFECTIVE FIRM

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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)	
91.4	Floodplain	21400	1413.22	1426.91	1422.04	1427.54	0.001638	6.39	3350.03	382.33	0.38
91.4	Floodway	21400	1413.22	1426.91	1422.04	1427.54	0.001638	6.39	3350.03	382.33	0.38
91	Floodplain	21400	1408.74	1426.43	1420.99	1427.33	0.002263	7.58	2825.07	262.64	0.41
91	Floodway	21400	1408.74	1426.43	1420.97	1427.33	0.002263	7.58	2825.07	262.64	0.41
90.5	Floodplain	21400	1406.06	1425.49	1419.83	1426.83	0.002966	9.29	2302.36	186.03	0.47
90.5	Floodway	21400	1406.06	1425.49	1419.83	1426.83	0.002966	9.29	2302.36	186.03	0.47
90	Floodplain	21400	1404.89	1423.63	1420.63	1426.08	0.005085	12.57	1701.84	152.26	0.66
90	Floodway	21400	1404.89	1423.63	1420.63	1426.08	0.005085	12.57	1701.84	152.26	0.66
89.5	Floodplain	21400	1404.19	1422.84	1419.14	1424.92	0.004773	11.58	1847.77	170.21	0.62
89.5	Floodway	21400	1404.19	1422.84	1419.14	1424.92	0.004773	11.58	1847.77	170.21	0.62
89	Floodplain	21400	1402.86	1422.04	1418.55	1424.02	0.004545	11.28	1896.95	179.39	0.61
89	Floodway	21400	1402.86	1422.04	1418.55	1424.02	0.004545	11.28	1896.95	179.39	0.61
88.5	Floodplain	21400	1401.08	1417.46	1417.46	1422.3	0.011807	17.67	1211.24	124.15	1.00
88.5	Floodway	21400	1401.08	1417.46	1417.46	1422.3	0.011807	17.67	1211.24	124.15	1.00
88.4	Floodplain	21400	1401.35	1416.92	1416.57	1421.68	0.006252	17.52	1221.8	117.33	0.96
88.4	Floodway	21400	1401.35	1416.92	1416.57	1421.68	0.006258	17.52	1221.4	117.32	0.96
88	Floodplain	21400	1401.09	1415.56	1415.56	1420.68	0.02307	18.16	1178.19	114.36	1.00
88	Floodway	21400	1401.09	1415.56	1415.56	1420.68	0.023045	18.16	1178.58	114.37	1.00
87.9	Floodplain	21400	1398.48	1413.09	1413.09	1418.1	0.024013	17.95	1192.02	118.75	1.00
87.9	Floodway	21400	1398.48	1413.09	1413.09	1418.1	0.024013	17.95	1192.02	118.75	1.00
87.4	Floodplain	21400	1392.56	1411.75	1405.83	1413.63	0.005446	11.01	1943.26	135.93	0.51
87.4	Floodway	21400	1392.56	1411.75	1405.83	1413.63	0.005446	11.01	1943.26	135.93	0.51
87.3	Floodplain	21400	1394	1411	1406.2	1413.07	0.008974	11.55	1852.27	140.75	0.56
87.3	Floodway	21400	1394	1411	1406.2	1413.07	0.008974	11.55	1852.27	140.75	0.56
87	Floodplain	21400	1391.98	1410.14	1404.08	1411.85	0.00655	10.49	2040.41	145.03	0.49
87	Floodway	21400	1391.98	1410.14	1404.07	1411.85	0.00655	10.49	2040.41	145.03	0.49
86.5	Floodplain	21400	1391	1407.15	1402.96	1409.39	0.011709	12.01	1781.8	138.59	0.59
86.5	Floodway	21400	1391	1407.15	1402.96	1409.39	0.011709	12.01	1781.8	138.59	0.59
86.4	Floodplain	21400	1390	1407.04	1401.65	1408.82	0.007344	10.72	1996.78	147.07	0.51
86.4	Floodway	21400	1390	1407.04	1401.65	1408.82	0.007344	10.72	1996.78	147.07	0.51
86.3	Floodplain	21400	1391	1406.17	1401.71	1408.2	0.009422	11.43	1872.2	148.85	0.57
86.3	Floodway	21400	1391	1406.17	1401.71	1408.2	0.009422	11.43	1872.2	148.85	0.57
86	Floodplain	21400	1386.09	1402.67	1401.73	1406.25	0.021605	15.18	1409.51	148.56	0.87
86	Floodway	21400	1386.09	1402.67	1401.73	1406.25	0.021605	15.18	1409.51	148.56	0.87
85.4	Floodplain	21400	1387.36	1401.43	1397.25	1402.92	0.008427	9.79	2184.93	199.82	0.52
85.4	Floodway	21400	1387.36	1401.43	1397.25	1402.92	0.008427	9.79	2184.93	199.82	0.52
85	Floodplain	21400	1381.93	1400.18	1394.23	1401.15	0.003759	7.9	2710.31	229.86	0.41
85	Floodway	21400	1381.93	1400.18	1394.23	1401.15	0.003758	7.9	2710.34	229.86	0.41
84	Floodplain	21400	1377.3	1399.5	1387.98	1399.89	0.001677	5.12	4333.04	325.74	0.21
84	Floodway	21400	1377.3	1399.5	1387.98	1399.89	0.001677	5.12	4333.04	325.74	0.21

NORTH

SCALE 1" = 200'

200 0 200 400

SCALE FEET

LEGEND

- RM 0007 / 1464.040 — ELEVATION REFERENCE MARKER (REFERENCED FROM 1995 FIS)
- 1490 — TOPO CONTOUR
- ZONE A AND ZONE AE
- ZONE AE FLOODWAY
- SHADED ZONE X
- 84 — HEC-RAS CROSS SECTION
- LIMIT OF DETAILED STUDY
- 1430 — BASE FLOOD ELEVATION
- PROPOSED IMPROVEMENTS

DATE:
APP'D
DATE
CCW
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DESCRIPTION
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DATE

DESIGN:
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ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 06-26-13
PLOT TIME: 09:41:52

G.C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BOULEVARD - LAS VEGAS, NV 89146
T: 702.804.8000 F: 702.804.8299 GCWALLACE.COM

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CLARK COUNTY, NEVADA
DEPARTMENT OF PUBLIC WORKS

MUDDY RIVER LOGANDALE LEVEE

CLOMR

WORK MAP HEC-RAS MODEL

DRAWING
FIGURE-4
OF SHTS

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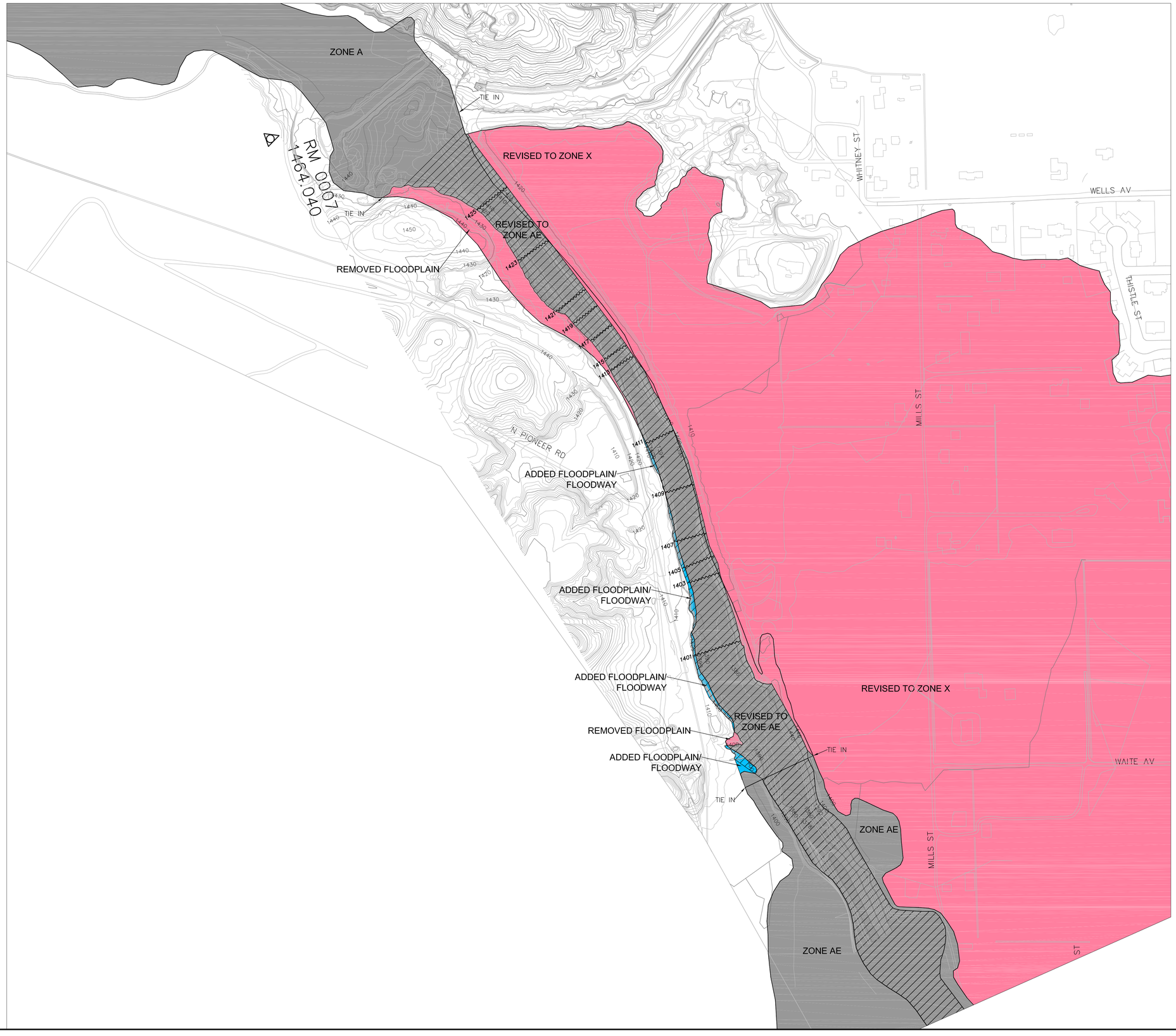

NORTH

SCALE 1" = 200'

200 0 200 400

SCALE FEET

LEGEND

RM 0007 1464.040	ELEVATION REFERENCE MARKER (REFERENCED FROM 1995 FIS)
1490	TOPO CONTOUR
	ZONE A AND ZONE AE
	ZONE AE FLOODWAY
	SHADED ZONE X
	REMOVED SFHA FLOODPLAIN
	ADDED SFHA FLOODPLAIN / FLOODWAY
1430	BASE FLOOD ELEVATION

DATE:

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

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ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 06-24-13
PLOT TIME: 14:34:56

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1555 S. RAINBOW BOULEVARD · LAS VEGAS, NV 89146
T: 702.804.2000 · F: 702.804.2299 · GCWALLACE.COM

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CLARK COUNTY, NEVADA
DEPARTMENT OF PUBLIC WORKS
MUDDY RIVER LOGANDALE LEVEE
CLOMR
REVISED FIRM

DRAWING
FIGURE-5
OF SHTS

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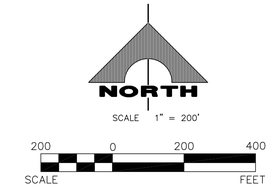

LEGEND

RM 0007 1464.040	ELEVATION REFERENCE MARKER (REFERENCED FROM 1995 FIS)
1490	TOPO CONTOUR
	ZONE A AND ZONE AE
	ZONE AE FLOODWAY
	SHADED ZONE X
1430	BASE FLOOD ELEVATION

DATE:

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

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PLOT TIME: 14:35:51

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

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CLARK COUNTY, NEVADA
DEPARTMENT OF PUBLIC WORKS
MUDDY RIVER LOGANDALE LEVEE
CLOMR
ANNOTATED FIRM

DRAWING
FIGURE-6
OF SHTS

2. FEMA FORMS

MT-2 Form 1: Overview & Concurrence Form
MT-2 Form 2: Riverine Hydrology & Hydraulics Form
MT-2 Form 3: Riverine Structures Form
Payment Information Form

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

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☒ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
320003	Clark County	NV	32003C	1105F	11/16/11

2. a. Flooding Source: Muddy River

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: Muddy River Logandale Levee

4. FEMA zone designations affected: A (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☒ Physical Change ☒ Improved Methodology/Data ☐ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☒ Hydraulic Analysis ☐ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☒ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
   ☒ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☐ Channelization ☒ Levee/Floodwall ☐ Bridge/Culvert

☐ Dam ☒ Fill ☐ Other (Attach Description)

6. ☒ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $6,050

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: John Catanese	Company: Clark County Public Works Department	
Mailing Address: 500 S. Grand Central Pkwy Las Vegas, NV 89155-4000	Daytime Telephone No.: (702)455-6050	Fax No.: (702)455-6113
	E-Mail Address: catanese@clarkcountynv.gov	
Signature of Requester (required):	Date:	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: John Catanese, Associate Engineer	Community Name: Clark County	
Mailing Address: 500 S. Grand Central Pkwy Las Vegas, NV 89155-4000	Daytime Telephone No.: (702)455-6050	Fax No.: (702)455-6113
	E-Mail Address: catanese@clarkcountynv.gov	
Community Official's Signature (required):	Date:	

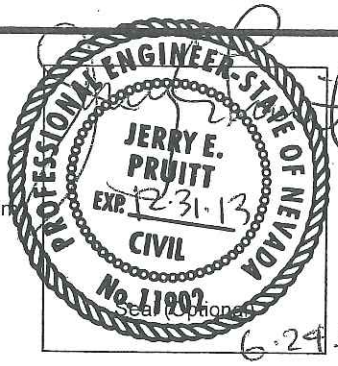
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Jerry E. Pruitt, PE	License No.: 11902	Expiration Date: 12/31/13	
Company Name: G.C. Wallace, Inc.	Telephone No.: (702)804-2011	Fax No.: (702)804-2299	
Signature: Jerry E Pruitt	Date: 6-24-13	E-Mail Address: jpruitt@gcwallace.com	

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans



6-29-13

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

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Muddy River

Note: Fill out one form for each flooding source studied

A. HYDROLOGY

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

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

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

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)

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

☐ Statistical Analysis of Gage Records ☐ Precipitation/Runoff Model → Specify Model: _____
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters), and documentation to support the new analysis.

4. Review/Approval of Analysis

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

5. Impacts of Sediment Transport on Hydrology

Is the hydrology for the revised flooding source(s) affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation..

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit*	39,825' above Fish & Game Diversion Structure	84 (AX)	1399.5	1399.5
Upstream Limit*	Wells Siding, 43,175' above Fish & Game	91.4	1428.7	1426.9

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: HEC-RAS

3. Pre-Submittal Review of Hydraulic Models*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name: MRLEVEEDUP.PRJ	Plan Name: MRLEVEEDUP.GO1	File Name: N/A	Plan Name: N/A	NAVD88
Corrected Effective Model*	File Name: MRLEVEECOR.PRJ	Plan Name: MRLEVEECOR.G09	File Name: N/A	Plan Name: N/A	NAVD88
Existing or Pre-Project Conditions Model	File Name: N/A	Plan Name: N/A	File Name: N/A	Plan Name: N/A	N/A
Revised or Post-Project Conditions Model	File Name: MRLEVEEPRO.PRJ	Plan Name: MRLEVEEPRO.G01	File Name: MRLEVEEPRO.PRJ	Plan Name: MRLEVEEPRO.G01	NAVD88
Other - (attach description)	File Name: N/A	Plan Name: N/A	File Name: N/A	Plan Name: N/A	N/A

* For details, refer to the corresponding section of the instructions.

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic work map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☒ Digital Mapping (GIS/CADD) Data Submitted (preferred)

Topographic Information: Topography/Survey

Source: AeroTech Mapping/GC Wallace Survey Date: November 22, 2009/January 18, 2011

Accuracy: See MT-2 Form attached.

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach a **copy of the effective FIRM and/or FBFM**, at the same scale as the original, annotated to show the boundaries of the revised 1%-and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%-and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area on revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☒ Yes ☐ No

   a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations:**

      - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot compared to pre-project conditions.
      - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.

   b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☐ Yes ☐ No

      If Yes, please attach **proof of property owner notification and acceptance (if available).** Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.

2. Does the request involve the placement or proposed placement of fill? ☒ Yes ☐ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(A)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☐ No

   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being established. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA).

For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA. Please see the MT-2 instructions for more detail.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

MT-2 FORM 2 ATTACHMENT

MT-2 Form 2

C. This is to certify that all work accomplished in the conduct of this CLOMR was done in accordance with the Statement of Work and General Provisions of Contract 500.887, and all amendments thereto, together with all such modifications, either written or oral, as the Regional PO and/or the Contracting Officer or their representatives have directed, such as modifications affecting this contract, and that all such work has been accomplished in accordance with sound and accepted engineering practices within the contract provisions for respective phases of work. Topographic data on work maps and exhibits is certified to represent existing conditions and to be accurate to the best of my knowledge as per Volume 2, Section 2.1.5 Guidelines and Specifications for Flood Hazard Mapping Partners, FEMA, April 2003.

Jerry Pruitt, PE – Vice President
G. C. WALLACE, INC.

C. Accuracy – Topography: Aero Tech Mapping, November 22,2009, Map Accuracy: To conform to ASPRS (Class 1) for 2 foot Contours. RMSE on Contours 0.67'; RMSE Spot Elevations: 0.33' RMSE on Planimetrics 2.0'.

C. Accuracy – Survey: G.C. Wallace Survey, January 2011, Per NAC 625.775, National Map Accuracy Standards as it existed on November 14, 1997. Horizontal Accuracy: Not more than 10 percent of the points tested shall be in error by more than 1/50", measured on the publication scale. These limits of accuracy shall apply in all cases to positions of well-defined points only, being easily visible or recoverable on the ground. Vertical Accuracy: Not more than 10 percent of the elevations tested shall be in error more than one-half the contour interval.

D. #1 – Yes, but only at one location and only 0.2 foot. The increase is due to a transition and the required freeboard is met and there are no adverse impacts to adjacent properties or facilities.

D. #4 – Clark County has obtained the Section 10 Incidental Take Permit from U.S. Fish and Wildlife for all land disturbance conducted by local government on non-Federal land. The attached Incidental Take Permit is the demonstration of Endangered Species Act (ESA) compliance as the Incidental Take Permit issued by U.S. Fish and Wildlife indicated "non-Federal lands in Clark County Nevada, for cities and Clark County". The proposed flood control project is one of the "Covered Activities". Permits for construction within the Flood Zone will not be allowed until receipt of the CLOMR from FEMA. Supporting information has been included with this document in the attached Supporting Documentation 4.4.

DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. NO. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20598-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program; Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Muddy River

Note: Fill out one form for each flooding source studied.

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization.....complete Section B
Bridge/Culvert.....complete Section C
Dam.....complete Section D
Levee/Floodwall.....complete Section E
Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: Logandale Levee

   Type (check one): ☐ Channelization ☐ Bridge/Culvert ☒ Levee/Floodwall ☐ Dam

   Location of Structure: 40,350' above the Fish and Game Diversion Structure

   Downstream Limit/Cross Section: 85.4

   Upstream Limit/Cross Section: 91.4

2. Name of Structure: _____

   Type (check one): ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

3. Name of Structure: _____

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.

B. CHANNELIZATION

Flooding Source: Muddy River

Name of Structure: Logandale Levee

1. Hydraulic Considerations

The channel was designed to carry 21,400 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

☒ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☒ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☒ At Transitions

☐ Other locations (specify): _____

2. Channel Design Plans

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Accessory Structures

The channelization includes (check one):

☒ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections

☐ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Energy dissipator

☐ Weir ☐ Other (Describe):

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport? ☐ Yes ☒ No

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

C. BRIDGE/CULVERT

Flooding Source: _____

Name of Structure: _____

1. This revision reflects (check one):

☐ Bridge/culvert not modeled in the FIS

☐ Modified bridge/culvert previously modeled in the FIS

☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): _____
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☐ Dimensions (height, width, span, radius, length)
☐ Shape (culverts only)
☐ Material
☐ Beveling or Rounding
☐ Wing Wall Angle
☐ Skew Angle
☐ Distances Between Cross Sections
☐ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☐ Top of Road Elevations – Upstream and Downstream
☐ Structure Invert Elevations – Upstream and Downstream
☐ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport? ☐ Yes ☐ No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.

D. DAM/BASIN

Flooding Source: _____
Name of Structure: _____

1. This request is for (check one): ☐ Existing dam/basin ☐ New dam/basin ☐ Modification of existing dam/basin

2. The dam/basin was designed by (check one): ☐ Federal agency ☐ State agency ☐ Private organization ☐ Local government agency

   Name of the agency or organization: _____

3. The Dam was permitted as (check one): ☐ Federal Dam ☐ State Dam

   Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

   Permit or ID number _____ Permitting Agency or Organization _____

   a. ☐ Local Government Dam ☐ Private Dam

   Provided related drawings, specification and supporting design information.

4. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

   Was the dam/basin designed using critical duration storm? (must account for the maximum volume of runoff)

   ☐ Yes, provide supporting documentation with your completed Form 2.

   ☐ No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why debris/sediment analysis was not considered?

6. Does the Base Flood Elevation behind the dam/basin or downstream of the dam/basin change? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

	Stillwater Elevation Behind the Dam/Basin	
FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)	_____	_____
50-year (2%)	_____	_____
100-year (1%)	_____	_____
500-year (0.2%)	_____	_____
Normal Pool Elevation	_____	_____

7. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL

1. System Elements

a. This Levee/Floodwall analysis is based on (check one): ☒ upgrading of an existing levee/floodwall system ☐ a newly constructed levee/floodwall system ☐ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☒ earthen embankment, dike, berm, etc. Station 14+50 to 41+00
☐ structural floodwall Station _____ to _____
☐ Other (describe): Station _____ to _____

c. Structural Type (check one): ☐ monolithic cast-in place reinforced concrete ☐ reinforced concrete masonry block ☐ sheet piling ☐ Other (describe): _____

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☒ No

If Yes, by which agency? _____

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures. Sheet Numbers: C1 thru C4
2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers: C6 thru C9
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers: C7, S1
4. A layout detail for the embankment protection measures. Sheet Numbers: C1 thru C4
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, Floodwall structure, closure structures, and pump stations. Sheet Numbers: C11 thru C13, S2

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout	☒ Yes	☐ No
3.5 feet or more at the upstream end	☒ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☒ Yes	☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☐ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☐ No

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☒ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☒ exists ☐ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device
27+25	Left	18" IRR	1406.1	Flap Gate

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope land side is: 2.5:1

b. The maximum levee slope flood side is: 1.5:1

c. The range of velocities along the levee during the base flood is: 8 (min.) to 18 (max.)

d. Embankment material is protected by (describe what kind): Reinforced Concrete Lining and Heavy Riprap

e. Riprap Design Parameters (check one): ☒ Velocity ☐ Tractive stress
Attach references

Reach	Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
					D_{100}	D_{50}	Thickness	
Sta 25+00 to 25+50	2:1	16.5	17.7	Straig		24"	48"	48"
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

(Extend table on an added sheet as needed and reference each entry)

f. Is a bedding/filter analysis and design attached? ☒ Yes ☐ No

g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Standard Reinforced Concrete Lining.

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:
See section 5.3.2 and Table 5-3 in Section 5.2 of the geotechnical report.

☒ Overall height: Sta.: 18+00, height 10.1 ft.

☒ Limiting foundation soil strength:

Strength ϕ = 30 degrees, c = 100 psf

Slope: SS = 2 (h) to 1 (v)

(Repeat as needed on an added sheet for additional locations)

b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):
Spencer's Method

c. Summary of stability analysis results: Stability analysis described in Section 5.3 with results presented in 5.3.4.

E. LEVEE/FLOODWALL (CONTINUED)

5. Embankment And Foundation Stability (continued)

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction	Sta18+00 = 1.6 Sta23+00 =1.5	1.3
II	Sudden drawdown	Sta18+00 = 1.2 Sta23+00 =1.1	1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage	Sta18+00 = 2.0 Sta23+00 =1.9	1.4
VI	Earthquake (Case I)	Sta18+00 = 1.3 Sta23+00 =1.2	1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

d. Was a seepage analysis for the embankment performed? ☒ Yes ☐ No

If Yes, describe methodology used: Finite Element Modeling. Steady State w/ 100-yr WSE. See Section 5.3.

e. Was a seepage analysis for the foundation performed? ☒ Yes ☐ No

f. Were uplift pressures at the embankment landside toe checked? ☒ Yes ☐ No

g. Were seepage exit gradients checked for piping potential? ☒ Yes ☐ No

h. The duration of the base flood hydrograph against the embankment is 20 hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one): ☐ UBC (1988) ☐ Other (specify): _____

b. Stability analysis submitted provides for: ☐ Overturning ☐ Sliding If not, explain: _____

c. Loading included in the analyses were: ☐ Lateral earth @ P_A = _____ psf; P_p = _____ psf

☐ Surcharge-Slope @ _____, ☐ surface _____ psf

☐ Wind @ P_w = _____ psf

☐ Seepage (Uplift); _____ ☐ Earthquake @ P_{eq} = _____ %g

☐ 1%-annual-chance significant wave height: _____ ft.

☐ 1%-annual-chance significant wave period: _____ sec.

d. Summary of Stability Analysis Results: Factors of Safety.
Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)
Note: (Extend table on an added sheet as needed and reference)

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability (continued)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☒ Yes ☐ No

b. The computed range of settlement is N/A ft. to _____ ft.

c. Settlement of the levee crest is determined to be primarily from : ☐ Foundation consolidation ☐ Embankment compression ☒ Other (Describe): see attach

d. Differential settlement of floodwalls ☐ has ☒ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: _____ acres
Draining to ponding area: _____ acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: _____ cfs

e. Which flooding conditions were analyzed?

• Gravity flow (Interior Watershed)	☐ Yes	☐ No
• Common storm (River Watershed)	☐ Yes	☐ No
• Historical ponding probability	☐ Yes	☐ No
• Coastal wave overtopping	☐ Yes	☐ No

If No for any of the above, attach explanation.

e. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is _____ cfs

h. The length of levee system used to drive this seepage rate in item g: _____ ft.

E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☒ No

If Yes, include the number of pumping plants: _____ For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☒ is not a problem

Hydrocompaction ☐ is ☒ is not a problem

Heave differential movement due to soils of high shrink/swell ☐ is ☒ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:
N/A

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☒ No Attach supporting documentation

d. Sediment Transport Considerations:

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

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☒ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?
☒ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?
☒ Yes ☐ No If the answer is No to any of the above, please attach supporting documentation.

E. LEVEE/FLOODWALL (CONTINUED)

11. Maintenance Plan

Please attach a copy of the fomal maintenance plan for the levee/floodwall

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

CERTIFICATION OF THE LEVEE DOCUMENTION

This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: _____ License No.: _____ Expiration Date: _____

Company Name: _____ Telephone No.: _____ Fax No.: _____

Signature: _____ Date: _____ E-Mail Address: _____

F. SEDIMENT TRANSPORT

Flooding Source: _____

Name of Structure: _____

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume _____ acre-feet

Debris load associated with the base flood discharge: Volume _____ acre-feet

Sediment transport rate _____ (percent concentration by volume)

Method used to estimate sediment transport: _____

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition: _____

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport: _____

Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

MT-2 FORM 3 ATTACHMENT

MT-2 Form 3

B. #1 – Hydraulic jump is controlled by reinforced concrete lining of the slope and providing 10.9-feet of freeboard on the levee.
B. #4 – There is no opportunity for significant sediment to build up along the proposed system, therefore sedimentation was not considered for design.
E. #4g – Reinforced concrete slope protection
E. #6 – Not applicable.
E. #8 – Not applicable.
E. #9d – There is no opportunity for significant sediment to build up along the proposed system, therefore sedimentation was not considered for design.

E. #7c – The existing levee has been in place for approximately 100 years. The proposed levee height is approximately the same as the existing; therefore, load related settlement within the clay foundation soils is expected to already have occurred. Any rebound settlement resulting from levee removal and replacement is expected to be elastic and completed during construction.

FEDERAL EMERGENCY MANAGEMENT AGENCY

PAYMENT INFORMATION FORM

Community Name: Clark County

Project Identifier: Muddy River Logandale Levee

THIS FORM MUST BE MAILED, ALONG WITH THE APPROPRIATE FEE, TO THE ADDRESS BELOW OR FAXED TO THE FAX NUMBER BELOW.

Type of Request:

☐ MT-1 application
☒ MT-2 application

LOMC Clearinghouse
7390 Coca Cola Drive
Suite 204
Hanover, MD 21076

☐ EDR application

FEMA Project Library
847 South Pickett St.
Alexandria, VA 22304
FAX (703) 212-4090

Request No.: _____ (if known)

Amount: $6,050.00

☐ INITIAL FEE* ☒ FINAL FEE ☐ FEE BALANCE** ☐ MASTER CARD ☐ VISA ☒ CHECK ☐ MONEY ORDER

*Note: Check only for EDR and/or Alluvial Fan requests (as appropriate).

**Note: Check only if submitting a corrected fee for an ongoing request.

COMPLETE THIS SECTION ONLY IF PAYING BY CREDIT CARD

CARD NUMBER

☐☐☐☐ — ☐☐☐☐ — ☐☐☐☐ — ☐☐☐☐

1 2 3 4 — 5 6 7 8 — 9 10 11 12 — 13 14 15 16

EXP. DATE

☐☐ — ☐☐

Month — Year

_____ _____

Date Signature

NAME *(AS IT APPEARS ON CARD)*: _____
(please print or type)

ADDRESS: _____
(for your credit card receipt-please print or type) _____

DAYTIME PHONE: _____

ORIGINAL DOCUMENT PRINTED ON CHEMICAL REACTIVE PAPER WITH MICROPRINTED BORDER

103089

G.C. WALLACE, INC.
ENGINEERS | PLANNERS | SURVEYORS
1555 SOUTH RAINBOW BLVD.
LAS VEGAS, NEVADA 89146
(702) 804-2000 FAX (702) 804-2293

NEVADA STATE BANK
P.O. Box 990
Las Vegas, NV 89125-0990

94-77/1224

June 20, 2013

AMOUNT

Six Thousand Fifty and 00/100 Dollars

PAY TO THE ORDER OF

National Flood Insurance Program

VOID AFTER 180 DAYS

6,050.00

Details on back. Security Features Included.

DOCUMENT INCLUDES A HIDDEN WORD. DO NOT CASH IF THE WORD VOID IS VISIBLE. ALSO INCLUDES AN ORIGINAL WATERMARK

⑈103089⑈ ⑆122400779⑆ 055202328⑈

G.C. WALLACE, INC. - Engineers | Planners | Surveyors - 1555 S. Rainbow Blvd. - Las Vegas, Nevada 89146

103089

Check Date: 6/20/2013

Invoice Number	Date	Voucher	Amount	Discounts	Previous Pay	Net Amount
JP500887	6/17/2013	000000142021	6,050.00			6,050.00
National Flood Insurance Program		TOTAL	6,050.00			6,050.00
110101	1	10237				

103089

3.1 HYDRAULIC MODELING COMPUTATIONS

HEC-RAS Model: Duplicate Effective Model with CheckRAS
HEC-RAS Model: Corrected Effective Model with CheckRAS
HEC-RAS Model: Post Project Model with CheckRAS

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X     X
X     X  X        X           X   X     X   X    X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X      X    X       X
X     X  X        X    X      X   X     X    X       X
X     X  XXXXXX    XXXX       X    X    X    X   XXXXX
```

PROJECT DATA
Project Title: MRLEVEE DUPLICATE EFFECTIVE
Project File : MRLEVEEDUP.prj
Run Date and Time: 6/20/2013 1:39:55 PM

Project in English units

Project Description:
DUPLICATE EFFECTIVE MODEL CONVERTED FROM FLOOD HAZARD MAPPING STUDY AND FIS
HEC-2

PLAN DATA

Plan Title: Plan 02
Plan File : f:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-DupEff\MRLEVEEDUP.p02

Geometry Title: DUP
Geometry File : f:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-DupEff\MRLEVEEDUP.g01

Flow Title : DUP
Flow File : f:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-DupEff\MRLEVEEDUP.f01

Plan Summary Information:
Number of: Cross Sections = 6 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed at all cross sections
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: DUP
Flow File : f:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-DupEff\MRLEVEEDUP.f01

Flow Data (cfs)

River	Reach	RS	PF 1
RIVER-1	Reach-1	88	21400

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
RIVER-1	Reach-1	PF 1	Known WS = 1416.4	Known WS = 1399.5

GEOMETRY DATA

Geometry Title: DUP
Geometry File : f:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-DupEff\MRLEVEEDUP.g01

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 88

INPUT
Description:
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1458.92	1422	1474.92	1420	1477.82	1418	1480.81	1416	1483.74	1414
1486.74	1412	1489.77	1410	1492.77	1408	1495.89	1406	1499.51	1404.14
1499.78	1404	1550.63	1402	1566.74	1402	1570.1	1404	1572.55	1406
1575.06	1408	1577.61	1410	1580.11	1412	1582.59	1414	1585.15	1416
1624.26	1418	1627.75	1420	1631.22	1422	1634.67	1424	1638.05	1426
1641.46	1428	1655.4	1430	1663.89	1432	1686.35	1432	1686.41	1432
1719.54	1430	1731.41	1430	1737.89	1432	1743.34	1434	1747.84	1436
1752.32	1438	1795.57	1440						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1458.92	.05	1458.92	.04	1585.15	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1458.92	1585.15	601	545	479	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1421.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.13	Wt. n-Val.		0.040	0.050
W.S. Elev (ft)	1416.37	Reach Len. (ft)	601.00	545.00	479.00
Crit W.S. (ft)	1415.96	Flow Area (sq ft)		1177.83	1.34
E.G. Slope (ft/ft)	0.010542	Area (sq ft)		1177.83	1.34
Q Total (cfs)	21400.00	Flow (cfs)		21398.67	1.33
Top Width (ft)	112.13	Top Width (ft)		104.89	7.24
Vel Total (ft/s)	18.15	Avg. Vel. (ft/s)		18.17	0.99
Max Chl Dpth (ft)	14.37	Hydr. Depth (ft)		11.23	0.19
Conv. Total (cfs)	208430.9	Conv. (cfs)		208418.0	12.9
Length Wtd. (ft)	544.51	Wetted Per. (ft)		113.29	7.25
Min Ch El (ft)	1402.00	Shear (lb/sq ft)		6.84	0.12
Alpha	1.00	Stream Power (lb/ft s)	1795.57	0.00	0.00
Frctn Loss (ft)	7.75	Cum Volume (acre-ft)	3.67	99.39	3.43
C & E Loss (ft)	0.43	Cum SA (acres)	0.65	6.38	0.93

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 87

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
3425.07	1416	3436.31	1417.28	3455.28	1416	3482.77	1400	3489.13	1392
3498.24	1389.5	3509.21	1392	3547.84	1396	3561.92	1400	3569.26	1404
3579.87	1408	3589.12	1412	3609.53	1413.45	3634.29	1416	3641.56	1420
3659.07	1423	3680.59	1420	3684.3	1416	3754.33	1414.67	3842.42	1416
3919.56	1416	3933.12	1420	3945.31	1424	3960.99	1428	3976.2	1432
3986.87	1436	4050.22	1440	4098.69	1440				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
3425.07	.05	3482.77	.08	3561.92	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3482.77	3561.92	517.6	531.37	537.92	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1413.31	Element			
Vel Head (ft)	3.70	Wt. n-Val.	0.050	0.080	0.050
W.S. Elev (ft)	1409.62	Reach Len. (ft)	517.60	531.37	537.92
Crit W.S. (ft)	1407.41	Flow Area (sq ft)	79.42	1232.15	97.27
E.G. Slope (ft/ft)	0.020297	Area (sq ft)	79.42	1232.15	97.27
Q Total (cfs)	21400.00	Flow (cfs)	869.05	19477.30	1053.65
Top Width (ft)	117.35	Top Width (ft)	16.52	79.15	21.68
Vel Total (ft/s)	15.19	Avg. Vel. (ft/s)	10.94	15.81	10.83
Max Chl Dpth (ft)	20.11	Hydr. Depth (ft)	4.81	15.57	4.49
Conv. Total (cfs)	150208.2	Conv. (cfs)	6100.0	136712.7	7395.6
Length Wtd. (ft)	531.10	Wetted Per. (ft)	19.11	84.39	23.77
Min Ch El (ft)	1389.50	Shear (lb/sq ft)	5.27	18.50	5.19
Alpha	1.03	Stream Power (lb/ft s)	4098.69	0.00	0.00
Frctn Loss (ft)	8.66	Cum Volume (acre-ft)	3.13	84.31	2.89
C & E Loss (ft)	0.36	Cum SA (acres)	0.54	5.23	0.77

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 86

INPUT
Description:
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
3674.02	1407.3	3687.68	1408	3724.06	1411.96	3746.13	1408	3756.25	1400
3768.48	1392	3793.81	1388	3827.85	1384	3837.08	1381.25	3849.87	1384
3858.08	1387.8	3864.77	1388	3873.52	1392	3881.01	1400	3885.53	1404
3893.83	1408	3936.63	1410.49	3954.29	1412	3979.96	1414.35	4006.98	1412
4044.61	1408	4181.61	1408	4265.05	1412	4293.52	1416	4311.15	1420
4323.1	1424	4344.4	1432	4359.2	1436	4380.46	1440	4412.73	1444
4447.35	1448	4468.04	1452	4485.19	1456	4504.81	1460	4526.62	1464
4546.4	1468	4567.35	1472						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
3674.02	.05	3768.48	.08	3873.52	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3768.48	3873.52	250.05	253.87 252.67	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1404.30	Element			
Vel Head (ft)	2.51	Wt. n-Val.	0.050	0.080	0.050
W.S. Elev (ft)	1401.79	Reach Len. (ft)	250.05	253.87	252.67
Crit W.S. (ft)	1397.68	Flow Area (sq ft)	72.86	1584.86	45.19
E.G. Slope (ft/ft)	0.013375	Area (sq ft)	72.86	1584.86	45.19
Q Total (cfs)	21400.00	Flow (cfs)	648.04	20407.13	344.83
Top Width (ft)	129.05	Top Width (ft)	14.50	105.04	9.51
Vel Total (ft/s)	12.57	Avg. Vel. (ft/s)	8.89	12.88	7.63
Max Chl Dpth (ft)	20.54	Hydr. Depth (ft)	5.03	15.09	4.75
Conv. Total (cfs)	185037.8	Conv. (cfs)	5603.3	176452.8	2981.6
Length Wtd. (ft)	253.76	Wetted Per. (ft)	17.50	107.99	13.66
Min Ch El (ft)	1381.25	Shear (lb/sq ft)	3.48	12.25	2.76
Alpha	1.02	Stream Power (lb/ft s)	4567.35	0.00	0.00
Frctn Loss (ft)	1.89	Cum Volume (acre-ft)	2.22	67.13	2.01
C & E Loss (ft)	0.49	Cum SA (acres)	0.36	4.11	0.58

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 85.5

INPUT
Description:
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1000	1406.6	1068.59	1404.79	1157.75	1404.74	1163.85	1408	1184.76	1411.02
1198.73	1408	1210.63	1400	1224.94	1392	1248.37	1388	1260.16	1384
1268.81	1380	1274.97	1379.62	1280.03	1380	1299.81	1384	1346.77	1387.63
1394.9	1388	1411.21	1392	1418.4	1400	1424.93	1404	1434.71	1408
1452.98	1408.8	1478.63	1410.26	1495.68	1408	1558.75	1407.12	1594.86	1408
1695.99	1412	1759.48	1416	1809.79	1420	1849.45	1424	1870.16	1428
1895.51	1432	1908.17	1436	1921.92	1440	1947.64	1444		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1000	.05	1224.94	.08	1411.21	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1224.94	1411.21	250.56	257.04 256.98	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1401.93	Element			
Vel Head (ft)	0.88	Wt. n-Val.	0.050	0.080	0.050
W.S. Elev (ft)	1401.04	Reach Len. (ft)	250.56	257.04	256.98
Crit W.S. (ft)	1393.71	Flow Area (sq ft)	72.96	2747.39	37.14
E.G. Slope (ft/ft)	0.004721	Area (sq ft)	72.96	2747.39	37.14
Q Total (cfs)	21400.00	Flow (cfs)	375.09	20870.25	154.66
Top Width (ft)	211.02	Top Width (ft)	15.86	186.27	8.89
Vel Total (ft/s)	7.49	Avg. Vel. (ft/s)	5.14	7.60	4.16

Max Chl Dpth (ft)	21.42	Hydr. Depth (ft)	4.60	14.75	4.18
Conv. Total (cfs)	311442.6	Conv. (cfs)	5458.8	303732.9	2250.9
Length Wtd. (ft)	256.95	Wetted Per. (ft)	18.26	189.20	12.75
Min Ch El (ft)	1379.62	Shear (lb/sq ft)	1.18	4.28	0.86
Alpha	1.01	Stream Power (lb/ft s)	1947.64	0.00	0.00
Frctn Loss (ft)	0.93	Cum Volume (acre-ft)	1.80	54.50	1.77
C & E Loss (ft)	0.08	Cum SA (acres)	0.27	3.26	0.53

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 85

INPUT
Description:
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
3574.05	1404	3592.4	1404	3608.3	1400	3613.25	1396	3621.65	1392
3635.44	1388	3652.86	1384	3691.32	1380	3709.4	1378.79	3726.06	1380
3742.29	1384	3786.84	1384	3799.78	1384	3809.83	1388	3818.75	1392
3828	1400	3830.89	1404	3898.3	1408	3909.31	1408.35	3920.63	1408
3976.8	1408	4043.4	1411.59	4085.72	1412	4129.54	1416	4175.8	1420
4186.02	1424	4221.05	1428	4243.75	1432	4288.63	1436	4355.28	1436
4368.57	1432	4377.16	1428	4388.07	1424	4396.29	1420	4600.41	1420

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
3574.05	.05	3621.65	.08	3818.75	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3621.65	3818.75	414.07	449.02	430.64	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1400.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.63	Wt. n-Val.	0.050	0.080	0.050
W.S. Elev (ft)	1400.30	Reach Len. (ft)	414.07	449.02	430.64
Crit W.S. (ft)	1390.59	Flow Area (sq ft)	64.43	3290.22	39.78
E.G. Slope (ft/ft)	0.002836	Area (sq ft)	64.43	3290.22	39.78
Q Total (cfs)	21400.00	Flow (cfs)	249.04	21015.46	135.50
Top Width (ft)	221.09	Top Width (ft)	14.53	197.10	9.46
Vel Total (ft/s)	6.30	Avg. Vel. (ft/s)	3.87	6.39	3.41
Max Chl Dpth (ft)	21.51	Hydr. Depth (ft)	4.43	16.69	4.20
Conv. Total (cfs)	401835.3	Conv. (cfs)	4676.3	394614.6	2544.3
Length Wtd. (ft)	447.57	Wetted Per. (ft)	16.88	200.52	12.60
Min Ch El (ft)	1378.79	Shear (lb/sq ft)	0.68	2.91	0.56
Alpha	1.01	Stream Power (lb/ft s)	4600.41	0.00	0.00
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)	1.41	36.69	1.55
C & E Loss (ft)	0.07	Cum SA (acres)	0.18	2.13	0.47

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 84

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

2536.21	1402.2	2661.93	1402.15	3042.1	1400.51	3095.34	1401.09	3102.49	1400
3126.85	1380	3160.53	1377.3	3208.81	1380	3308.85	1384	3329.29	1388
3333.64	1392	3343.01	1396	3391.96	1396	3413.24	1396	3431.07	1400
3461.59	1402.4	3477.77	1402.24	3531.18	1403.16	3570.5	1404	3581.84	1404.36
3598.01	1408	3598.56	1412	3608.48	1416	3624.2	1420	3658.86	1420
3689.76	1420	3693.45	1424	3716.39	1424				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
2536.21	.05	3126.85	.08	3343.01	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
3126.85	3343.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1399.89	Element			
Vel Head (ft)	0.39	Wt. n-Val.	0.050	0.080	0.050
W.S. Elev (ft)	1399.50	Reach Len. (ft)			
Crit W.S. (ft)	1387.98	Flow Area (sq ft)	231.57	3828.36	273.11
E.G. Slope (ft/ft)	0.001677	Area (sq ft)	231.57	3828.36	273.11
Q Total (cfs)	21400.00	Flow (cfs)	1083.11	19600.11	716.78
Top Width (ft)	325.74	Top Width (ft)	23.75	216.16	85.83
Vel Total (ft/s)	4.94	Avg. Vel. (ft/s)	4.68	5.12	2.62
Max Chl Dpth (ft)	22.20	Hydr. Depth (ft)	9.75	17.71	3.18
Conv. Total (cfs)	522641.0	Conv. (cfs)	26452.2	478683.2	17505.7
Length Wtd. (ft)		Wetted Per. (ft)	30.73	219.19	86.22
Min Ch El (ft)	1377.30	Shear (lb/sq ft)	0.79	1.83	0.33
Alpha	1.04	Stream Power (lb/ft s)	3716.39	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:RIVER-1

Reach	River Sta.	n1	n2	n3
Reach-1	88	.05	.04	.05
Reach-1	87	.05	.08	.05
Reach-1	86	.05	.08	.05
Reach-1	85.5	.05	.08	.05
Reach-1	85	.05	.08	.05
Reach-1	84	.05	.08	.05

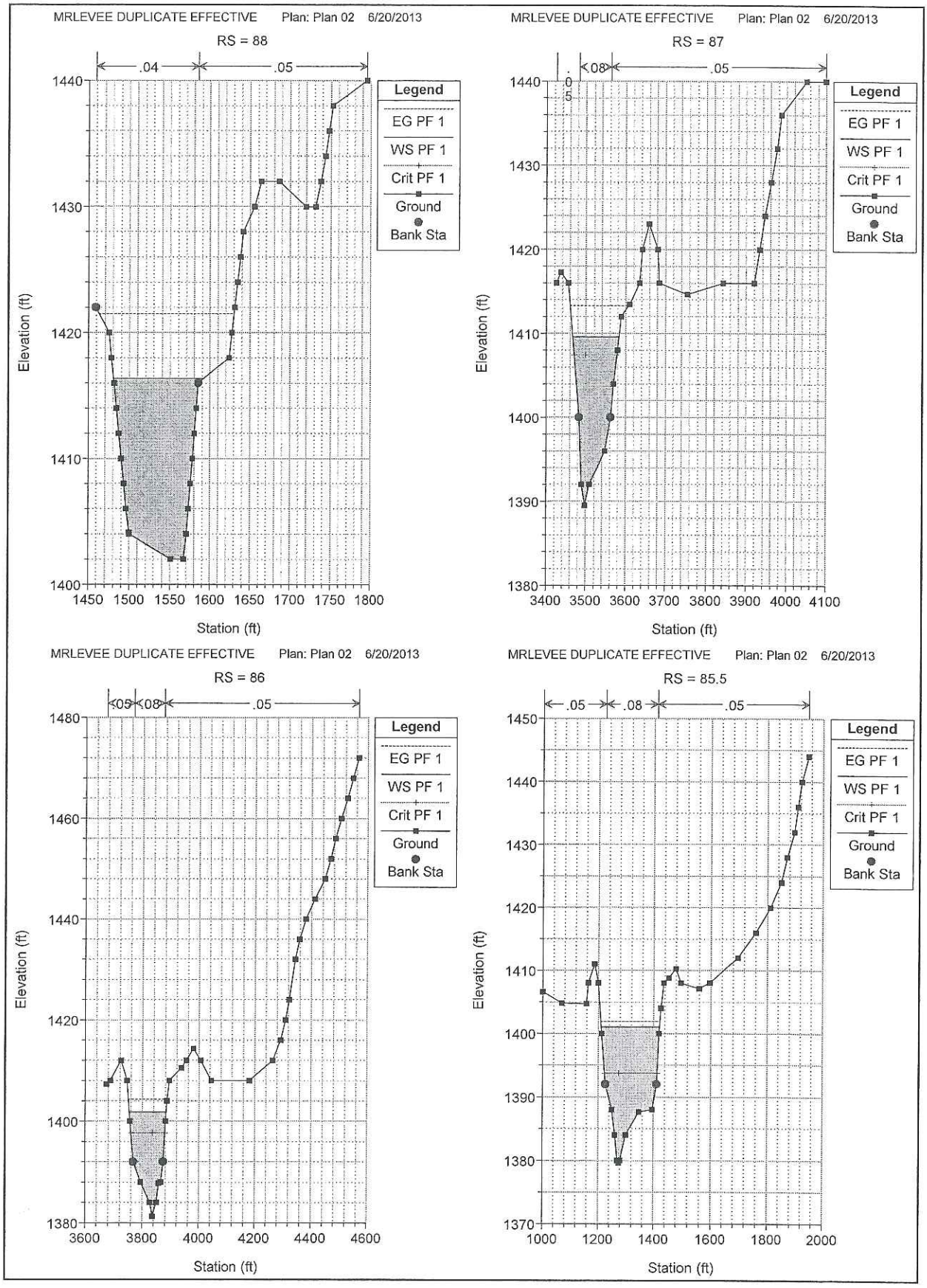
SUMMARY OF REACH LENGTHS

River: RIVER-1

Reach	River Sta.	Left	Channel	Right
Reach-1	88	601	545	479
Reach-1	87	517.6	531.37	537.92
Reach-1	86	250.05	253.87	252.67
Reach-1	85.5	250.56	257.04	256.98
Reach-1	85	414.07	449.02	430.64
Reach-1	84			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: RIVER-1

Reach	River Sta.	Contr.	Expan.
Reach-1	88	.1	.3
Reach-1	87	.1	.3
Reach-1	86	.1	.3
Reach-1	85.5	.1	.3
Reach-1	85	.1	.3
Reach-1	84	.1	.3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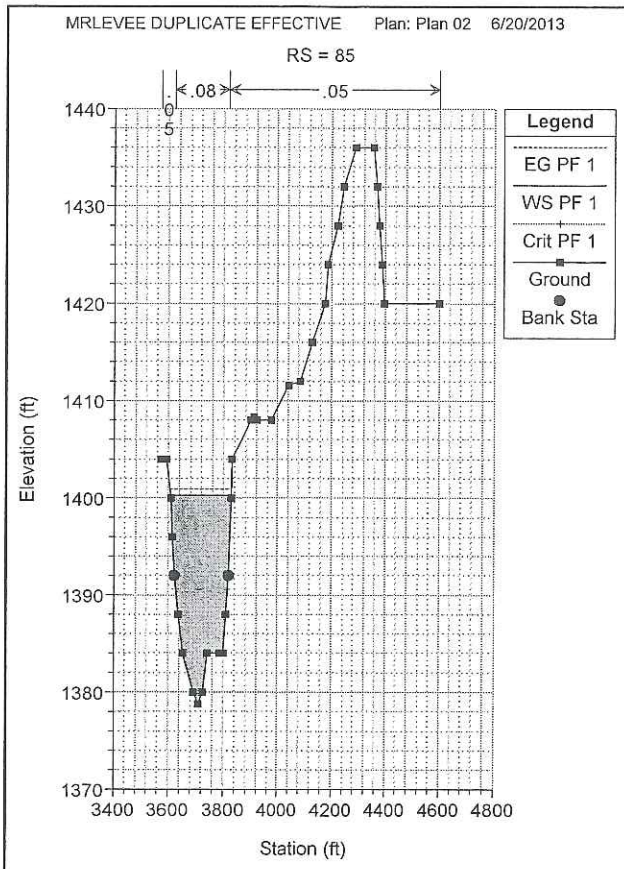
RS = 88
.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE DUPLICATE EFFECTIVE Plan: Plan 02 6/20/2013
RS = 87
.08
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE DUPLICATE EFFECTIVE Plan: Plan 02 6/20/2013
RS = 86
.05
.08
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE DUPLICATE EFFECTIVE Plan: Plan 02 6/20/2013
RS = 85.5
.05
.08
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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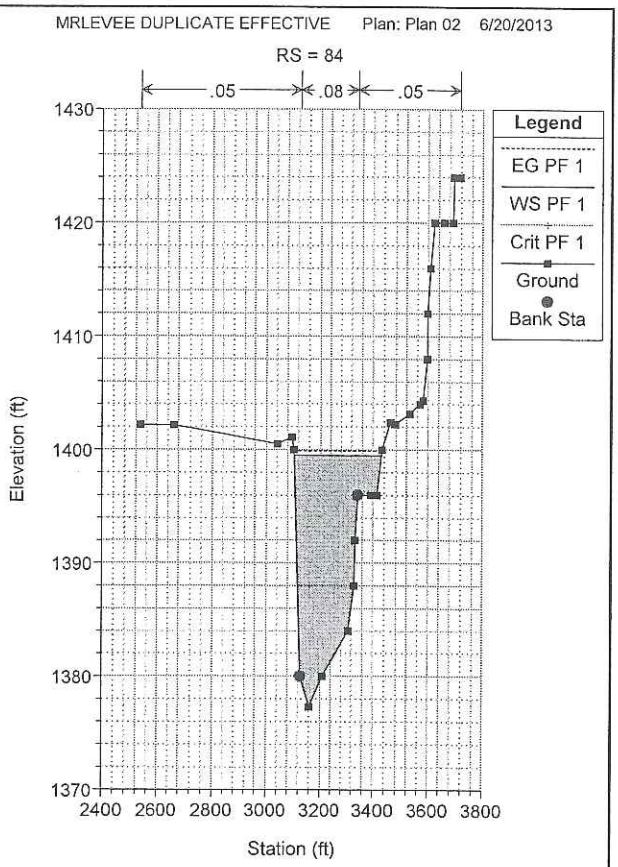
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1440
1430
1420
1410
1400
1390
1380
1370
3400 3600 3800 4000 4200 4400 4600 4800


MRLEVEE DUPLICATE EFFECTIVE Plan: Plan 02 6/20/2013
RS = 84
.05
.08
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1430
1420
1410
1400
1390
1380
1370
2400 2600 2800 3000 3200 3400 3600 3800

HEC-RAS Plan: Plan 02 River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	88	PF 1	21400.00	1402.00	1416.37	1415.96	1421.50	0.010542	18.17	1179.17	112.13	0.96
Reach-1	87	PF 1	21400.00	1389.50	1409.62	1407.41	1413.31	0.020297	15.81	1408.83	117.35	0.71
Reach-1	86	PF 1	21400.00	1381.25	1401.79	1397.68	1404.30	0.013375	12.88	1702.92	129.05	0.58
Reach-1	85.5	PF 1	21400.00	1379.62	1401.04	1393.71	1401.93	0.004721	7.60	2857.49	211.02	0.35
Reach-1	85	PF 1	21400.00	1378.79	1400.30	1390.59	1400.92	0.002836	6.39	3394.43	221.09	0.28
Reach-1	84	PF 1	21400.00	1377.30	1399.50	1387.98	1399.89	0.001677	5.12	4333.04	325.74	0.21

MRLEVEE DUPLICATE EFFECTIVE Plan: Plan 02 6/20/2013

RIVER-1 Reach-1

Legend

EG PF 1

WS PF 1

Crit PF 1

Ground

Elevation (ft)

1430

1420

1410

1400

1390

1380

1370

0

500

1000

1500

2000

2500

Main Channel Distance (ft)

85

85.5

86

87

88

cHECk-RAS Report

HEC-RAS Project:	*mrleveedup.prj*
Plan File:	*mrleveedup.p02*
Geometry File:	*mrleveedup.g01*
Flow File:	*mrleveedup.f01*
Report Date:	*6/21/2013*

Message ID	Message	Cross sections affected	Comments
MP SW 01DK	The name of the stream is ($streamname$). The flow regime is subcritical or mixed flow. Starting water-surface elevations are computed from Known WSELs as the downstream boundary condition. Provide backup information on Known water-surface elevations or use same energy slope for all the profiles as the starting boundary condition and rerun the plan.		Per effective model. Backup information on starting WSE included.
NT RC 05	The left overbank n-value of $nlob$ and the right overbank n-value of $nrob$ are less than or equal to the channel n-value of nch. Follow the procedure in (FHWA, 1984) to compute the n-value for the natural floodplain and the channel. Or follow the procedure in (USGS, 1977) to compute the n-value for urban development. Please submit supporting information on the evaluation of n-values.	84; 85; 85.5; 86; 87	n values per 1995 FIS Restudy Muddy River. Backup information included.
XS DC 02	Constant discharge used for the entire profile for $assignedname$ flood. At least two discharges should be selected; one at the mouth and the other at the middle of the watershed or above the confluence of a tributary. Or provide explanation why only one discharge should be used. Other flood frequencies should also be checked.		Flow unchanged from effective model.
XS SW 01DK	The name of the stream is $streamname$. The flow regime is subcritical or mixed flow. Starting WSEL is computed from Known WSEL as the downstream boundary for $Assigned_Name$ flood. Provide backup information on Known WSEL or use energy slope as the downstream boundary.	84	Per effective model. Backup information on starting WSE included.

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX        XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X     X    X   X
XXXXXXX  XXXX     X       XXX XXXX      XXXXXX    XXXX
X     X  X        X           X  X      X    X       X
X     X  X        X    X      X   X     X    X       X
X     X  XXXXXX    XXXX       X    X    X    X   XXXXX
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PROJECT DATA
Project Title: MRLEVEE-CORRECTED EFFECTIVE
Project File : MRLEVEECOR.prj
Run Date and Time: 6/21/2013 5:34:18 PM

Project in English units

PLAN DATA

Plan Title: Corrected Effective
Plan File : F:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-CorrEff\MRLEVEECOR.p09

Geometry Title: COR
Geometry File : F:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-CorrEff\MRLEVEECOR.g09

Flow Title : COR
Flow File : F:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-CorrEff\MRLEVEECOR.f03

Plan Description:
Corrected Effective Model

Plan Summary Information:

Number of:	Cross Sections	= 14	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculation tolerance	= 0.01
Maximum number of iterations	= 20
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options
Critical depth computed at all cross sections
Conveyance Calculation Method: Between every coordinate point (HEC2 Style)
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: COR
Flow File : F:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-CorrEff\MRLEVEECOR.f03

Flow Data (cfs)

River	Reach	RS	PF 1
RIVER-1	Reach-1	91.4	21400

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
RIVER-1	Reach-1	PF 1	Critical	Known WS = 1399.5

GEOMETRY DATA

Geometry Title: COR
Geometry File : F:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-CorrEff\MRLEVEECOR.g09

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 91.4

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1428.4	34.85	1426	131.63	1417	135.12	1416	159.91	1413.73
175.24	1413.22	194.63	1414.62	211.68	1415.07	238.43	1415.54	309.85	1416
370.52	1419.84	408.23	1425	424.13	1429	446.57	1429.68	476.6	1433
508.47	1433.09								

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.025	34.85	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	424.13	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1429.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.43	Wt. n-Val.		0.040	
W.S. Elev (ft)	1428.68	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1422.02	Flow Area (sq ft)		4082.19	
E.G. Slope (ft/ft)	0.000896	Area (sq ft)		4082.19	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	422.86	Top Width (ft)		422.86	
Vel Total (ft/s)	5.24	Avg. Vel. (ft/s)		5.24	
Max Chl Dpth (ft)	15.46	Hydr. Depth (ft)		9.65	
Conv. Total (cfs)	714770.0	Conv. (cfs)		714770.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		424.88	
Min Ch El (ft)	1413.22	Shear (lb/sq ft)		0.54	
Alpha	1.00	Stream Power (lb/ft s)	508.47	0.00	0.00
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	5.73	160.99	1.43
C & E Loss (ft)	0.02	Cum SA (acres)	0.73	12.62	0.50

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 91

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1421.33	11.5	1421.87	32.6	1428.49	58.3	1428.08	81.6	1417.47
154.4	1413.4	167.9	1410.09	174	1408.74	182.1	1409.62	186.6	1411.32
247.6	1415.03	261.1	1415.75	287.9	1415.94	294.9	1420.67	317.3	1427.15
340.6	1427.08	351.4	1431.62	397.1	1432.05	408.9	1432.11		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	167.9	.04	247.6	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
58.3	317.3	195	173	137	.1	.3

Left Levee Station= 32.6 Elevation= 1428.49

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1428.97	Element			
Vel Head (ft)	0.68	Wt. n-Val.	0.050	0.045	0.050
W.S. Elev (ft)	1428.30	Reach Len. (ft)	195.00	173.00	137.00
Crit W.S. (ft)	1421.01	Flow Area (sq ft)	1.49	3237.55	29.32
E.G. Slope (ft/ft)	0.001346	Area (sq ft)	1.49	3237.55	29.32
Q Total (cfs)	21400.00	Flow (cfs)	0.37	21364.71	34.92
Top Width (ft)	298.85	Top Width (ft)	13.66	259.00	26.20
Vel Total (ft/s)	6.55	Avg. Vel. (ft/s)	0.25	6.60	1.19
Max Chl Dpth (ft)	19.56	Hydr. Depth (ft)	0.11	12.50	1.12
Conv. Total (cfs)	583316.3	Conv. (cfs)	10.1	582354.4	951.8
Length Wtd. (ft)	175.46	Wetted Per. (ft)	13.66	264.82	26.44
Min Ch El (ft)	1408.74	Shear (lb/sq ft)	0.01	1.03	0.09
Alpha	1.01	Stream Power (lb/ft s)	408.90	32.60	0.00
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	5.73	152.59	1.40
C & E Loss (ft)	0.04	Cum SA (acres)	0.71	11.84	0.47

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 90.5

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1416.14	59.8	1416.45	70.1	1418.53	79.5	1418.64	104.6	1427.34
130.6	1426.99	173.1	1410.48	225.8	1409.92	232.6	1406.06	244.9	1406.49
247.1	1407.71	251.3	1410.63	278.4	1411.52	323.1	1429.45	350.7	1429.72
369.8	1430.37								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	225.8	.04	251.3	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
130.6	323.1	183	167	165	.1	.3

Left Levee Station= 104.6 Elevation= 1427.34

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1428.70	Element			
Vel Head (ft)	0.53	Wt. n-Val.	0.050	0.049	
W.S. Elev (ft)	1428.17	Reach Len. (ft)	183.00	167.00	165.00
Crit W.S. (ft)	1420.03	Flow Area (sq ft)	1066.88	2690.25	
E.G. Slope (ft/ft)	0.001252	Area (sq ft)	1066.88	2690.25	
Q Total (cfs)	21400.00	Flow (cfs)	4844.95	16555.05	

Top Width (ft)	319.92	Top Width (ft)	130.60	189.32	
Vel Total (ft/s)	5.70	Avg. Vel. (ft/s)	4.54	6.15	
Max Chl Dpth (ft)	22.11	Hydr. Depth (ft)	8.17	14.21	
Conv. Total (cfs)	604852.7	Conv. (cfs)	136938.3	467914.4	
Length Wtd. (ft)	168.81	Wetted Per. (ft)	144.31	197.90	
Min Ch El (ft)	1406.06	Shear (lb/sq ft)	0.58	1.06	
Alpha	1.05	Stream Power (lb/ft s)	369.80	104.60	0.00
Frctn Loss (ft)	0.42	Cum Volume (acre-ft)	3.34	140.82	1.35
C & E Loss (ft)	0.20	Cum SA (acres)	0.39	10.95	0.42

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 90

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1415.24	55.6	1415.43	63.3	1416.55	73	1417.13	97.9	1426.29
124.4	1426.5	195.6	1404.89	197.7	1405.95	199.9	1407.74	212.8	1409.51
218	1408.03	228.2	1410.87	248.3	1416.37	264.5	1417.75	281.5	1428.48
306.5	1428.36	314.9	1428.52						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	195.6	.04	228.2	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
124.4	281.5	205	213	.1	.3

Left Levee Station= 124.4 Elevation= 1426.5

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1428.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.50	Wt. n-Val.		0.048	
W.S. Elev (ft)	1425.59	Reach Len. (ft)	205.00	213.00	213.00
Crit W.S. (ft)	1422.46	Flow Area (sq ft)		1687.82	
E.G. Slope (ft/ft)	0.007061	Area (sq ft)		1687.82	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	149.52	Top Width (ft)		149.52	
Vel Total (ft/s)	12.68	Avg. Vel. (ft/s)		12.68	
Max Chl Dpth (ft)	20.70	Hydr. Depth (ft)		11.29	
Conv. Total (cfs)	254670.6	Conv. (cfs)		254670.6	
Length Wtd. (ft)	213.00	Wetted Per. (ft)		157.26	
Min Ch El (ft)	1404.89	Shear (lb/sq ft)		4.73	
Alpha	1.00	Stream Power (lb/ft s)	314.90	124.40	0.00
Frctn Loss (ft)	1.56	Cum Volume (acre-ft)	1.10	132.42	1.35
C & E Loss (ft)	0.01	Cum SA (acres)	0.11	10.30	0.42

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water surface
whose main channel velocity head was the closest to the previously computed cross section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 89.5

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1414.27	48.7	1414.21	58.2	1415.6	68.6	1416.22	94.9	1425.42
126.8	1425.99	192.2	1404.19	194.4	1405.36	196.8	1406.92	203	1405.89
228.4	1407.8	230.7	1410.51	244.9	1411.37	273.4	1420.99	297.8	1424.48
320.2	1425.16	334.2	1425.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	192.2	.04	228.4	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
126.8	297.8	179	188	203	.1	.3

Left Levee Station= 126.8 Elevation= 1425.99

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1426.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.45	Wt. n-Val.		0.048	
W.S. Elev (ft)	1424.06	Reach Len. (ft)	179.00	188.00	203.00
Crit W.S. (ft)	1420.83	Flow Area (sq ft)		1703.16	
E.G. Slope (ft/ft)	0.007569	Area (sq ft)		1703.16	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	162.31	Top Width (ft)		162.31	
Vel Total (ft/s)	12.56	Avg. Vel. (ft/s)		12.56	
Max Chl Dpth (ft)	19.87	Hydr. Depth (ft)		10.49	
Conv. Total (cfs)	245981.0	Conv. (cfs)		245981.0	
Length Wtd. (ft)	188.00	Wetted Per. (ft)		169.53	
Min Ch El (ft)	1404.19	Shear (lb/sq ft)		4.75	
Alpha	1.00	Stream Power (lb/ft s)	334.20	126.80	0.00
Frctn Loss (ft)	1.15	Cum Volume (acre-ft)	1.10	124.13	1.35
C & E Loss (ft)	0.16	Cum SA (acres)	0.11	9.54	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 89

INPUT
Description:
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1413.3	53.4	1413.88	68.9	1414.39	93.9	1424.51	117.9	1424.6
128.4	1423.36	153.6	1409.34	170.2	1405.21	173.1	1404.72	175.5	1405.3
183.6	1407.11	186.9	1405.67	192.8	1402.86	194.1	1404.16	195.2	1405.35
203.1	1404.21	222.4	1407.04	236.8	1412.08	258.6	1417.88	285.6	1418.67
299.5	1422.44	305	1425.63	331	1426.22	348.8	1425.85	431.2	1435.95
462.5	1439.74								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	153.6	.04	222.4	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
117.9	305	347	335	320	.1	.3

Left Levee Station= 117.9 Elevation= 1424.6

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1425.20	Element			
Vel Head (ft)	1.91	Wt. n-Val.		0.046	
W.S. Elev (ft)	1423.29	Reach Len. (ft)	347.00	335.00	320.00
Crit W.S. (ft)	1419.40	Flow Area (sq ft)		1930.52	
E.G. Slope (ft/ft)	0.005072	Area (sq ft)		1930.52	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	172.44	Top Width (ft)		172.44	
Vel Total (ft/s)	11.09	Avg. Vel. (ft/s)		11.09	
Max Chl Dpth (ft)	20.43	Hydr. Depth (ft)		11.20	
Conv. Total (cfs)	300476.6	Conv. (cfs)		300476.6	
Length Wtd. (ft)	335.00	Wetted Per. (ft)		181.52	
Min Ch El (ft)	1402.86	Shear (lb/sq ft)		3.37	
Alpha	1.00	Stream Power (lb/ft s)	462.50	117.90	0.00
Frctn Loss (ft)	3.58	Cum Volume (acre-ft)	1.10	116.29	1.35
C & E Loss (ft)	0.36	Cum SA (acres)	0.11	8.82	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 88

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1412.81	2.2	1412.49	10.4	1411.2	59.7	1412.52	74.8	1413.66
94	1422.37	134	1421.9	160.2	1403.83	187.9	1402.93	188.1	1402.36
201.8	1401.09	206.9	1401.6	229.3	1401.7	247.1	1418.17	277.4	1417.15
285.7	1417.21	304.5	1429.39	331.1	1433.92				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	160.2	.08	229.3	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
134	247.1	340.3	320.7	294.7	.1	.3

Left Levee Station= 94 Elevation= 1422.37

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1421.26	Element			
Vel Head (ft)	5.54	Wt. n-Val.		0.070	
W.S. Elev (ft)	1415.72	Reach Len. (ft)	340.30	320.70	294.70
Crit W.S. (ft)	1415.72	Flow Area (sq ft)		1132.80	
E.G. Slope (ft/ft)	0.035406	Area (sq ft)		1132.80	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	

Top Width (ft)	101.48	Top Width (ft)		101.48	
Vel Total (ft/s)	18.89	Avg. Vel. (ft/s)		18.89	
Max Chl Dpth (ft)	14.62	Hydr. Depth (ft)		11.16	
Conv. Total (cfs)	113730.8	Conv. (cfs)		113730.8	
Length Wtd. (ft)	320.70	Wetted Per. (ft)		111.17	
Min Ch El (ft)	1401.09	Shear (lb/sq ft)		22.52	
Alpha	1.00	Stream Power (lb/ft s)	331.10	94.00	0.00
Frctn Loss (ft)	5.05	Cum Volume (acre-ft)	1.10	104.51	1.35
C & E Loss (ft)	0.99	Cum SA (acres)	0.11	7.76	0.42

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 87.4

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1410.53	36.9	1411.52	45.3	1412.32	65.4	1418.23	98	1417.65
125.2	1395.49	131.7	1392.56	189.8	1393.03	200.1	1394.69	230.9	1414.19
254.7	1414.49	258.5	1414.57	280.8	1425.97	282.7	1426.71		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	125.2	.08	189.8	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
98	230.9	260.7	224.3	184.3	.1	.3

Left Levee Station= 65.4 Elevation= 1418.23

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1413.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.25	Wt. n-Val.		0.066	
W.S. Elev (ft)	1411.64	Reach Len. (ft)	260.70	224.30	184.30
Crit W.S. (ft)	1406.09	Flow Area (sq ft)		1779.45	
E.G. Slope (ft/ft)	0.008865	Area (sq ft)		1779.45	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	121.49	Top Width (ft)		121.49	
Vel Total (ft/s)	12.03	Avg. Vel. (ft/s)		12.03	
Max Chl Dpth (ft)	19.08	Hydr. Depth (ft)		14.65	
Conv. Total (cfs)	227285.4	Conv. (cfs)		227285.4	
Length Wtd. (ft)	224.30	Wetted Per. (ft)		132.92	
Min Ch El (ft)	1392.56	Shear (lb/sq ft)		7.41	
Alpha	1.00	Stream Power (lb/ft s)	282.70	65.40	0.00
Frctn Loss (ft)	1.44	Cum Volume (acre-ft)	1.10	93.79	1.35
C & E Loss (ft)	0.33	Cum SA (acres)	0.11	6.94	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 87

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1409.55	11.1	1410.61	29	1416.82	40.4	1417.36	46.1	1400.88
59.7	1394.77	71	1392.59	109.5	1391.98	112.5	1392.52	155.4	1392.34
160.3	1394.35	176.8	1396.33	205.2	1413.29	242.1	1414.56	262.3	1423.27
264.2	1423.87								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	59.7	.08	176.8	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
40.4	205.2	316.8	327.97 330.22	.1	.3

Left Levee Station= 40.4 Elevation= 1417.36

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1412.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.15	Wt. n-Val.		0.071	
W.S. Elev (ft)	1410.97	Reach Len. (ft)	316.80	327.97	330.22
Crit W.S. (ft)	1402.85	Flow Area (sq ft)		2486.40	
E.G. Slope (ft/ft)	0.004839	Area (sq ft)		2486.40	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	158.71	Top Width (ft)		158.71	
Vel Total (ft/s)	8.61	Avg. Vel. (ft/s)		8.61	
Max Chl Dpth (ft)	18.99	Hydr. Depth (ft)		15.67	
Conv. Total (cfs)	307625.5	Conv. (cfs)		307625.5	
Length Wtd. (ft)	327.97	Wetted Per. (ft)		172.02	
Min Ch El (ft)	1391.98	Shear (lb/sq ft)		4.37	
Alpha	1.00	Stream Power (lb/ft s)	264.20	40.40	0.00
Frctn Loss (ft)	2.07	Cum Volume (acre-ft)	1.10	82.81	1.35
C & E Loss (ft)	0.08	Cum SA (acres)	0.11	6.22	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 86.4

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	1409.14	29.4	1413.29	59.4	1412.97	62.3	1412	64.7	1410
67.1	1408	69.5	1406	71.9	1404	74.3	1402	76.7	1400
79.1	1398	81.5	1396	84.8	1394	88.1	1392	103.3	1390
168.7	1390	173.3	1392	178.3	1394	183.3	1396	186.2	1398
187.3	1400	188.3	1402	189.4	1404	190.4	1406	192.6	1408
195.1	1410	197.6	1412	246.8	1414				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	88.1	.08	173.3	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
59.4	197.6	200.8	203.4	207.7	.1	.3

Left Levee Station= 29.4 Elevation= 1413.29

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1409.97	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.99	Wt. n-Val.		0.069	
W.S. Elev (ft)	1407.97	Reach Len. (ft)	200.80	203.40	207.70
Crit W.S. (ft)	1402.00	Flow Area (sq ft)		1888.42	
E.G. Slope (ft/ft)	0.008586	Area (sq ft)		1888.42	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	125.43	Top Width (ft)		125.43	
Vel Total (ft/s)	11.33	Avg. Vel. (ft/s)		11.33	
Max Chl Dpth (ft)	17.97	Hydr. Depth (ft)		15.06	
Conv. Total (cfs)	230945.2	Conv. (cfs)		230945.2	
Length Wtd. (ft)	203.40	Wetted Per. (ft)		138.42	
Min Ch El (ft)	1390.00	Shear (lb/sq ft)		7.31	
Alpha	1.00	Stream Power (lb/ft s)	246.80	29.40	0.00
Frctn Loss (ft)	2.88	Cum Volume (acre-ft)	1.10	66.34	1.35
C & E Loss (ft)	0.21	Cum SA (acres)	0.11	5.15	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 86

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1403.35	29.6	1412.21	65.6	1412.3	85.1	1394.19	132.7	1391.7
144.1	1388.82	162.1	1386.09	231.9	1410.93	250.3	1410.46	256.9	1410.46
287.1	1411.56								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	85.1	.08	162.1	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
65.6	231.9	205.81	211.61	210.55	.1	.3

Left Levee Station= 65.6 Elevation= 1412.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1406.87	Element	Left OB	Channel	Right OB

Vel Head (ft)	4.13	Wt. n-Val.		0.067	
W.S. Elev (ft)	1402.74	Reach Len. (ft)	205.81	211.61	210.55
Crit W.S. (ft)	1402.13	Flow Area (sq ft)		1312.21	
E.G. Slope (ft/ft)	0.027726	Area (sq ft)		1312.21	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	132.98	Top Width (ft)		132.98	
Vel Total (ft/s)	16.31	Avg. Vel. (ft/s)		16.31	
Max Chl Dpth (ft)	16.65	Hydr. Depth (ft)		9.87	
Conv. Total (cfs)	128519.9	Conv. (cfs)		128519.9	
Length Wtd. (ft)	211.61	Wetted Per. (ft)		139.84	
Min Ch El (ft)	1386.09	Shear (lb/sq ft)		16.24	
Alpha	1.00	Stream Power (lb/ft s)	287.10	65.60	0.00
Frctn Loss (ft)	3.11	Cum Volume (acre-ft)	1.10	58.87	1.35
C & E Loss (ft)	0.78	Cum SA (acres)	0.11	4.55	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 85.4

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1407.15	40.7	1406.24	53.8	1410.62	79.1	1411.58	113.1	1387.86
138.9	1388.87	166.9	1388.33	176.7	1387.36	239.8	1390	264.9	1392
270.8	1394	278.8	1396	283.4	1398	285.8	1400	287.9	1402
296.3	1404	301.5	1406	305.7	1408	349.1	1410	365.3	1410
382.4	1408								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	113.1	.08	239.8	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
79.1 305.7 294.8 299.3 299.1 .1 .3
Left Levee Station= 79.1 Elevation= 1411.58

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1402.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.52	Wt. n-Val.		0.070	
W.S. Elev (ft)	1401.45	Reach Len. (ft)	294.80	299.30	299.10
Crit W.S. (ft)	1397.26	Flow Area (sq ft)		2160.80	
E.G. Slope (ft/ft)	0.009079	Area (sq ft)		2160.80	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	193.71	Top Width (ft)		193.71	
Vel Total (ft/s)	9.90	Avg. Vel. (ft/s)		9.90	
Max Chl Dpth (ft)	14.09	Hydr. Depth (ft)		11.15	
Conv. Total (cfs)	224598.3	Conv. (cfs)		224598.3	
Length Wtd. (ft)	299.30	Wetted Per. (ft)		200.49	
Min Ch El (ft)	1387.36	Shear (lb/sq ft)		6.11	
Alpha	1.00	Stream Power (lb/ft s)	382.40	79.10	0.00
Frctn Loss (ft)	1.67	Cum Volume (acre-ft)	1.10	50.43	1.35
C & E Loss (ft)	0.17	Cum SA (acres)	0.11	3.75	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 85

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-743.4	1402	0	1403.5	8.9	1402.29	59	1400.5	78.5	1400.52
96.8	1409.36	114.5	1399.15	125.8	1394.87	145.5	1390.98	158.8	1386.89
173.4	1381.93	180.5	1383.54	184.3	1385.66	219.4	1386.65	222.6	1386.17
292.6	1386.71	295.7	1387.98	320	1388.14	342.6	1400.19	348.2	1407.17
389.1	1407.09	411.3	1407.4	420.6	1409.99				

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-743.4	.05	0	.05	158.8	.08	219.4	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
96.8	348.2	414.07	449.02	430.64	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1401.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.97	Wt. n-Val.		0.059	
W.S. Elev (ft)	1400.18	Reach Len. (ft)	414.07	449.02	430.64
Crit W.S. (ft)	1394.23	Flow Area (sq ft)		2709.89	
E.G. Slope (ft/ft)	0.003760	Area (sq ft)		2709.89	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	229.85	Top Width (ft)		229.85	
Vel Total (ft/s)	7.90	Avg. Vel. (ft/s)		7.90	
Max Chl Dpth (ft)	18.25	Hydr. Depth (ft)		11.79	
Conv. Total (cfs)	348977.1	Conv. (cfs)		348977.1	
Length Wtd. (ft)	447.82	Wetted Per. (ft)		236.77	
Min Ch El (ft)	1381.93	Shear (lb/sq ft)		2.69	
Alpha	1.00	Stream Power (lb/ft s)	420.60	0.00	0.00
Frctn Loss (ft)	1.08	Cum Volume (acre-ft)	1.10	33.70	1.35
C & E Loss (ft)	0.17	Cum SA (acres)	0.11	2.30	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 84

INPUT

Description:

Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
2536.21	1402.2	2661.93	1402.15	3042.1	1400.51	3095.34	1401.09	3102.49	1400
3126.85	1380	3160.53	1377.3	3208.81	1380	3308.85	1384	3329.29	1388
3333.64	1392	3343.01	1396	3391.96	1396	3413.24	1396	3431.07	1400
3461.59	1402.4	3477.77	1402.24	3531.18	1403.16	3570.5	1404	3581.84	1404.36
3598.01	1408	3598.56	1412	3608.48	1416	3624.2	1420	3658.86	1420
3689.76	1420	3693.45	1424	3716.39	1424				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
2536.21	.05	3126.85	.08	3343.01	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
3126.85	3343.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1399.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.39	Wt. n-Val.	0.050	0.080	0.050
W.S. Elev (ft)	1399.50	Reach Len. (ft)			
Crit W.S. (ft)	1387.98	Flow Area (sq ft)	231.57	3828.36	273.11
E.G. Slope (ft/ft)	0.001673	Area (sq ft)	231.57	3828.36	273.11
Q Total (cfs)	21400.00	Flow (cfs)	1082.09	19581.64	736.27
Top Width (ft)	325.74	Top Width (ft)	23.75	216.16	85.83
Vel Total (ft/s)	4.94	Avg. Vel. (ft/s)	4.67	5.11	2.70
Max Chl Dpth (ft)	22.20	Hydr. Depth (ft)	9.75	17.71	3.18
Conv. Total (cfs)	523134.0	Conv. (cfs)	26452.2	478683.2	17998.6
Length Wtd. (ft)		Wetted Per. (ft)	30.73	219.19	86.22
Min Ch El (ft)	1377.30	Shear (lb/sq ft)	0.79	1.82	0.33
Alpha	1.04	Stream Power (lb/ft s)	3716.39	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:RIVER-1

Reach	River Sta.	n1	n2	n3	n4
Reach-1	91.4	.025	.04		
Reach-1	91	.05	.04	.05	
Reach-1	90.5	.05	.04	.05	
Reach-1	90	.05	.04	.05	
Reach-1	89.5	.05	.04	.05	
Reach-1	89	.05	.04	.05	
Reach-1	88	.05	.08	.05	
Reach-1	87.4	.05	.08	.05	
Reach-1	87	.05	.08	.05	
Reach-1	86.4	.05	.08	.05	
Reach-1	86	.05	.08	.05	
Reach-1	85.4	.05	.08	.05	
Reach-1	85	.05	.05	.08	.05
Reach-1	84	.05	.08	.05	

SUMMARY OF REACH LENGTHS

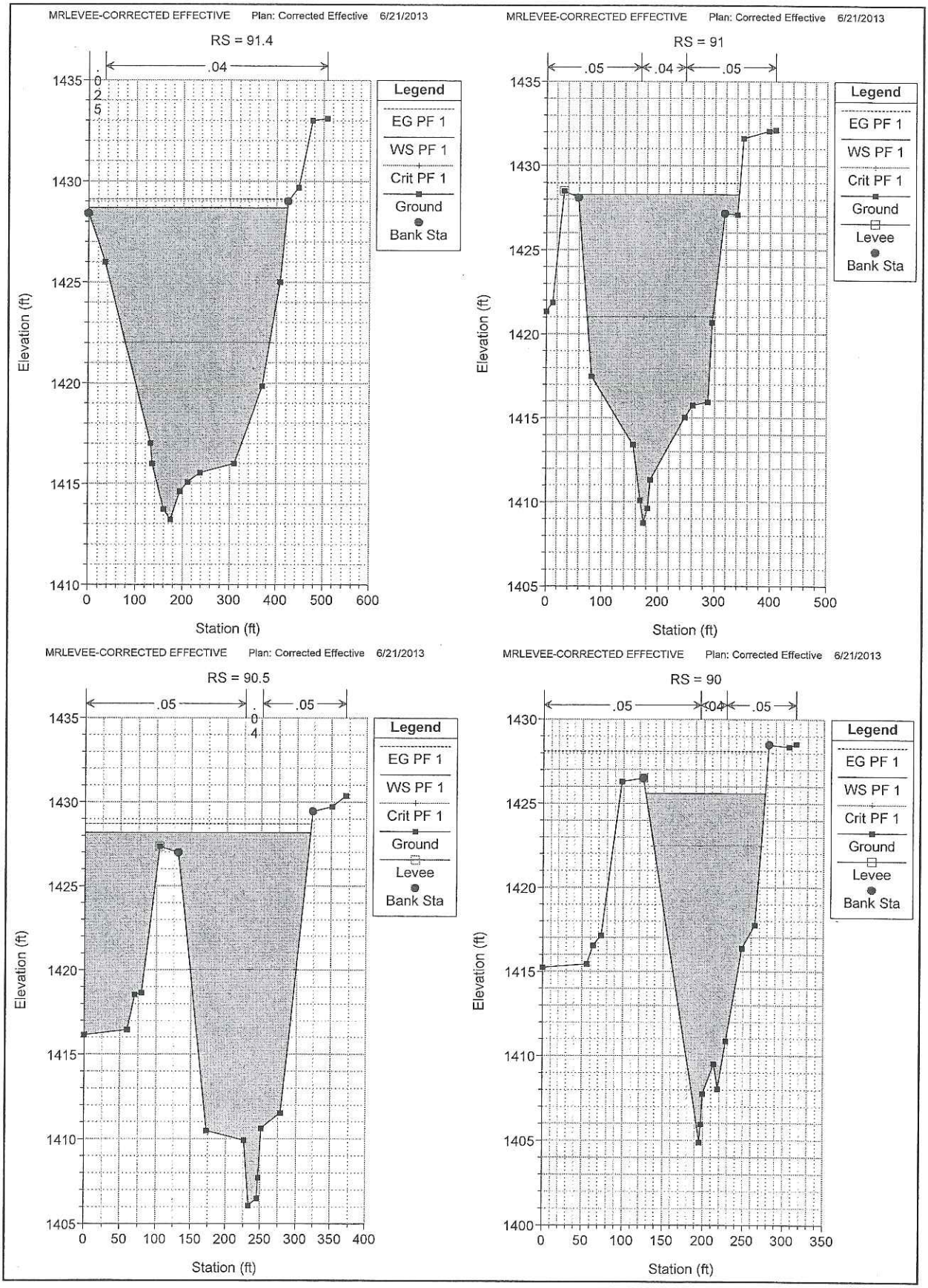
River: RIVER-1

Reach	River Sta.	Left	Channel	Right
Reach-1	91.4	100	100	100
Reach-1	91	195	173	137
Reach-1	90.5	183	167	165

Reach-1	90	205	213	213
Reach-1	89.5	179	188	203
Reach-1	89	347	335	320
Reach-1	88	340.3	320.7	294.7
Reach-1	87.4	260.7	224.3	184.3
Reach-1	87	316.8	327.97	330.22
Reach-1	86.4	200.8	203.4	207.7
Reach-1	86	205.81	211.61	210.55
Reach-1	85.4	294.8	299.3	299.1
Reach-1	85	414.07	449.02	430.64
Reach-1	84			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: RIVER-1

Reach	River Sta.	Contr.	Expan.
Reach-1	91.4	.1	.3
Reach-1	91	.1	.3
Reach-1	90.5	.1	.3
Reach-1	90	.1	.3
Reach-1	89.5	.1	.3
Reach-1	89	.1	.3
Reach-1	88	.1	.3
Reach-1	87.4	.1	.3
Reach-1	87	.1	.3
Reach-1	86.4	.1	.3
Reach-1	86	.1	.3
Reach-1	85.4	.1	.3
Reach-1	85	.1	.3
Reach-1	84	.1	.3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Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-CORRECTED EFFECTIVE Plan: Corrected Effective 6/21/2013
RS = 91
.05
.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-CORRECTED EFFECTIVE Plan: Corrected Effective 6/21/2013
RS = 90.5
.05
.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-CORRECTED EFFECTIVE Plan: Corrected Effective 6/21/2013
RS = 90
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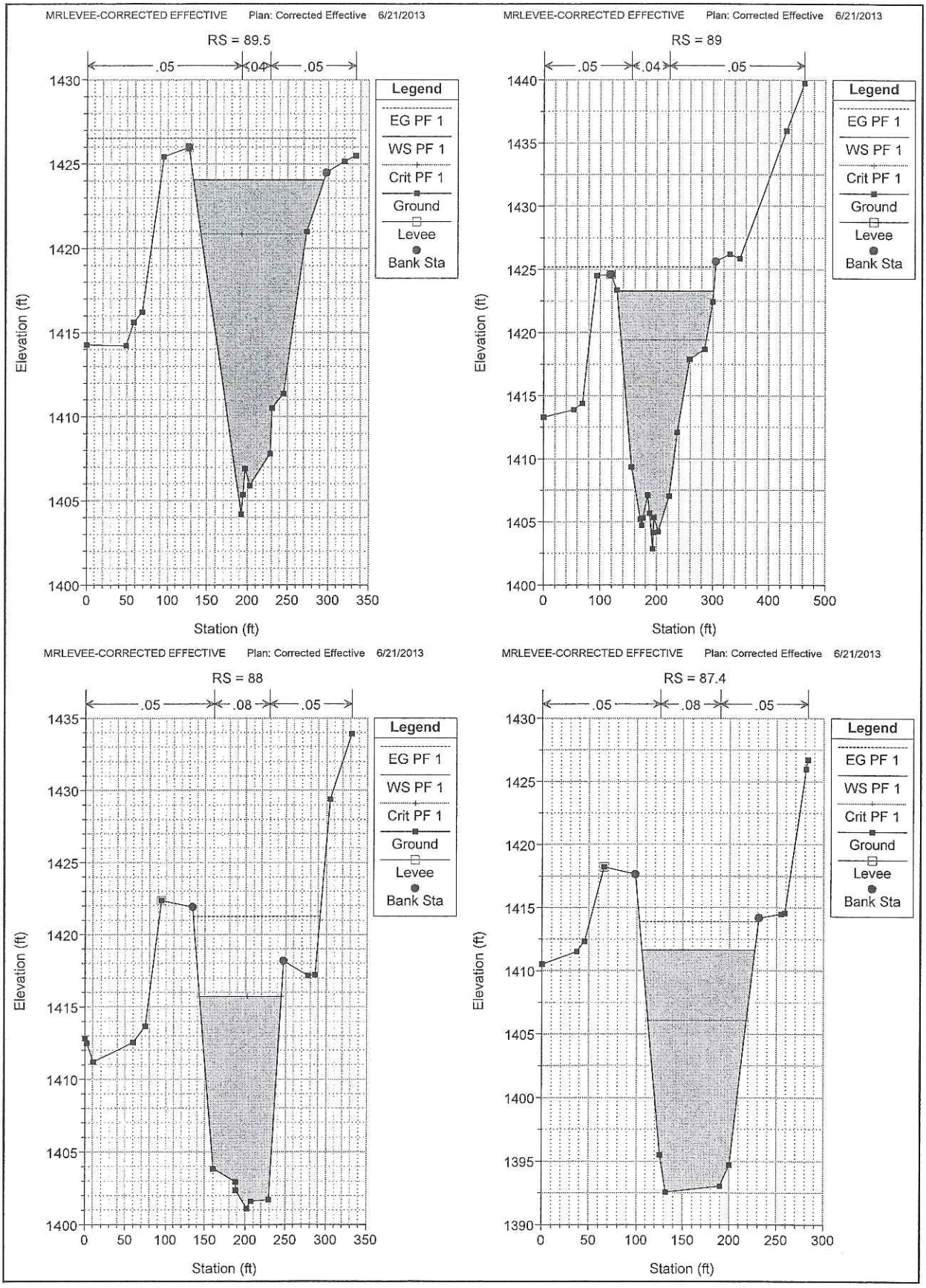
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-CORRECTED EFFECTIVE Plan: Corrected Effective 6/21/2013
RS = 89
.05
.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-CORRECTED EFFECTIVE Plan: Corrected Effective 6/21/2013
RS = 88
.05
.08
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-CORRECTED EFFECTIVE Plan: Corrected Effective 6/21/2013
RS = 87.4
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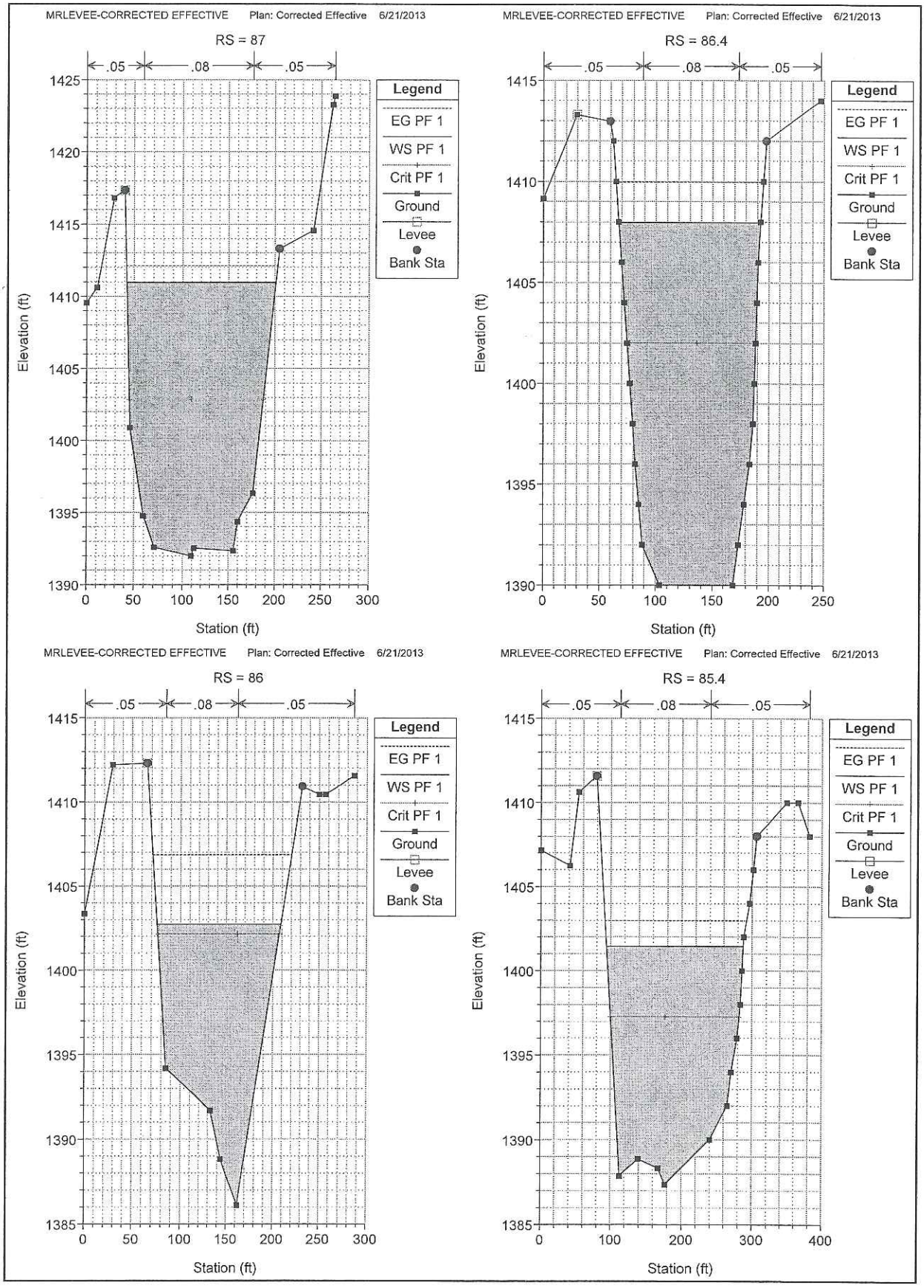
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
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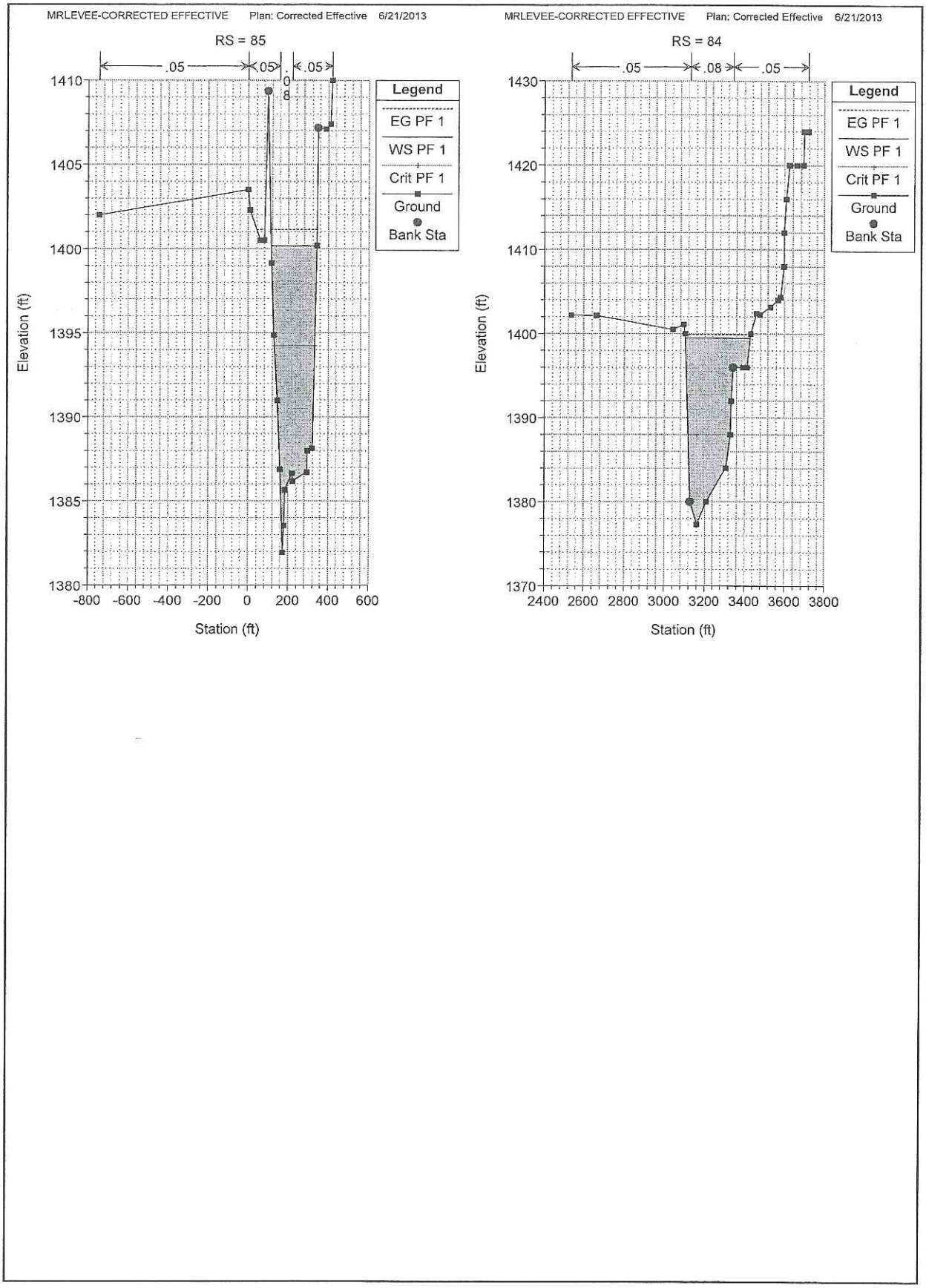
RS = 86.4
MRLEVEE-CORRECTED EFFECTIVE Plan: Corrected Effective 6/21/2013
RS = 86
MRLEVEE-CORRECTED EFFECTIVE Plan: Corrected Effective 6/21/2013
RS = 85.4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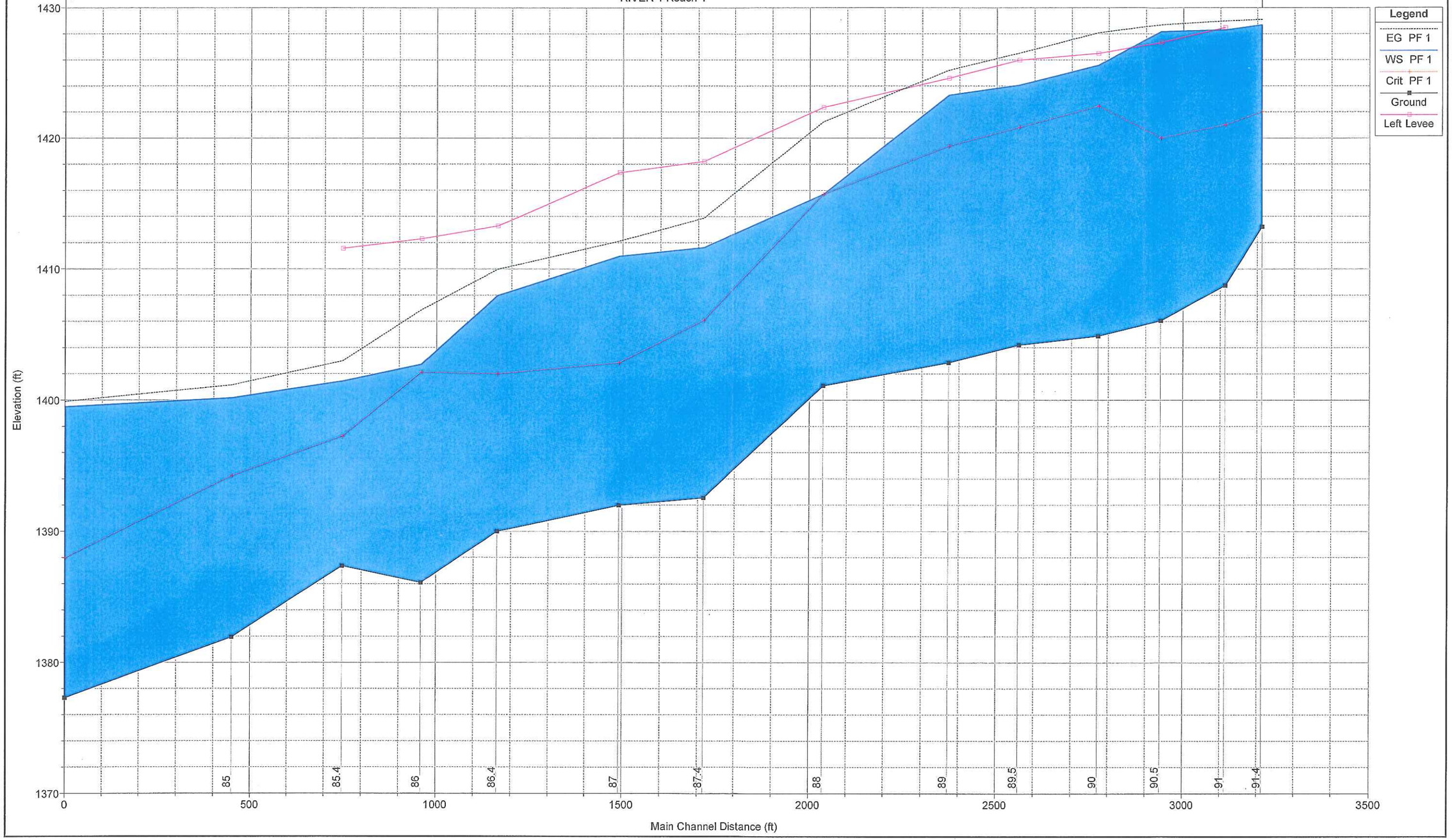
.05
0.8
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-CORRECTED EFFECTIVE Plan: Corrected Effective 6/21/2013
RS = 84
.05
.08
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

HEC-RAS Plan: COR River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	91.4	PF 1	21400.00	1413.22	1428.68	1422.02	1429.11	0.000896	5.24	4082.19	422.86	0.30
Reach-1	91	PF 1	21400.00	1408.74	1428.30	1421.01	1428.97	0.001346	6.60	3268.37	298.85	0.33
Reach-1	90.5	PF 1	21400.00	1406.06	1428.17	1420.03	1428.70	0.001252	6.15	3757.13	319.92	0.29
Reach-1	90	PF 1	21400.00	1404.89	1425.59	1422.46	1428.09	0.007061	12.68	1687.82	149.52	0.67
Reach-1	89.5	PF 1	21400.00	1404.19	1424.06	1420.83	1426.52	0.007569	12.56	1703.16	162.31	0.68
Reach-1	89	PF 1	21400.00	1402.86	1423.29	1419.40	1425.20	0.005072	11.09	1930.52	172.44	0.58
Reach-1	88	PF 1	21400.00	1401.09	1415.72	1415.72	1421.26	0.035406	18.89	1132.80	101.48	1.00
Reach-1	87.4	PF 1	21400.00	1392.56	1411.64	1406.09	1413.89	0.008865	12.03	1779.45	121.49	0.55
Reach-1	87	PF 1	21400.00	1391.98	1410.97	1402.85	1412.12	0.004839	8.61	2486.40	158.71	0.38
Reach-1	86.4	PF 1	21400.00	1390.00	1407.97	1402.00	1409.97	0.008586	11.33	1888.42	125.43	0.51
Reach-1	86	PF 1	21400.00	1386.09	1402.74	1402.13	1406.87	0.027726	16.31	1312.21	132.98	0.91
Reach-1	85.4	PF 1	21400.00	1387.36	1401.45	1397.26	1402.98	0.009079	9.90	2160.80	193.71	0.52
Reach-1	85	PF 1	21400.00	1381.93	1400.18	1394.23	1401.14	0.003760	7.90	2709.89	229.85	0.41
Reach-1	84	PF 1	21400.00	1377.30	1399.50	1387.98	1399.89	0.001673	5.11	4333.04	325.74	0.21

MRLEVEE-CORRECTED EFFECTIVE Plan: Corrected Effective 6/21/2013

RIVER-1 Reach-1



cHECk-RAS Report

HEC-RAS Project:	*mrleveecor.prj*
Plan File:	*mrleveecor.p09*
Geometry File:	*mrleveecor.g09*
Flow File:	*mrleveecor.f03*
Report Date:	*6/21/2013*

Message ID	Message	Cross sections affected	Comments
MP SW 01DK	The name of the stream is ($streamname$). The flow regime is subcritical or mixed flow. Starting water-surface elevations are computed from Known WSELs as the downstream boundary condition. Provide backup information on Known water-surface elevations or use same energy slope for all the profiles as the starting boundary condition and rerun the plan.		Per effective model. Backup information on starting WSE included.
NT RC 05	The left overbank n-value of $nlob$ and the right overbank n-value of $nrob$ are less than or equal to the channel n-value of nch. Follow the procedure in (FHWA, 1984) to compute the n-value for the natural floodplain and the channel. Or follow the procedure in (USGS, 1977) to compute the n-value for urban development. Please submit supporting information on the evaluation of n-values.	84	n values per 1995 FIS Restudy Muddy River. Backup information included.
XS DC 02	Constant discharge used for the entire profile for $assignedname$ flood. At least two discharges should be selected; one at the mouth and the other at the middle of the watershed or above the confluence of a tributary. Or provide explanation why only one discharge should be used. Other flood frequencies should also be checked.		Flow unchanged from effective model.
XS EC 01L	Cross section extended vertically. Flow Code will be EL. The $assignedname$ WSEL of $wsel$ is higher than the starting GR station elevation of $grelv$. The Left_Sta_Eff is equal to the starting GR station. If there is divided flow then cross section should be trimmed or the ineffective flow station should be used to block the divided flow. If there is no divided flow then the cross section should be expanded to cover the $assignedname$ floodplain.The HEC-RAS geometry file may need to be recreated using a GIS program. Or provide explanation why the cross section should not be expanded.	90.5; 91.4	The model demonstrates that existing embankment overtopping occurs.

XS LV 02L	The Left levee option is used at this river station. It is the most upstream cross section on the levee. Freeboard is computed by subtracting the 1%-annual-chance WSEl from the levee crest elevation. Left Freeboard of $lfrbrd$ is less than 3.5 feet. A without-levee analysis needs to be conducted since the freeboard does not meet the requirements of Part 65.10 of the National Flood Insurance Program regulations (FEMA, 1986). Please submit all the required models for levees.	89; 89.5; 90; 90.5	The model demonstrates that existing embankment overtopping occurs.
XS LV 04L	The Left levee option is used at this river station. The input Left Levee Elevation of $leveel$ is lower than the $assignedname$ flood WSEL of $wselev$. The Left Levee Elevation should be raised above the highest flood frequency WSEL.	90.5	
XS LV 05L	The Left levee option is used at this river station. The $assignednameMin$ flood overtops the levee. The $assignednameMin$ flood WSEL of $wselMin$ is higher than the levee crest elevation of $grelv$. The input Left Levee Elevation of $leveeelvl$ is higher than the $assignednameMax$ flood WSEL of $wselMax$. The Lateral Structure option or other options should be used to determine the proper With-levee discharge and WSEL.	91	
XS SW 01DK	The name of the stream is $streamname$. The flow regime is subcritical or mixed flow. Starting WSEL is computed from Known WSEL as the downstream boundary for $Assigned_Name$ flood. Provide backup information on Known WSEL or use energy slope as the downstream boundary.	84	Backup information on starting WSE included.

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X     X
X     X  X        X           X   X     X    X   X
XXXXXXX  XXXX     X       XXX XXXX      XXXXXX    XXXX
X     X  X        X           X  X      X    X       X
X     X  X        X    X      X   X     X    X       X
X     X  XXXXXX    XXXX       X    X    X    X   XXXXX
```

PROJECT DATA
Project Title: MRLEVEE-PROPOSED CONDITION
Project File : MRLEVEEPRO.prj
Run Date and Time: 6/21/2013 6:49:13 PM

Project in English units

PLAN DATA

Plan Title: Plan 01
Plan File : F:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-PostProject\MRLEVEEPRO.p01

Geometry Title: PRO-rev
Geometry File : F:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-PostProject\MRLEVEEPRO.g01

Flow Title : PRO
Flow File : F:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-PostProject\MRLEVEEPRO.f04

Plan Summary Information:

Number of:	Cross Sections	= 20	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculation tolerance	= 0.01
Maximum number of iterations	= 20
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options
Critical depth computed at all cross sections
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

Encroachment Data
Equal Conveyance = True
Left Offset = 0
Right Offset = 0

River = RIVER-1 Reach = Reach-1

RS	Profile	Method	Value1	Value2
91.5	Floodway	1	1179.78	1765.26
91	Floodway	1	46.36	317.3
90.5	Floodway	1	120.6	323.1
90	Floodway	1	115.48	281.5
89.5	Floodway	1	111.2	297.8

89	Floodway	1	114.26	305
88	Floodway	1	115.93	247.1
87.41	Floodway	1	35.4	170.7
87.4	Floodway	1	78.03	230.9
87	Floodway	1	44.73	205.2
86.4	Floodway	1	27.45	197.6
86.39	Floodway	1	27.45	197.6
86	Floodway	1	41.58	231.9
85.4	Floodway	1	68.84	305.7
85	Floodway	1	96.8	348.2
84	Floodway	1	3095.34	3461.59

FLOW DATA

Flow Title: PRO
Flow File : F:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-PostProject\MRLEVEEPRO.f04

Flow Data (cfs)

River	Reach	RS	Floodplain	Floodway
RIVER-1	Reach-1	91.4	21400	21400

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
RIVER-1	Reach-1	Floodplain	Critical	Known WS = 1399.5
RIVER-1	Reach-1	Floodway	Critical	Known WS = 1399.5

GEOMETRY DATA

Geometry Title: PRO-rev
Geometry File : F:\Projects\500\500-887\Division\Fctl\Calcs\CLOMR\RAS-PostProject\MRLEVEEPRO.g01

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 91.4

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1428.4	3.87	1428.29	11.85	1432.28	25.85	1432	34.85	1426
131.63	1417	135.12	1416	159.91	1413.73	175.24	1413.22	194.63	1414.62
211.68	1415.07	238.43	1415.54	309.85	1416	370.52	1419.84	408.23	1425
424.13	1429	446.57	1429.68	476.6	1433	508.47	1433.09		

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.025	34.85	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	424.13	100	100	.1	.3

Left Levee Station= 11.85 Elevation= 1432.28

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1427.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.63	Wt. n-Val.		0.040	

W.S. Elev (ft)	1426.91	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1422.04	Flow Area (sq ft)		3350.03	
E.G. Slope (ft/ft)	0.001638	Area (sq ft)		3350.03	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	382.33	Top Width (ft)		382.33	
Vel Total (ft/s)	6.39	Avg. Vel. (ft/s)		6.39	
Max Chl Dpth (ft)	13.69	Hydr. Depth (ft)		8.76	
Conv. Total (cfs)	528706.8	Conv. (cfs)		528706.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		384.04	
Min Ch El (ft)	1413.22	Shear (lb/sq ft)		0.89	
Alpha	1.00	Stream Power (lb/ft s)	508.47	11.85	0.00
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	1.10	155.65	1.35
C & E Loss (ft)	0.03	Cum SA (acres)	0.11	12.94	0.43

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1427.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.63	Wt. n-Val.		0.040	
W.S. Elev (ft)	1426.91	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1422.04	Flow Area (sq ft)		3350.03	
E.G. Slope (ft/ft)	0.001638	Area (sq ft)		3350.03	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	382.33	Top Width (ft)		382.33	
Vel Total (ft/s)	6.39	Avg. Vel. (ft/s)		6.39	
Max Chl Dpth (ft)	13.69	Hydr. Depth (ft)		8.76	
Conv. Total (cfs)	528706.8	Conv. (cfs)		528706.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		384.04	
Min Ch El (ft)	1413.22	Shear (lb/sq ft)		0.89	
Alpha	1.00	Stream Power (lb/ft s)	508.47	11.85	0.00
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	1.10	155.65	1.35
C & E Loss (ft)	0.03	Cum SA (acres)	0.11	12.94	0.43

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 91

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1421.33	11.5	1421.87	27.88	1430.32	42.88	1430.02	46.36	1428.68
71.47	1419	81.6	1417.47	154.4	1413.4	167.9	1410.09	174	1408.74
182.1	1409.62	186.6	1411.32	247.6	1415.03	261.1	1415.75	287.9	1415.94
294.9	1420.67	317.3	1427.15	340.6	1427.08	351.4	1431.62	397.1	1432.05
408.9	1432.11								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	46.36	.016	71.47	.05	167.9	.04	247.6	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
42.88	317.3	195	173	137	.1	.3

Left Levee Station= 27.77 Elevation= 1430.32

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1427.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.89	Wt. n-Val.		0.045	
W.S. Elev (ft)	1426.43	Reach Len. (ft)	195.00	173.00	137.00
Crit W.S. (ft)	1420.99	Flow Area (sq ft)		2825.07	
E.G. Slope (ft/ft)	0.002263	Area (sq ft)		2825.07	

Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	262.64	Top Width (ft)		262.64	
Vel Total (ft/s)	7.58	Avg. Vel. (ft/s)		7.58	
Max Chl Dpth (ft)	17.69	Hydr. Depth (ft)		10.76	
Conv. Total (cfs)	449847.8	Conv. (cfs)		449847.8	
Length Wtd. (ft)	173.00	Wetted Per. (ft)		267.55	
Min Ch El (ft)	1408.74	Shear (lb/sq ft)		1.49	
Alpha	1.00	Stream Power (lb/ft s)	408.90	27.77	0.00
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	1.10	148.56	1.35
C & E Loss (ft)	0.05	Cum SA (acres)	0.11	12.20	0.43

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1427.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.89	Wt. n-Val.		0.045	
W.S. Elev (ft)	1426.43	Reach Len. (ft)	195.00	173.00	137.00
Crit W.S. (ft)	1420.99	Flow Area (sq ft)		2825.07	
E.G. Slope (ft/ft)	0.002263	Area (sq ft)		2825.07	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	262.64	Top Width (ft)		262.64	
Vel Total (ft/s)	7.58	Avg. Vel. (ft/s)		7.58	
Max Chl Dpth (ft)	17.69	Hydr. Depth (ft)		10.76	
Conv. Total (cfs)	449847.8	Conv. (cfs)		449847.8	
Length Wtd. (ft)	173.00	Wetted Per. (ft)		267.55	
Min Ch El (ft)	1408.74	Shear (lb/sq ft)		1.49	
Alpha	1.00	Stream Power (lb/ft s)	408.90	27.77	0.00
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	1.10	148.56	1.35
C & E Loss (ft)	0.05	Cum SA (acres)	0.11	12.20	0.43

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 90.5

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1416.14	59.8	1416.45	70.1	1418.53	79.5	1418.64	79.81	1418.67
107.08	1428.8	121.2	1428.5	122.16	1428.02	148.11	1415	161.52	1415
173.1	1410.48	225.8	1409.92	232.6	1406.06	244.9	1406.49	247.1	1407.71
251.3	1410.63	278.4	1411.52	323.1	1429.45	350.7	1429.72	369.8	1430.37

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	121.2	.016	148.11	.05	225.8	.04	251.3	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
121.2	323.1	183	167	165	.1	.3

Left Levee Station= 107.08 Elevation= 1428.8

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1426.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.34	Wt. n-Val.		0.045	
W.S. Elev (ft)	1425.49	Reach Len. (ft)	183.00	167.00	165.00
Crit W.S. (ft)	1419.83	Flow Area (sq ft)		2302.36	
E.G. Slope (ft/ft)	0.002966	Area (sq ft)		2302.36	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	186.03	Top Width (ft)		186.03	

Vel Total (ft/s)	9.29	Avg. Vel. (ft/s)		9.29	
Max Chl Dpth (ft)	19.43	Hydr. Depth (ft)		12.38	
Conv. Total (cfs)	392954.4	Conv. (cfs)		392954.4	
Length Wtd. (ft)	167.00	Wetted Per. (ft)		194.34	
Min Ch El (ft)	1406.06	Shear (lb/sq ft)		2.19	
Alpha	1.00	Stream Power (lb/ft s)	369.80	107.08	0.00
Frctn Loss (ft)	0.64	Cum Volume (acre-ft)	1.10	138.38	1.35
C & E Loss (ft)	0.11	Cum SA (acres)	0.11	11.31	0.43

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1426.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.34	Wt. n-Val.		0.045	
W.S. Elev (ft)	1425.49	Reach Len. (ft)	183.00	167.00	165.00
Crit W.S. (ft)	1419.82	Flow Area (sq ft)		2302.36	
E.G. Slope (ft/ft)	0.002966	Area (sq ft)		2302.36	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	186.03	Top Width (ft)		186.03	
Vel Total (ft/s)	9.29	Avg. Vel. (ft/s)		9.29	
Max Chl Dpth (ft)	19.43	Hydr. Depth (ft)		12.38	
Conv. Total (cfs)	392954.4	Conv. (cfs)		392954.4	
Length Wtd. (ft)	167.00	Wetted Per. (ft)		194.34	
Min Ch El (ft)	1406.06	Shear (lb/sq ft)		2.19	
Alpha	1.00	Stream Power (lb/ft s)	369.80	107.08	0.00
Frctn Loss (ft)	0.64	Cum Volume (acre-ft)	1.10	138.38	1.35
C & E Loss (ft)	0.11	Cum SA (acres)	0.11	11.31	0.43

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 90

INPUT
Description:
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1415.24	55.6	1415.43	63.3	1416.55	73	1417.13	73.1	1417.02
99.48	1427.2	114.48	1426.9	115.48	1426.4	151.43	1410	153.43	1409
182.22	1409	195.6	1404.89	197.7	1405.95	199.9	1407.74	212.8	1409.51
218	1408.03	228.2	1410.87	248.3	1416.37	264.5	1417.75	281.5	1428.48
306.5	1428.36	314.9	1428.52						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	114.48	.016	153.43	.05	182.22	.04	228.2	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
114.48	281.5	205	213	.1	.3

Left Levee Station= 99.48 Elevation= 1427.2

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1426.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.46	Wt. n-Val.		0.041	
W.S. Elev (ft)	1423.63	Reach Len. (ft)	205.00	213.00	213.00
Crit W.S. (ft)	1420.63	Flow Area (sq ft)		1701.84	

E.G. Slope (ft/ft)	0.005085	Area (sq ft)		1701.84	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	152.26	Top Width (ft)		152.26	
Vel Total (ft/s)	12.57	Avg. Vel. (ft/s)		12.57	
Max Chl Dpth (ft)	18.74	Hydr. Depth (ft)		11.18	
Conv. Total (cfs)	300102.8	Conv. (cfs)		300102.8	
Length Wtd. (ft)	213.00	Wetted Per. (ft)		160.18	
Min Ch El (ft)	1404.89	Shear (lb/sq ft)		3.37	
Alpha	1.00	Stream Power (lb/ft s)	314.90	99.48	0.00
Frctn Loss (ft)	1.05	Cum Volume (acre-ft)	1.10	130.70	1.35
C & E Loss (ft)	0.11	Cum SA (acres)	0.11	10.66	0.43

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1426.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.46	Wt. n-Val.		0.041	
W.S. Elev (ft)	1423.63	Reach Len. (ft)	205.00	213.00	213.00
Crit W.S. (ft)	1420.63	Flow Area (sq ft)		1701.84	
E.G. Slope (ft/ft)	0.005085	Area (sq ft)		1701.84	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	152.26	Top Width (ft)		152.26	
Vel Total (ft/s)	12.57	Avg. Vel. (ft/s)		12.57	
Max Chl Dpth (ft)	18.74	Hydr. Depth (ft)		11.18	
Conv. Total (cfs)	300102.8	Conv. (cfs)		300102.8	
Length Wtd. (ft)	213.00	Wetted Per. (ft)		160.18	
Min Ch El (ft)	1404.89	Shear (lb/sq ft)		3.37	
Alpha	1.00	Stream Power (lb/ft s)	314.90	99.48	0.00
Frctn Loss (ft)	1.05	Cum Volume (acre-ft)	1.10	130.70	1.35
C & E Loss (ft)	0.11	Cum SA (acres)	0.11	10.66	0.43

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 89.5

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1414.27	48.7	1414.21	58.2	1415.6	68.6	1416.22	68.92	1416.34
94.98	1426.13	109.98	1425.83	111.2	1425.22	142.74	1410	174.46	1410
192.2	1404.19	194.4	1405.36	196.8	1406.92	203	1405.89	228.4	1407.8
230.7	1410.51	244.9	1411.37	273.4	1420.99	297.8	1424.48	320.2	1425.16
334.2	1425.5								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	109.98	.016	142.74	.05	174.46	.04	228.4	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
109.98	297.8	179	188	203	.1	.3

Left Levee Station= 94.98 Elevation= 1426.13

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1424.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.08	Wt. n-Val.		0.042	
W.S. Elev (ft)	1422.84	Reach Len. (ft)	179.00	188.00	203.00
Crit W.S. (ft)	1419.14	Flow Area (sq ft)		1847.77	
E.G. Slope (ft/ft)	0.004773	Area (sq ft)		1847.77	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	170.21	Top Width (ft)		170.21	
Vel Total (ft/s)	11.58	Avg. Vel. (ft/s)		11.58	
Max Chl Dpth (ft)	18.65	Hydr. Depth (ft)		10.86	
Conv. Total (cfs)	309768.7	Conv. (cfs)		309768.7	
Length Wtd. (ft)	188.00	Wetted Per. (ft)		177.97	
Min Ch El (ft)	1404.19	Shear (lb/sq ft)		3.09	
Alpha	1.00	Stream Power (lb/ft s)	334.20	94.98	0.00
Frctn Loss (ft)	0.88	Cum Volume (acre-ft)	1.10	122.02	1.35
C & E Loss (ft)	0.03	Cum SA (acres)	0.11	9.87	0.43

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1424.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.08	Wt. n-Val.		0.042	
W.S. Elev (ft)	1422.84	Reach Len. (ft)	179.00	188.00	203.00
Crit W.S. (ft)	1419.14	Flow Area (sq ft)		1847.77	
E.G. Slope (ft/ft)	0.004773	Area (sq ft)		1847.77	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	170.21	Top Width (ft)		170.21	
Vel Total (ft/s)	11.58	Avg. Vel. (ft/s)		11.58	
Max Chl Dpth (ft)	18.65	Hydr. Depth (ft)		10.86	
Conv. Total (cfs)	309768.7	Conv. (cfs)		309768.7	
Length Wtd. (ft)	188.00	Wetted Per. (ft)		177.97	
Min Ch El (ft)	1404.19	Shear (lb/sq ft)		3.09	
Alpha	1.00	Stream Power (lb/ft s)	334.20	94.98	0.00
Frctn Loss (ft)	0.88	Cum Volume (acre-ft)	1.10	122.03	1.35
C & E Loss (ft)	0.03	Cum SA (acres)	0.11	9.87	0.43

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 89

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1413.3	53.4	1413.88	68.9	1414.39	97.88	1425.2	112.88	1424.9
114.26	1424.21	142.88	1410	150.9	1406	167.25	1406	170.2	1405.21
173.1	1404.72	175.5	1405.3	183.6	1407.11	186.9	1405.67	192.8	1402.86
194.1	1404.16	195.2	1405.35	203.1	1404.21	222.4	1407.04	236.8	1412.08
258.6	1417.88	285.6	1418.67	299.5	1422.44	305	1425.63	331	1426.22
348.8	1425.85	431.2	1435.95	462.5	1439.74				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	112.88	.016	150.9	.05	167.25	.04	222.4	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
97.88	305	198	206	182	.1	.3

Left Levee Station= 97.88 Elevation= 1425.2

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1424.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.98	Wt. n-Val.		0.041	
W.S. Elev (ft)	1422.04	Reach Len. (ft)	198.00	206.00	182.00
Crit W.S. (ft)	1418.55	Flow Area (sq ft)		1896.95	
E.G. Slope (ft/ft)	0.004545	Area (sq ft)		1896.95	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	179.39	Top Width (ft)		179.39	
Vel Total (ft/s)	11.28	Avg. Vel. (ft/s)		11.28	
Max Chl Dpth (ft)	19.18	Hydr. Depth (ft)		10.57	
Conv. Total (cfs)	317442.3	Conv. (cfs)		317442.3	
Length Wtd. (ft)	206.00	Wetted Per. (ft)		187.93	
Min Ch El (ft)	1402.86	Shear (lb/sq ft)		2.86	
Alpha	1.00	Stream Power (lb/ft s)	462.50	97.88	0.00
Frctn Loss (ft)	1.43	Cum Volume (acre-ft)	1.10	113.94	1.35
C & E Loss (ft)	0.29	Cum SA (acres)	0.11	9.12	0.43

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1424.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.98	Wt. n-Val.		0.041	
W.S. Elev (ft)	1422.04	Reach Len. (ft)	198.00	206.00	182.00
Crit W.S. (ft)	1418.55	Flow Area (sq ft)		1896.95	
E.G. Slope (ft/ft)	0.004545	Area (sq ft)		1896.95	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	179.39	Top Width (ft)		179.39	
Vel Total (ft/s)	11.28	Avg. Vel. (ft/s)		11.28	
Max Chl Dpth (ft)	19.18	Hydr. Depth (ft)		10.57	
Conv. Total (cfs)	317442.3	Conv. (cfs)		317442.3	
Length Wtd. (ft)	206.00	Wetted Per. (ft)		187.93	
Min Ch El (ft)	1402.86	Shear (lb/sq ft)		2.86	
Alpha	1.00	Stream Power (lb/ft s)	462.50	97.88	0.00
Frctn Loss (ft)	1.43	Cum Volume (acre-ft)	1.10	113.94	1.35
C & E Loss (ft)	0.29	Cum SA (acres)	0.11	9.12	0.43

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 88.5

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	1412.01	50.79	1412.67	65.3	1413.58	93.27	1423.39	108.27	1423.09
134.44	1410	144.44	1405	158.34	1405	166.13	1403.14	170.42	1401.08
180.14	1404.88	208.2	1405	245.43	1418.07	252.09	1420.31	287.84	1423.32

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	108.27	.016	144.44	.05	158.34	.04	180.14	.05
208.2	.044	245.43	.05						

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
108.27	252.09	49	47	44	.1	.3

Left Levee Station= 93.27 Elevation= 1423.39

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1422.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.85	Wt. n-Val.		0.040	
W.S. Elev (ft)	1417.46	Reach Len. (ft)	49.00	47.00	44.00
Crit W.S. (ft)	1417.46	Flow Area (sq ft)		1211.24	
E.G. Slope (ft/ft)	0.011807	Area (sq ft)		1211.24	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	124.15	Top Width (ft)		124.15	
Vel Total (ft/s)	17.67	Avg. Vel. (ft/s)		17.67	
Max Chl Dpth (ft)	16.38	Hydr. Depth (ft)		9.76	
Conv. Total (cfs)	196941.6	Conv. (cfs)		196941.6	
Length Wtd. (ft)	47.00	Wetted Per. (ft)		130.62	
Min Ch El (ft)	1401.08	Shear (lb/sq ft)		6.84	
Alpha	1.00	Stream Power (lb/ft s)	287.84	93.27	0.00
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	1.10	106.59	1.35
C & E Loss (ft)	0.03	Cum SA (acres)	0.11	8.40	0.43

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1422.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.85	Wt. n-Val.		0.040	
W.S. Elev (ft)	1417.46	Reach Len. (ft)	49.00	47.00	44.00
Crit W.S. (ft)	1417.46	Flow Area (sq ft)		1211.24	
E.G. Slope (ft/ft)	0.011807	Area (sq ft)		1211.24	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	124.15	Top Width (ft)		124.15	
Vel Total (ft/s)	17.67	Avg. Vel. (ft/s)		17.67	
Max Chl Dpth (ft)	16.38	Hydr. Depth (ft)		9.76	
Conv. Total (cfs)	196941.6	Conv. (cfs)		196941.6	
Length Wtd. (ft)	47.00	Wetted Per. (ft)		130.62	
Min Ch El (ft)	1401.08	Shear (lb/sq ft)		6.84	
Alpha	1.00	Stream Power (lb/ft s)	287.84	93.27	0.00
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	1.10	106.59	1.35
C & E Loss (ft)	0.02	Cum SA (acres)	0.11	8.40	0.43

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 88.4

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1411.78	52.24	1412.39	68.28	1413.6	95.6	1422.53	110.6	1422.23
135.06	1410	145.06	1405	151.49	1405	154.17	1403.22	171.83	1402.62
181.85	1401.35	194.4	1403.99	211.08	1404	239.28	1417.26	246.8	1417.92
273.6	1419.9								

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	110.6	.016	145.06	.05	151.49	.04	211.08	.016
239.28	.05								

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
110.6	239.28	100	89	.1	.3

Left Levee Station= 95.6 Elevation= 1422.53

CROSS SECTION OUTPUT Profile #Floodplain

			Left OB	Channel	Right OB
E.G. Elev (ft)	1421.68	Element			
Vel Head (ft)	4.76	Wt. n-Val.		0.031	
W.S. Elev (ft)	1416.92	Reach Len. (ft)	100.00	89.00	94.00
Crit W.S. (ft)	1416.57	Flow Area (sq ft)		1221.80	
E.G. Slope (ft/ft)	0.006252	Area (sq ft)		1221.80	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	117.33	Top Width (ft)		117.33	
Vel Total (ft/s)	17.52	Avg. Vel. (ft/s)		17.52	
Max Chl Dpth (ft)	15.57	Hydr. Depth (ft)		10.41	
Conv. Total (cfs)	270657.4	Conv. (cfs)		270657.4	
Length Wtd. (ft)	89.00	Wetted Per. (ft)		123.94	
Min Ch El (ft)	1401.35	Shear (lb/sq ft)		3.85	
Alpha	1.00	Stream Power (lb/ft s)	273.60	95.60	0.00
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)	1.10	105.28	1.35
C & E Loss (ft)	0.04	Cum SA (acres)	0.11	8.27	0.43

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1421.68	Element			
Vel Head (ft)	4.77	Wt. n-Val.		0.031	
W.S. Elev (ft)	1416.92	Reach Len. (ft)	100.00	89.00	94.00
Crit W.S. (ft)	1416.57	Flow Area (sq ft)		1221.40	
E.G. Slope (ft/ft)	0.006258	Area (sq ft)		1221.40	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	117.32	Top Width (ft)		117.32	
Vel Total (ft/s)	17.52	Avg. Vel. (ft/s)		17.52	
Max Chl Dpth (ft)	15.57	Hydr. Depth (ft)		10.41	
Conv. Total (cfs)	270517.9	Conv. (cfs)		270517.9	
Length Wtd. (ft)	89.00	Wetted Per. (ft)		123.92	
Min Ch El (ft)	1401.35	Shear (lb/sq ft)		3.85	

Alpha	1.00	Stream Power (lb/ft s)	273.60	95.60	0.00
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)	1.10	105.28	1.35
C & E Loss (ft)	0.04	Cum SA (acres)	0.11	8.27	0.43

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 88

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1412.81	2.2	1412.49	10.4	1411.2	59.7	1412.52	74.8	1413.66
100.93	1422.05	115.93	1421.7	140.64	1409.92	150.37	1405	158.5	1405
160.2	1403.83	187.9	1402.93	188.1	1402.36	201.8	1401.09	206.9	1401.6
222.4	1401.7	247.1	1418.17	277.4	1417.15	285.7	1417.21	304.5	1429.39
331.1	1433.92								

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	115.93	.016	150.37	.05	160.2	.08	222.4	.016
247.1	.05								

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
115.93	247.1	46	46	.1	.3

Left Levee Station= 100.93 Elevation= 1422.05

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1420.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.12	Wt. n-Val.		0.056	
W.S. Elev (ft)	1415.56	Reach Len. (ft)	46.00	46.00	46.00
Crit W.S. (ft)	1415.56	Flow Area (sq ft)		1178.19	
E.G. Slope (ft/ft)	0.023070	Area (sq ft)		1178.19	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	114.36	Top Width (ft)		114.36	
Vel Total (ft/s)	18.16	Avg. Vel. (ft/s)		18.16	
Max Chl Dpth (ft)	14.47	Hydr. Depth (ft)		10.30	
Conv. Total (cfs)	140893.7	Conv. (cfs)		140893.7	
Length Wtd. (ft)	46.00	Wetted Per. (ft)		121.87	
Min Ch El (ft)	1401.09	Shear (lb/sq ft)		13.92	
Alpha	1.00	Stream Power (lb/ft s)	331.10	100.93	0.00
Frctn Loss (ft)	1.08	Cum Volume (acre-ft)	1.10	102.83	1.35
C & E Loss (ft)	0.04	Cum SA (acres)	0.11	8.03	0.43

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1420.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.12	Wt. n-Val.		0.056	
W.S. Elev (ft)	1415.56	Reach Len. (ft)	46.00	46.00	46.00
Crit W.S. (ft)	1415.56	Flow Area (sq ft)		1178.58	
E.G. Slope (ft/ft)	0.023045	Area (sq ft)		1178.58	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	114.37	Top Width (ft)		114.37	
Vel Total (ft/s)	18.16	Avg. Vel. (ft/s)		18.16	
Max Chl Dpth (ft)	14.47	Hydr. Depth (ft)		10.30	
Conv. Total (cfs)	140970.0	Conv. (cfs)		140970.0	
Length Wtd. (ft)	46.00	Wetted Per. (ft)		121.89	
Min Ch El (ft)	1401.09	Shear (lb/sq ft)		13.91	
Alpha	1.00	Stream Power (lb/ft s)	331.10	100.93	0.00
Frctn Loss (ft)	1.08	Cum Volume (acre-ft)	1.10	102.83	1.35
C & E Loss (ft)	0.03	Cum SA (acres)	0.11	8.03	0.43

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 87.9

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1411.99	34.47	1412.12	56.55	1413.58	65.68	1413.6	91.2	1422.03
106.46	1422.11	137.64	1402	143.77	1401.28	159.85	1398.8	180.05	1398.48
190.4	1400.49	231.58	1407.99	243.53	1415.99	278.2	1418	307.99	1431
324.27	1431.02								

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	106.46	.016	137.64	.08	190.4	.05	231.58	.016
243.53	.05								

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
106.46	243.53	294.3	274.7	248.7	.1	.3

Left Levee Station= 91.2 Elevation= 1422.03

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1418.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.00	Wt. n-Val.		0.058	
W.S. Elev (ft)	1413.09	Reach Len. (ft)	294.30	274.70	248.70
Crit W.S. (ft)	1413.09	Flow Area (sq ft)		1192.02	
E.G. Slope (ft/ft)	0.024013	Area (sq ft)		1192.02	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	118.75	Top Width (ft)		118.75	
Vel Total (ft/s)	17.95	Avg. Vel. (ft/s)		17.95	

Max Chl Dpth (ft)	14.61	Hydr. Depth (ft)		10.04	
Conv. Total (cfs)	138099.1	Conv. (cfs)		138099.1	
Length Wtd. (ft)	274.70	Wetted Per. (ft)		124.68	
Min Ch El (ft)	1398.48	Shear (lb/sq ft)		14.33	
Alpha	1.00	Stream Power (lb/ft s)	324.27	91.20	0.00
Frctn Loss (ft)	2.75	Cum Volume (acre-ft)	1.10	101.58	1.35
C & E Loss (ft)	0.94	Cum SA (acres)	0.11	7.91	0.43

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1418.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.00	Wt. n-Val.		0.058	
W.S. Elev (ft)	1413.09	Reach Len. (ft)	294.30	274.70	248.70
Crit W.S. (ft)	1413.09	Flow Area (sq ft)		1192.02	
E.G. Slope (ft/ft)	0.024013	Area (sq ft)		1192.02	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	118.75	Top Width (ft)		118.75	
Vel Total (ft/s)	17.95	Avg. Vel. (ft/s)		17.95	
Max Chl Dpth (ft)	14.61	Hydr. Depth (ft)		10.04	
Conv. Total (cfs)	138099.1	Conv. (cfs)		138099.1	
Length Wtd. (ft)	274.70	Wetted Per. (ft)		124.68	
Min Ch El (ft)	1398.48	Shear (lb/sq ft)		14.33	
Alpha	1.00	Stream Power (lb/ft s)	324.27	91.20	0.00
Frctn Loss (ft)	2.75	Cum Volume (acre-ft)	1.10	101.58	1.35
C & E Loss (ft)	0.94	Cum SA (acres)	0.11	7.91	0.43

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 87.4

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1410.53	36.9	1411.52	48.93	1412.1	67.11	1418.16	82.13	1417.85
107.46	1401	118.19	1401	125.2	1395.49	131.7	1392.56	189.8	1393.03
201.65	1394.69	230.9	1414.19	254.7	1414.49	258.5	1414.57	280.8	1425.97
282.7	1426.71								

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	82.13	.016	107.46	.05	125.2	.08	189.8	.05
201.65	.016	230.9	.05						

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
82.13	230.9	82	79	80	.1	.3

Left Levee Station= 63.03 Elevation= 1418.16

CROSS SECTION OUTPUT Profile #Floodplain

			Left OB	Channel	Right OB
E.G. Elev (ft)	1413.63	Element			
Vel Head (ft)	1.88	Wt. n-Val.		0.056	
W.S. Elev (ft)	1411.75	Reach Len. (ft)	82.00	79.00	80.00
Crit W.S. (ft)	1405.83	Flow Area (sq ft)		1943.26	
E.G. Slope (ft/ft)	0.005446	Area (sq ft)		1943.26	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	135.93	Top Width (ft)		135.93	
Vel Total (ft/s)	11.01	Avg. Vel. (ft/s)		11.01	
Max Chl Dpth (ft)	19.19	Hydr. Depth (ft)		14.30	
Conv. Total (cfs)	289976.4	Conv. (cfs)		289976.4	
Length Wtd. (ft)	79.00	Wetted Per. (ft)		147.00	
Min Ch El (ft)	1392.56	Shear (lb/sq ft)		4.49	
Alpha	1.00	Stream Power (lb/ft s)	282.70	63.03	0.00
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)	1.10	91.69	1.35
C & E Loss (ft)	0.02	Cum SA (acres)	0.11	7.11	0.43

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1413.63	Element			
Vel Head (ft)	1.88	Wt. n-Val.		0.056	
W.S. Elev (ft)	1411.75	Reach Len. (ft)	82.00	79.00	80.00
Crit W.S. (ft)	1405.83	Flow Area (sq ft)		1943.26	
E.G. Slope (ft/ft)	0.005446	Area (sq ft)		1943.26	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	135.93	Top Width (ft)		135.93	
Vel Total (ft/s)	11.01	Avg. Vel. (ft/s)		11.01	
Max Chl Dpth (ft)	19.19	Hydr. Depth (ft)		14.30	
Conv. Total (cfs)	289976.4	Conv. (cfs)		289976.4	
Length Wtd. (ft)	79.00	Wetted Per. (ft)		147.00	
Min Ch El (ft)	1392.56	Shear (lb/sq ft)		4.49	
Alpha	1.00	Stream Power (lb/ft s)	282.70	63.03	0.00
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)	1.10	91.69	1.35
C & E Loss (ft)	0.02	Cum SA (acres)	0.11	7.11	0.43

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1

REACH: Reach-1 RS: 87.3

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1410	39.09	1410	74.71	1412	92.5	1417.77	107.5	1417.47
142.7	1394	210.07	1394	228.76	1398	239.12	1402	247.44	1404.5
259.64	1412.52	262.75	1413	287.21	1414	295.07	1416.16	307.48	1423
330.33	1423	337.09	1421.59	358.24	1410.66				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	107.5	.016	142.7	.08	247.44	.016	259.64	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
107.5	259.64	178.6	145.2	104.2	.1	.3

Left Levee Station= 92.5 Elevation= 1417.77

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1413.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.07	Wt. n-Val.		0.065	0.050
W.S. Elev (ft)	1411.00	Reach Len. (ft)	178.60	145.20	104.20
Crit W.S. (ft)	1406.20	Flow Area (sq ft)		1852.17	0.11
E.G. Slope (ft/ft)	0.008974	Area (sq ft)		1852.17	0.11
Q Total (cfs)	21400.00	Flow (cfs)		21399.93	0.07
Top Width (ft)	140.75	Top Width (ft)		140.11	0.65
Vel Total (ft/s)	11.55	Avg. Vel. (ft/s)		11.55	0.61
Max Chl Dpth (ft)	16.99	Hydr. Depth (ft)		13.22	0.17
Conv. Total (cfs)	225900.6	Conv. (cfs)		225899.9	0.7
Length Wtd. (ft)	145.20	Wetted Per. (ft)		148.73	1.06
Min Ch El (ft)	1394.00	Shear (lb/sq ft)		6.98	0.06
Alpha	1.00	Stream Power (lb/ft s)	358.24	92.50	0.00
Frctn Loss (ft)	1.11	Cum Volume (acre-ft)	1.10	88.25	1.35
C & E Loss (ft)	0.11	Cum SA (acres)	0.11	6.86	0.43

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1413.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.07	Wt. n-Val.		0.065	0.050
W.S. Elev (ft)	1411.00	Reach Len. (ft)	178.60	145.20	104.20
Crit W.S. (ft)	1406.20	Flow Area (sq ft)		1852.17	0.11
E.G. Slope (ft/ft)	0.008974	Area (sq ft)		1852.17	0.11
Q Total (cfs)	21400.00	Flow (cfs)		21399.93	0.07
Top Width (ft)	140.75	Top Width (ft)		140.11	0.65
Vel Total (ft/s)	11.55	Avg. Vel. (ft/s)		11.55	0.61
Max Chl Dpth (ft)	16.99	Hydr. Depth (ft)		13.22	0.17
Conv. Total (cfs)	225900.6	Conv. (cfs)		225899.9	0.7
Length Wtd. (ft)	145.20	Wetted Per. (ft)		148.73	1.06
Min Ch El (ft)	1394.00	Shear (lb/sq ft)		6.98	0.06
Alpha	1.00	Stream Power (lb/ft s)	358.24	92.50	0.00
Frctn Loss (ft)	1.11	Cum Volume (acre-ft)	1.10	88.25	1.35
C & E Loss (ft)	0.11	Cum SA (acres)	0.11	6.86	0.43

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 87

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1409.55	11.1	1410.61	29.73	1417.03	44.73	1416.73	85	1391.98
109.5	1391.98	112.5	1392.52	155.4	1392.34	160.3	1394.35	179.76	1396.33
205.2	1413.29	242.1	1414.56	262.3	1423.27	264.2	1423.87		

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	44.73	.016	85	.08	179.76	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
44.73	205.2	269.82	280.95 283.22	.1	.3

Left Levee Station= 29.73 Elevation= 1417.03

CROSS SECTION OUTPUT Profile #Floodplain

			Left OB	Channel	Right OB
E.G. Elev (ft)	1411.85	Element			
Vel Head (ft)	1.71	Wt. n-Val.		0.064	
W.S. Elev (ft)	1410.14	Reach Len. (ft)	269.82	280.95	283.22
Crit W.S. (ft)	1404.08	Flow Area (sq ft)		2040.41	
E.G. Slope (ft/ft)	0.006550	Area (sq ft)		2040.41	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	145.03	Top Width (ft)		145.03	
Vel Total (ft/s)	10.49	Avg. Vel. (ft/s)		10.49	
Max Chl Dpth (ft)	18.16	Hydr. Depth (ft)		14.07	
Conv. Total (cfs)	264426.6	Conv. (cfs)		264426.6	
Length Wtd. (ft)	280.95	Wetted Per. (ft)		154.89	
Min Ch El (ft)	1391.98	Shear (lb/sq ft)		5.39	
Alpha	1.00	Stream Power (lb/ft s)	264.20	29.73	0.00
Frctn Loss (ft)	2.41	Cum Volume (acre-ft)	1.10	81.76	1.35
C & E Loss (ft)	0.05	Cum SA (acres)	0.11	6.38	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

			Left OB	Channel	Right OB
E.G. Elev (ft)	1411.85	Element			
Vel Head (ft)	1.71	Wt. n-Val.		0.064	
W.S. Elev (ft)	1410.14	Reach Len. (ft)	269.82	280.95	283.22
Crit W.S. (ft)	1404.07	Flow Area (sq ft)		2040.41	
E.G. Slope (ft/ft)	0.006550	Area (sq ft)		2040.41	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	145.03	Top Width (ft)		145.03	
Vel Total (ft/s)	10.49	Avg. Vel. (ft/s)		10.49	
Max Chl Dpth (ft)	18.16	Hydr. Depth (ft)		14.07	
Conv. Total (cfs)	264426.6	Conv. (cfs)		264426.6	
Length Wtd. (ft)	280.95	Wetted Per. (ft)		154.89	
Min Ch El (ft)	1391.98	Shear (lb/sq ft)		5.39	

Alpha	1.00	Stream Power (lb/ft s)	264.20	29.73	0.00
Frctn Loss (ft)	2.41	Cum Volume (acre-ft)	1.10	81.76	1.35
C & E Loss (ft)	0.05	Cum SA (acres)	0.11	6.38	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 86.5

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1409.22	9.46	1410	21.93	1414.38	37.33	1414	56.84	1401
70.82	1400.97	84.09	1391.62	91.93	1391	170.93	1391	187.14	1408.14
195.63	1411	203.16	1412	249.08	1414				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	37.33	.016	56.84	.05	70.82	.08	170.93	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
37.33	187.14	47	47	.1	.3

Left Levee Station= 21.93 Elevation= 1414.38

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1409.39	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.24	Wt. n-Val.		0.070	
W.S. Elev (ft)	1407.15	Reach Len. (ft)	47.00	47.00	47.00
Crit W.S. (ft)	1402.96	Flow Area (sq ft)		1781.80	
E.G. Slope (ft/ft)	0.011709	Area (sq ft)		1781.80	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	138.59	Top Width (ft)		138.59	
Vel Total (ft/s)	12.01	Avg. Vel. (ft/s)		12.01	
Max Chl Dpth (ft)	16.15	Hydr. Depth (ft)		12.86	
Conv. Total (cfs)	197763.8	Conv. (cfs)		197763.8	
Length Wtd. (ft)	47.00	Wetted Per. (ft)		150.39	
Min Ch El (ft)	1391.00	Shear (lb/sq ft)		8.66	
Alpha	1.00	Stream Power (lb/ft s)	249.08	21.93	0.00
Frctn Loss (ft)	0.43	Cum Volume (acre-ft)	1.10	69.44	1.35
C & E Loss (ft)	0.14	Cum SA (acres)	0.11	5.47	0.42

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1409.39	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.24	Wt. n-Val.		0.070	
W.S. Elev (ft)	1407.15	Reach Len. (ft)	47.00	47.00	47.00
Crit W.S. (ft)	1402.96	Flow Area (sq ft)		1781.80	
E.G. Slope (ft/ft)	0.011709	Area (sq ft)		1781.80	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	138.59	Top Width (ft)		138.59	
Vel Total (ft/s)	12.01	Avg. Vel. (ft/s)		12.01	
Max Chl Dpth (ft)	16.15	Hydr. Depth (ft)		12.86	
Conv. Total (cfs)	197763.8	Conv. (cfs)		197763.8	

Length Wtd. (ft)	47.00	Wetted Per. (ft)		150.39	
Min Ch El (ft)	1391.00	Shear (lb/sq ft)		8.66	
Alpha	1.00	Stream Power (lb/ft s)	249.08	21.93	0.00
Frctn Loss (ft)	0.43	Cum Volume (acre-ft)	1.10	69.44	1.35
C & E Loss (ft)	0.14	Cum SA (acres)	0.11	5.47	0.42

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 86.4

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1409.14	14.37	1413	33.29	1413.24	56.36	1400.44	65.58	1399.43
75.02	1394	103.3	1390	168.7	1390	173.3	1392	178.3	1394
183.3	1396	186.2	1398	187.3	1400	188.3	1402	189.4	1404
190.4	1406	192.6	1408	195.1	1410	197.6	1412	246.8	1414

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	33.29	.016	75.02	.08	173.3	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33.29	197.6	55.4	72.4	94.8	.1 .3

Left Levee Station= 12.45 Elevation= 1413.33

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1408.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.78	Wt. n-Val.		0.065	
W.S. Elev (ft)	1407.04	Reach Len. (ft)	55.40	72.40	94.80
Crit W.S. (ft)	1401.65	Flow Area (sq ft)		1996.78	
E.G. Slope (ft/ft)	0.007344	Area (sq ft)		1996.78	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	147.07	Top Width (ft)		147.07	
Vel Total (ft/s)	10.72	Avg. Vel. (ft/s)		10.72	
Max Chl Dpth (ft)	17.04	Hydr. Depth (ft)		13.58	
Conv. Total (cfs)	249723.2	Conv. (cfs)		249723.2	
Length Wtd. (ft)	72.40	Wetted Per. (ft)		157.61	
Min Ch El (ft)	1390.00	Shear (lb/sq ft)		5.81	
Alpha	1.00	Stream Power (lb/ft s)	246.80	12.45	0.00
Frctn Loss (ft)	0.60	Cum Volume (acre-ft)	1.10	67.40	1.35
C & E Loss (ft)	0.02	Cum SA (acres)	0.11	5.31	0.42

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1408.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.78	Wt. n-Val.		0.065	
W.S. Elev (ft)	1407.04	Reach Len. (ft)	55.40	72.40	94.80
Crit W.S. (ft)	1401.65	Flow Area (sq ft)		1996.78	
E.G. Slope (ft/ft)	0.007344	Area (sq ft)		1996.78	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	147.07	Top Width (ft)		147.07	
Vel Total (ft/s)	10.72	Avg. Vel. (ft/s)		10.72	
Max Chl Dpth (ft)	17.04	Hydr. Depth (ft)		13.58	
Conv. Total (cfs)	249723.2	Conv. (cfs)		249723.2	
Length Wtd. (ft)	72.40	Wetted Per. (ft)		157.61	
Min Ch El (ft)	1390.00	Shear (lb/sq ft)		5.81	

Alpha	1.00	Stream Power (lb/ft s)	246.80	12.45	0.00
Frctn Loss (ft)	0.60	Cum Volume (acre-ft)	1.10	67.40	1.35
C & E Loss (ft)	0.02	Cum SA (acres)	0.11	5.31	0.42

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 86.3

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1408.31	16.56	1410	26.68	1412.16	36.3	1413.48	43.53	1413.23
79.97	1394	94.42	1394	112.22	1391	191.79	1391	209.3	1410
265.13	1412.9								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	43.53	.016	79.97	.05	94.42	.08	191.79	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
43.53	209.3	145.4	131	112.9	.1	.3

Left Levee Station= 36.3 Elevation= 1413.48

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1408.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.03	Wt. n-Val.		0.065	
W.S. Elev (ft)	1406.17	Reach Len. (ft)	145.40	131.00	112.90
Crit W.S. (ft)	1401.71	Flow Area (sq ft)		1872.20	
E.G. Slope (ft/ft)	0.009422	Area (sq ft)		1872.20	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	148.85	Top Width (ft)		148.85	
Vel Total (ft/s)	11.43	Avg. Vel. (ft/s)		11.43	
Max Chl Dpth (ft)	15.17	Hydr. Depth (ft)		12.58	
Conv. Total (cfs)	220462.0	Conv. (cfs)		220462.0	
Length Wtd. (ft)	131.00	Wetted Per. (ft)		158.77	
Min Ch El (ft)	1391.00	Shear (lb/sq ft)		6.94	
Alpha	1.00	Stream Power (lb/ft s)	265.13	36.30	0.00
Frctn Loss (ft)	1.79	Cum Volume (acre-ft)	1.10	64.18	1.35
C & E Loss (ft)	0.16	Cum SA (acres)	0.11	5.07	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1408.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.03	Wt. n-Val.		0.065	
W.S. Elev (ft)	1406.17	Reach Len. (ft)	145.40	131.00	112.90
Crit W.S. (ft)	1401.71	Flow Area (sq ft)		1872.20	
E.G. Slope (ft/ft)	0.009422	Area (sq ft)		1872.20	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	148.85	Top Width (ft)		148.85	

Vel Total (ft/s)	11.43	Avg. Vel. (ft/s)		11.43	
Max Chl Dpth (ft)	15.17	Hydr. Depth (ft)		12.58	
Conv. Total (cfs)	220462.0	Conv. (cfs)		220462.0	
Length Wtd. (ft)	131.00	Wetted Per. (ft)		158.77	
Min Ch El (ft)	1391.00	Shear (lb/sq ft)		6.94	
Alpha	1.00	Stream Power (lb/ft s)	265.13	36.30	0.00
Frctn Loss (ft)	1.79	Cum Volume (acre-ft)	1.10	64.18	1.35
C & E Loss (ft)	0.16	Cum SA (acres)	0.11	5.07	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 86

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1403.35	26.58	1412.14	41.58	1411.84	77.66	1394	85.1	1394
132.7	1391.7	144.1	1388.82	162.1	1386.09	231.9	1410.93	250.3	1410.46
256.9	1410.46	287.1	1411.56						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	41.58	.016	77.66	.05	85.1	.08	162.1	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
41.58	231.9	205.81	211.61 210.55	.1	.3

Left Levee Station= 26.58 Elevation= 1412.14

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1406.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.58	Wt. n-Val.		0.063	
W.S. Elev (ft)	1402.67	Reach Len. (ft)	205.81	211.61	210.55
Crit W.S. (ft)	1401.73	Flow Area (sq ft)		1409.51	
E.G. Slope (ft/ft)	0.021605	Area (sq ft)		1409.51	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	148.56	Top Width (ft)		148.56	
Vel Total (ft/s)	15.18	Avg. Vel. (ft/s)		15.18	
Max Chl Dpth (ft)	16.58	Hydr. Depth (ft)		9.49	
Conv. Total (cfs)	145591.3	Conv. (cfs)		145591.3	
Length Wtd. (ft)	211.61	Wetted Per. (ft)		154.07	
Min Ch El (ft)	1386.09	Shear (lb/sq ft)		12.34	
Alpha	1.00	Stream Power (lb/ft s)	287.10	26.58	0.00
Frctn Loss (ft)	2.70	Cum Volume (acre-ft)	1.10	59.25	1.35
C & E Loss (ft)	0.63	Cum SA (acres)	0.11	4.62	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1406.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.58	Wt. n-Val.		0.063	
W.S. Elev (ft)	1402.67	Reach Len. (ft)	205.81	211.61	210.55
Crit W.S. (ft)	1401.73	Flow Area (sq ft)		1409.51	
E.G. Slope (ft/ft)	0.021605	Area (sq ft)		1409.51	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	148.56	Top Width (ft)		148.56	
Vel Total (ft/s)	15.18	Avg. Vel. (ft/s)		15.18	
Max Chl Dpth (ft)	16.58	Hydr. Depth (ft)		9.49	
Conv. Total (cfs)	145591.3	Conv. (cfs)		145591.3	
Length Wtd. (ft)	211.61	Wetted Per. (ft)		154.07	
Min Ch El (ft)	1386.09	Shear (lb/sq ft)		12.34	
Alpha	1.00	Stream Power (lb/ft s)	287.10	26.58	0.00
Frctn Loss (ft)	2.70	Cum Volume (acre-ft)	1.10	59.25	1.35
C & E Loss (ft)	0.63	Cum SA (acres)	0.11	4.62	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 85.4

INPUT
Description:
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1407.15	40.7	1406.24	53.84	1410.41	68.84	1410.11	103.44	1394
113.1	1387.86	138.9	1388.87	166.9	1388.33	176.7	1387.36	239.8	1390
264.9	1392	270.8	1394	278.8	1396	283.4	1398	285.8	1400
287.9	1402	296.3	1404	301.5	1406	305.7	1408	349.1	1410
365.3	1410	382.4	1408						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	68.84	.016	103.44	.05	113.1	.08	239.8	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
68.84	305.7	294.8	299.3	299.1	.1	.3

Left Levee Station= 53.84 Elevation= 1410.41

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1402.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.49	Wt. n-Val.		0.067	
W.S. Elev (ft)	1401.43	Reach Len. (ft)	294.80	299.30	299.10
Crit W.S. (ft)	1397.25	Flow Area (sq ft)		2184.93	
E.G. Slope (ft/ft)	0.008427	Area (sq ft)		2184.93	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	199.82	Top Width (ft)		199.82	
Vel Total (ft/s)	9.79	Avg. Vel. (ft/s)		9.79	
Max Chl Dpth (ft)	14.07	Hydr. Depth (ft)		10.93	
Conv. Total (cfs)	233123.2	Conv. (cfs)		233123.2	

Length Wtd. (ft)	299.30	Wetted Per. (ft)		205.75	
Min Ch El (ft)	1387.36	Shear (lb/sq ft)		5.59	
Alpha	1.00	Stream Power (lb/ft s)	382.40	53.84	0.00
Frctn Loss (ft)	1.62	Cum Volume (acre-ft)	1.10	50.52	1.35
C & E Loss (ft)	0.16	Cum SA (acres)	0.11	3.77	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1402.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.49	Wt. n-Val.		0.067	
W.S. Elev (ft)	1401.43	Reach Len. (ft)	294.80	299.30	299.10
Crit W.S. (ft)	1397.25	Flow Area (sq ft)		2184.93	
E.G. Slope (ft/ft)	0.008427	Area (sq ft)		2184.93	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	199.82	Top Width (ft)		199.82	
Vel Total (ft/s)	9.79	Avg. Vel. (ft/s)		9.79	
Max Chl Dpth (ft)	14.07	Hydr. Depth (ft)		10.93	
Conv. Total (cfs)	233123.2	Conv. (cfs)		233123.2	
Length Wtd. (ft)	299.30	Wetted Per. (ft)		205.75	
Min Ch El (ft)	1387.36	Shear (lb/sq ft)		5.59	
Alpha	1.00	Stream Power (lb/ft s)	382.40	53.84	0.00
Frctn Loss (ft)	1.62	Cum Volume (acre-ft)	1.10	50.52	1.35
C & E Loss (ft)	0.16	Cum SA (acres)	0.11	3.77	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 85

INPUT
Description:
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-743.4	1402	0	1403.5	8.9	1402.29	17.58	1402.02	23.56	1405
40.08	1405.41	50.13	1400.54	59	1400.5	78.5	1400.52	96.8	1409.36
114.5	1399.15	125.8	1394.87	145.5	1390.98	158.8	1386.89	173.4	1381.93
180.5	1383.54	184.3	1385.66	219.4	1386.65	222.6	1386.17	292.6	1386.71
295.7	1387.98	320	1388.14	342.6	1400.19	348.2	1407.17	389.1	1407.09
411.3	1407.4	420.6	1409.99						

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-743.4	.05	0	.05	158.8	.08	219.4	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
96.8	348.2	414.07	449.02 430.64	.1	.3

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1401.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.97	Wt. n-Val.		0.059	
W.S. Elev (ft)	1400.18	Reach Len. (ft)	414.07	449.02	430.64
Crit W.S. (ft)	1394.23	Flow Area (sq ft)		2710.31	
E.G. Slope (ft/ft)	0.003759	Area (sq ft)		2710.31	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	229.86	Top Width (ft)		229.86	
Vel Total (ft/s)	7.90	Avg. Vel. (ft/s)		7.90	
Max Chl Dpth (ft)	18.25	Hydr. Depth (ft)		11.79	
Conv. Total (cfs)	349061.7	Conv. (cfs)		349061.7	
Length Wtd. (ft)	447.83	Wetted Per. (ft)		236.77	
Min Ch El (ft)	1381.93	Shear (lb/sq ft)		2.69	
Alpha	1.00	Stream Power (lb/ft s)	420.60	0.00	0.00
Frctn Loss (ft)	1.08	Cum Volume (acre-ft)	1.10	33.70	1.35
C & E Loss (ft)	0.17	Cum SA (acres)	0.11	2.30	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1401.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.97	Wt. n-Val.		0.059	
W.S. Elev (ft)	1400.18	Reach Len. (ft)	414.07	449.02	430.64
Crit W.S. (ft)	1394.23	Flow Area (sq ft)		2710.34	
E.G. Slope (ft/ft)	0.003758	Area (sq ft)		2710.34	
Q Total (cfs)	21400.00	Flow (cfs)		21400.00	
Top Width (ft)	229.86	Top Width (ft)		229.86	
Vel Total (ft/s)	7.90	Avg. Vel. (ft/s)		7.90	
Max Chl Dpth (ft)	18.25	Hydr. Depth (ft)		11.79	
Conv. Total (cfs)	349067.3	Conv. (cfs)		349067.3	
Length Wtd. (ft)	447.83	Wetted Per. (ft)		236.77	
Min Ch El (ft)	1381.93	Shear (lb/sq ft)		2.69	
Alpha	1.00	Stream Power (lb/ft s)	420.60	0.00	0.00
Frctn Loss (ft)	1.08	Cum Volume (acre-ft)	1.10	33.70	1.35
C & E Loss (ft)	0.17	Cum SA (acres)	0.11	2.30	0.42

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 84

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

2536.21	1402.2	2661.93	1402.15	3042.1	1400.51	3095.34	1401.09	3102.49	1400
3126.85	1380	3160.53	1377.3	3208.81	1380	3308.85	1384	3329.29	1388
3333.64	1392	3343.01	1396	3391.96	1396	3413.24	1396	3431.07	1400
3461.59	1402.4	3477.77	1402.24	3531.18	1403.16	3570.5	1404	3581.84	1404.36
3598.01	1408	3598.56	1412	3608.48	1416	3624.2	1420	3658.86	1420
3689.76	1420	3693.45	1424	3716.39	1424				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
2536.21	.05	3126.85	.08	3343.01	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
3126.85	3343.01	.1	.3

CROSS SECTION OUTPUT Profile #Floodplain

E.G. Elev (ft)	1399.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.39	Wt. n-Val.	0.050	0.080	0.050
W.S. Elev (ft)	1399.50	Reach Len. (ft)			
Crit W.S. (ft)	1387.98	Flow Area (sq ft)	231.57	3828.36	273.11
E.G. Slope (ft/ft)	0.001677	Area (sq ft)	231.57	3828.36	273.11
Q Total (cfs)	21400.00	Flow (cfs)	1083.11	19600.11	716.78
Top Width (ft)	325.74	Top Width (ft)	23.75	216.16	85.83
Vel Total (ft/s)	4.94	Avg. Vel. (ft/s)	4.68	5.12	2.62
Max Chl Dpth (ft)	22.20	Hydr. Depth (ft)	9.75	17.71	3.18
Conv. Total (cfs)	522641.0	Conv. (cfs)	26452.2	478683.2	17505.7
Length Wtd. (ft)		Wetted Per. (ft)	30.73	219.19	86.22
Min Ch El (ft)	1377.30	Shear (lb/sq ft)	0.79	1.83	0.33
Alpha	1.04	Stream Power (lb/ft s)	3716.39	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #Floodway

E.G. Elev (ft)	1399.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.39	Wt. n-Val.	0.050	0.080	0.050
W.S. Elev (ft)	1399.50	Reach Len. (ft)			
Crit W.S. (ft)	1387.98	Flow Area (sq ft)	231.57	3828.36	273.11
E.G. Slope (ft/ft)	0.001677	Area (sq ft)	231.57	3828.36	273.11
Q Total (cfs)	21400.00	Flow (cfs)	1083.11	19600.11	716.78
Top Width (ft)	325.74	Top Width (ft)	23.75	216.16	85.83
Vel Total (ft/s)	4.94	Avg. Vel. (ft/s)	4.68	5.12	2.62
Max Chl Dpth (ft)	22.20	Hydr. Depth (ft)	9.75	17.71	3.18
Conv. Total (cfs)	522641.0	Conv. (cfs)	26452.2	478683.2	17505.7
Length Wtd. (ft)		Wetted Per. (ft)	30.73	219.19	86.22
Min Ch El (ft)	1377.30	Shear (lb/sq ft)	0.79	1.83	0.33
Alpha	1.04	Stream Power (lb/ft s)	3716.39	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:RIVER-1

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7
Reach-1	91.4	.025	.04					
Reach-1	91	.025	.016	.05	.04	.05		
Reach-1	90.5	.025	.016	.05	.04	.05		
Reach-1	90	.025	.016	.05	.04	.05		
Reach-1	89.5	.025	.016	.05	.04	.05		
Reach-1	89	.025	.016	.05	.04	.05		
Reach-1	88.5	.025	.016	.05	.04	.05	.044	.05
Reach-1	88.4	.025	.016	.05	.04	.016	.05	
Reach-1	88	.025	.016	.05	.08	.016	.05	

Reach-1	87.9	.025	.016	.08	.05	.016	.05
Reach-1	87.4	.025	.016	.05	.08	.05	.016
.05							
Reach-1	87.3	.025	.016	.08	.016	.05	
Reach-1	87	.025	.016	.08	.05		
Reach-1	86.5	.025	.016	.05	.08	.05	
Reach-1	86.4	.025	.016	.08	.05		
Reach-1	86.3	.025	.016	.05	.08	.05	
Reach-1	86	.025	.016	.05	.08	.05	
Reach-1	85.4	.025	.016	.05	.08	.05	
Reach-1	85	.05	.05	.08	.05		
Reach-1	84	.05	.08	.05			

SUMMARY OF REACH LENGTHS

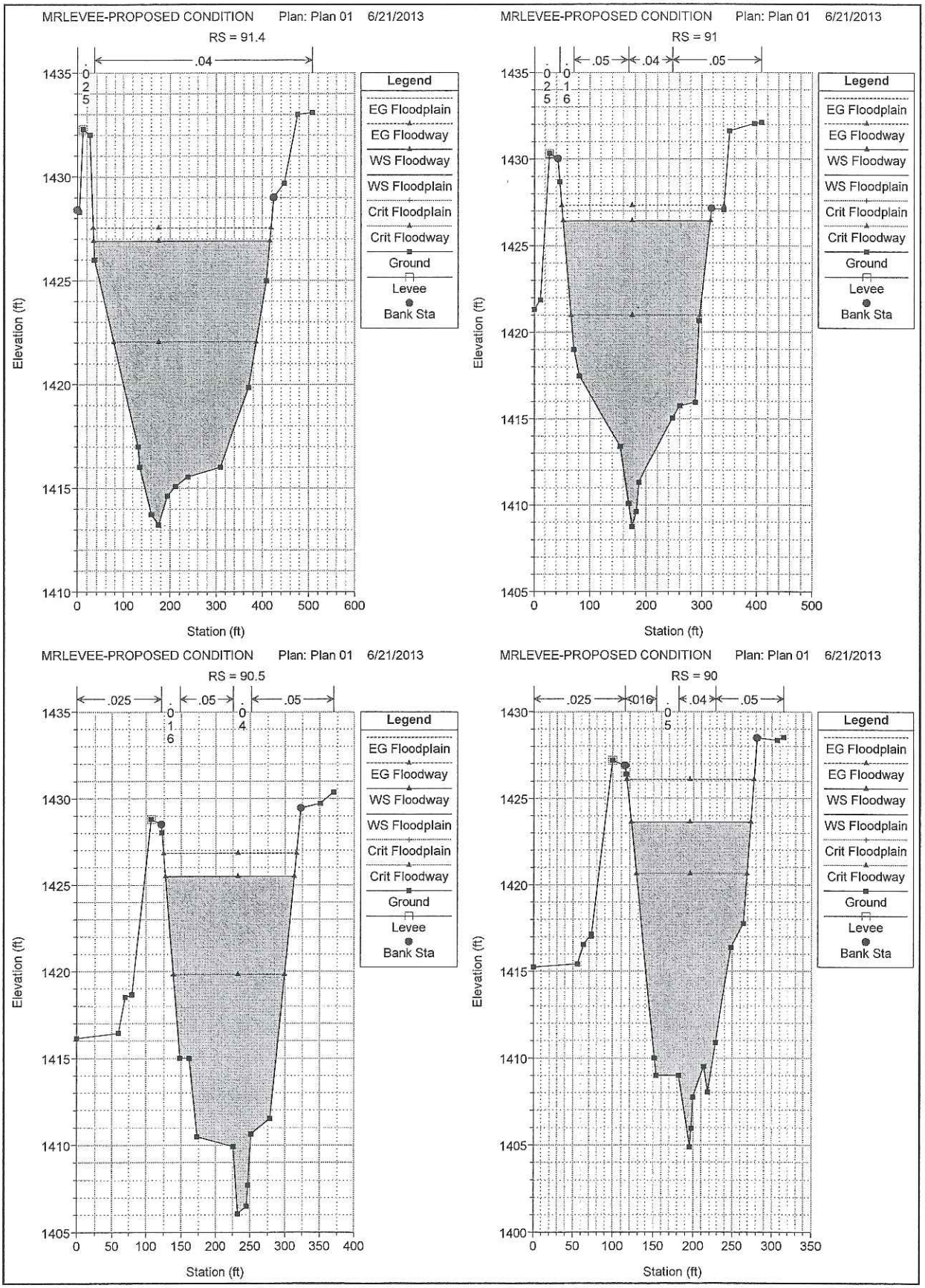
River: RIVER-1

Reach	River Sta.	Left	Channel	Right
Reach-1	91.4	100	100	100
Reach-1	91	195	173	137
Reach-1	90.5	183	167	165
Reach-1	90	205	213	213
Reach-1	89.5	179	188	203
Reach-1	89	198	206	182
Reach-1	88.5	49	47	44
Reach-1	88.4	100	89	94
Reach-1	88	46	46	46
Reach-1	87.9	294.3	274.7	248.7
Reach-1	87.4	82	79	80
Reach-1	87.3	178.6	145.2	104.2
Reach-1	87	269.82	280.95	283.22
Reach-1	86.5	47	47	47
Reach-1	86.4	55.4	72.4	94.8
Reach-1	86.3	145.4	131	112.9
Reach-1	86	205.81	211.61	210.55
Reach-1	85.4	294.8	299.3	299.1
Reach-1	85	414.07	449.02	430.64
Reach-1	84			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: RIVER-1

Reach	River Sta.	Contr.	Expan.
Reach-1	91.4	.1	.3
Reach-1	91	.1	.3
Reach-1	90.5	.1	.3
Reach-1	90	.1	.3
Reach-1	89.5	.1	.3
Reach-1	89	.1	.3
Reach-1	88.5	.1	.3
Reach-1	88.4	.1	.3
Reach-1	88	.1	.3
Reach-1	87.9	.1	.3
Reach-1	87.4	.1	.3
Reach-1	87.3	.1	.3
Reach-1	87	.1	.3
Reach-1	86.5	.1	.3
Reach-1	86.4	.1	.3
Reach-1	86.3	.1	.3
Reach-1	86	.1	.3
Reach-1	85.4	.1	.3
Reach-1	85	.1	.3

Reach-1	84	.1	.3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.025
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EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 91
.05
.04
.05
.025
.016
Legend
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EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
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.05
.05
.016
.04
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EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 90
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.016
.04
.05
.05
Legend
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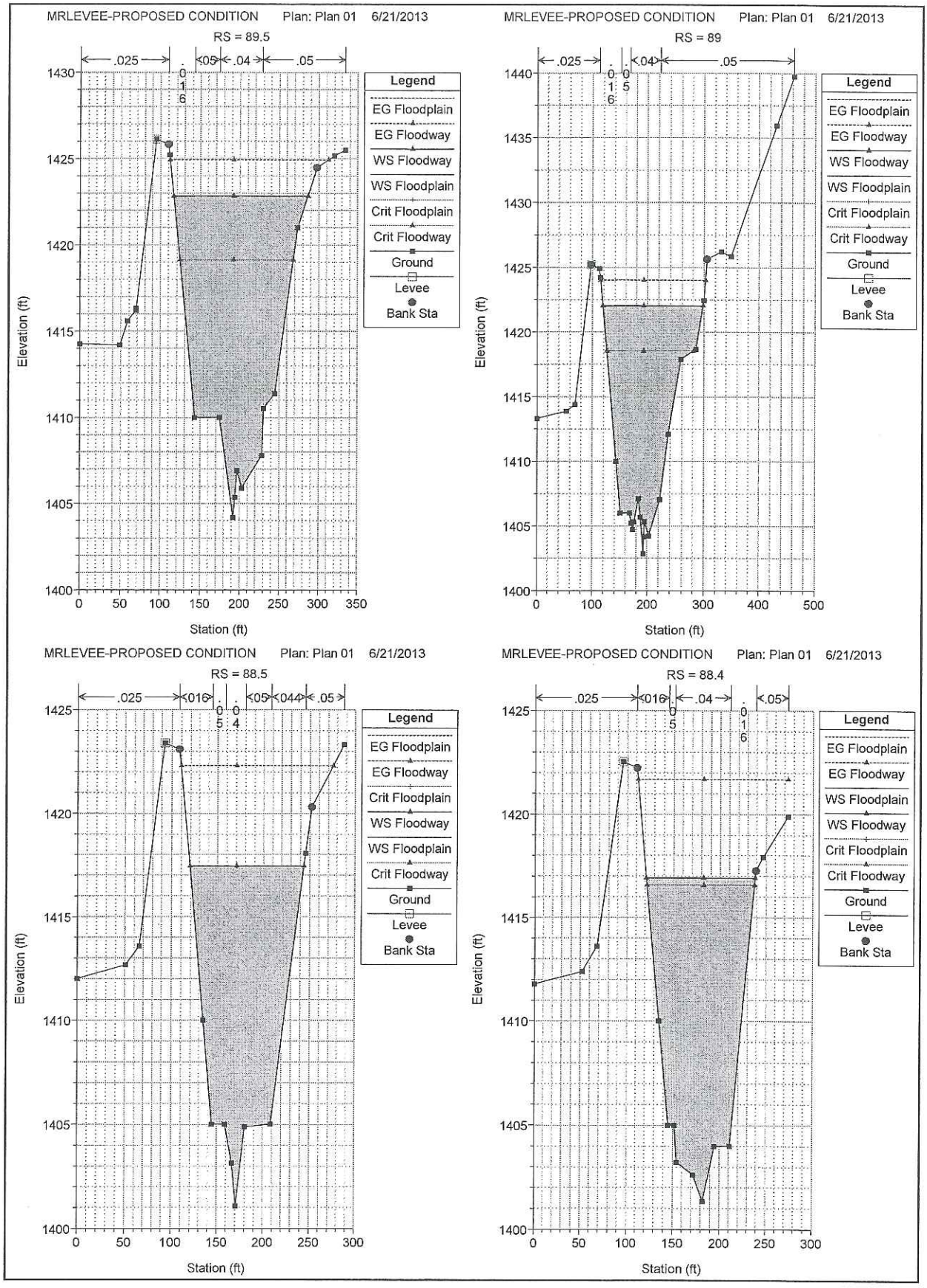
EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)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EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 89
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.04
.05
Legend
EG Floodplain
EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 88.5
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Legend
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EG Floodway
Crit Floodplain
WS Floodway
WS Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 88.4
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Legend
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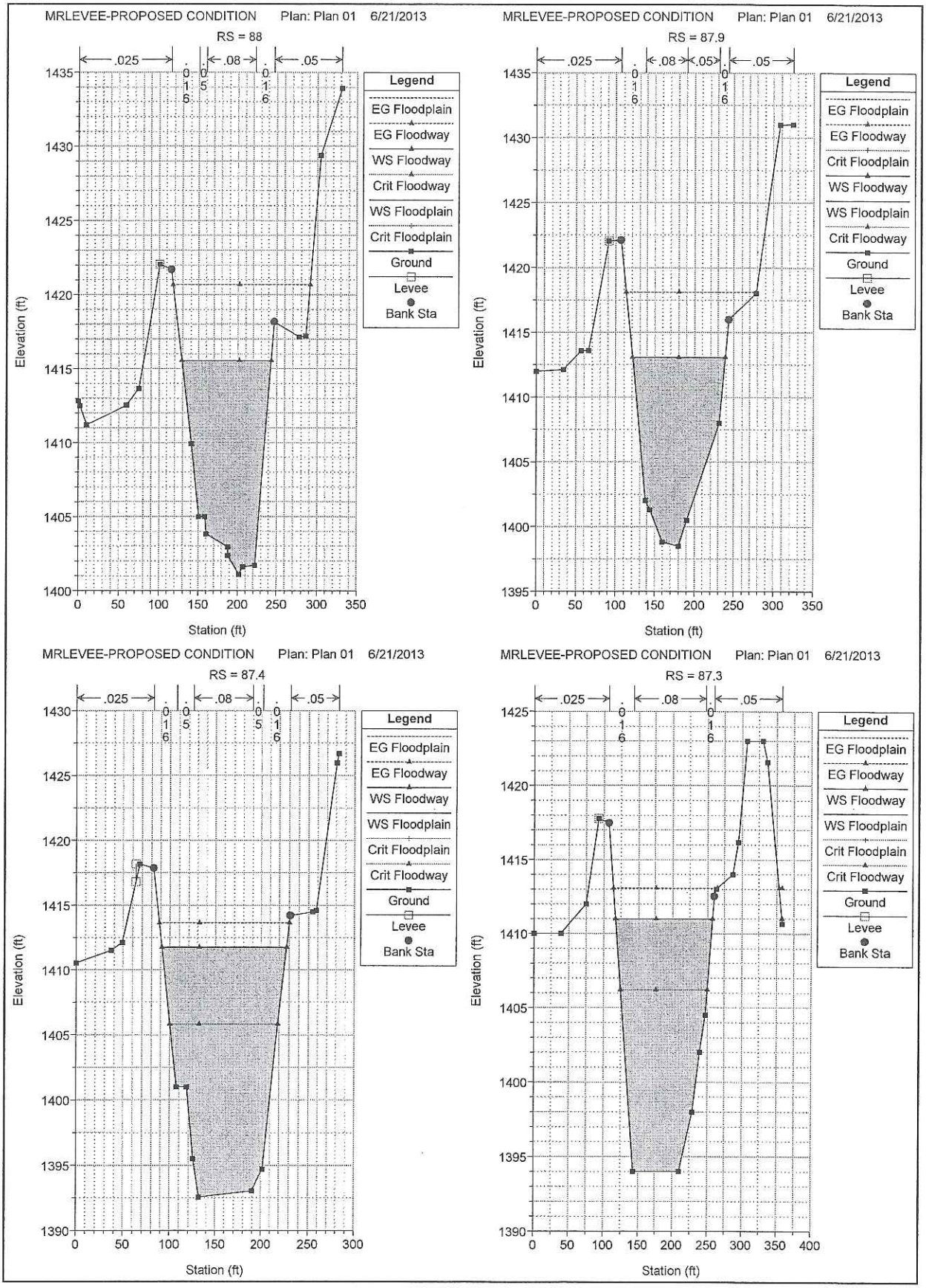
EG Floodway
WS Floodplain
WS Floodway
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)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EG Floodway
WS Floodway
Crit Floodway
WS Floodplain
Crit Floodplain
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
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.05
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0.16
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EG Floodway
Crit Floodplain
WS Floodway
WS Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 87.4
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0.05
0.05
0.16
Legend
EG Floodplain
EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 87.3
.025
.08
.05
0.16
0.16
Legend
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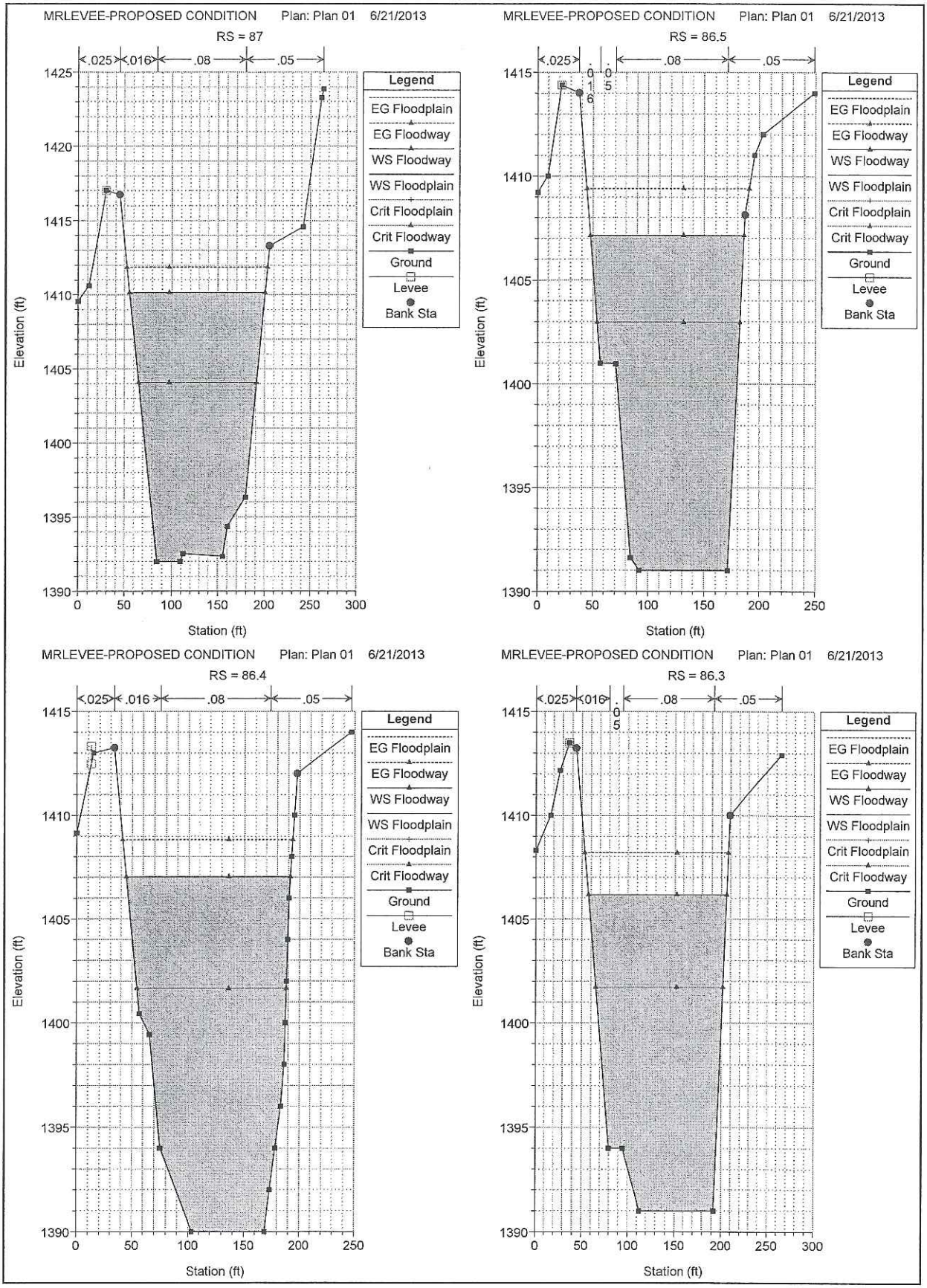
EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)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.08
.05
Elevation (ft)
Station (ft)
Legend
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EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 86.5
.025
.08
.05
Elevation (ft)
Station (ft)
Legend
EG Floodplain
EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 86.4
.025
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.08
.05
Elevation (ft)
Station (ft)
Legend
EG Floodplain
EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 86.3
.025
.016
.08
.05
Elevation (ft)
Station (ft)
Legend
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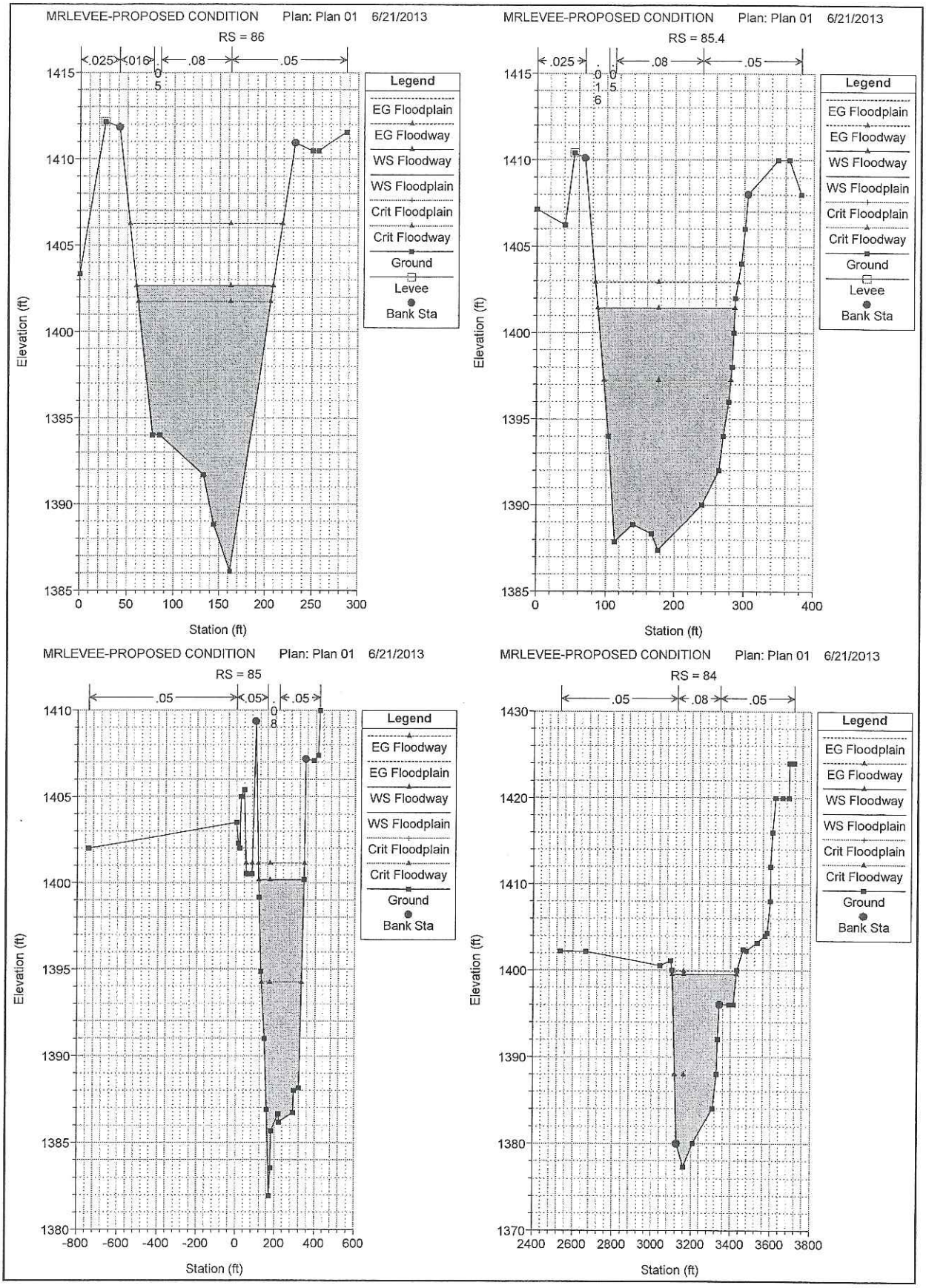
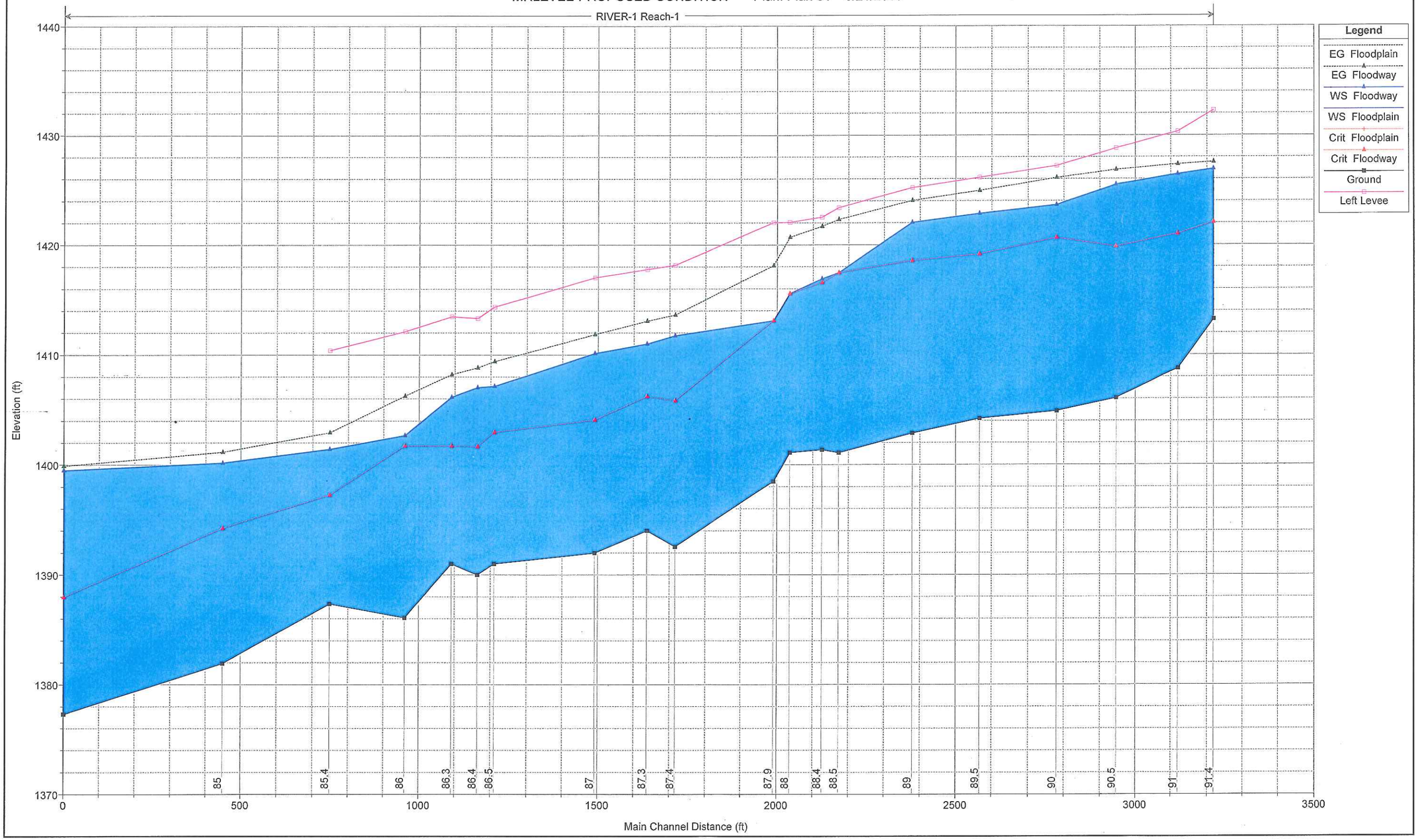
EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta


MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 86
.025
.016
.08
.05
Legend
EG Floodplain
EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 85.4
.025
.08
.05
Legend
EG Floodplain
EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 85
.05
.05
.05
Legend
EG Floodway
EG Floodplain
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Bank Sta
Elevation (ft)
Station (ft)
MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013
RS = 84
.05
.08
.05
Legend
EG Floodplain
EG Floodway
WS Floodway
WS Floodplain
Crit Floodplain
Crit Floodway
Ground
Bank Sta
Elevation (ft)
Station (ft)

HEC-RAS Plan: Plan 01 River: RIVER-1 Reach: Reach-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	91.4	Floodplain	21400.00	1413.22	1426.91	1422.04	1427.54	0.001638	6.39	3350.03	382.33	0.38
Reach-1	91.4	Floodway	21400.00	1413.22	1426.91	1422.04	1427.54	0.001638	6.39	3350.03	382.33	0.38
Reach-1	91	Floodplain	21400.00	1408.74	1426.43	1420.99	1427.33	0.002263	7.58	2825.07	262.64	0.41
Reach-1	91	Floodway	21400.00	1408.74	1426.43	1420.99	1427.33	0.002263	7.58	2825.07	262.64	0.41
Reach-1	90.5	Floodplain	21400.00	1406.06	1425.49	1419.83	1426.83	0.002966	9.29	2302.36	186.03	0.47
Reach-1	90.5	Floodway	21400.00	1406.06	1425.49	1419.82	1426.83	0.002966	9.29	2302.36	186.03	0.47
Reach-1	90	Floodplain	21400.00	1404.89	1423.63	1420.63	1426.08	0.005085	12.57	1701.84	152.26	0.66
Reach-1	90	Floodway	21400.00	1404.89	1423.63	1420.63	1426.08	0.005085	12.57	1701.84	152.26	0.66
Reach-1	89.5	Floodplain	21400.00	1404.19	1422.84	1419.14	1424.92	0.004773	11.58	1847.77	170.21	0.62
Reach-1	89.5	Floodway	21400.00	1404.19	1422.84	1419.14	1424.92	0.004773	11.58	1847.77	170.21	0.62
Reach-1	89	Floodplain	21400.00	1402.86	1422.04	1418.55	1424.02	0.004545	11.28	1896.95	179.39	0.61
Reach-1	89	Floodway	21400.00	1402.86	1422.04	1418.55	1424.02	0.004545	11.28	1896.95	179.39	0.61
Reach-1	88.5	Floodplain	21400.00	1401.08	1417.46	1417.46	1422.30	0.011807	17.67	1211.24	124.15	1.00
Reach-1	88.5	Floodway	21400.00	1401.08	1417.46	1417.46	1422.30	0.011807	17.67	1211.24	124.15	1.00
Reach-1	88.4	Floodplain	21400.00	1401.35	1416.92	1416.57	1421.68	0.006252	17.52	1221.80	117.33	0.96
Reach-1	88.4	Floodway	21400.00	1401.35	1416.92	1416.57	1421.68	0.006258	17.52	1221.40	117.32	0.96
Reach-1	88	Floodplain	21400.00	1401.09	1415.56	1415.56	1420.68	0.023070	18.16	1178.19	114.36	1.00
Reach-1	88	Floodway	21400.00	1401.09	1415.56	1415.56	1420.68	0.023045	18.16	1178.58	114.37	1.00
Reach-1	87.9	Floodplain	21400.00	1398.48	1413.09	1413.09	1418.10	0.024013	17.95	1192.02	118.75	1.00
Reach-1	87.9	Floodway	21400.00	1398.48	1413.09	1413.09	1418.10	0.024013	17.95	1192.02	118.75	1.00
Reach-1	87.4	Floodplain	21400.00	1392.56	1411.75	1405.83	1413.63	0.005446	11.01	1943.26	135.93	0.51
Reach-1	87.4	Floodway	21400.00	1392.56	1411.75	1405.83	1413.63	0.005446	11.01	1943.26	135.93	0.51
Reach-1	87.3	Floodplain	21400.00	1394.00	1411.00	1406.20	1413.07	0.008974	11.55	1852.27	140.75	0.56
Reach-1	87.3	Floodway	21400.00	1394.00	1411.00	1406.20	1413.07	0.008974	11.55	1852.27	140.75	0.56
Reach-1	87	Floodplain	21400.00	1391.98	1410.14	1404.08	1411.85	0.006550	10.49	2040.41	145.03	0.49
Reach-1	87	Floodway	21400.00	1391.98	1410.14	1404.07	1411.85	0.006550	10.49	2040.41	145.03	0.49
Reach-1	86.5	Floodplain	21400.00	1391.00	1407.15	1402.96	1409.39	0.011709	12.01	1781.80	138.59	0.59
Reach-1	86.5	Floodway	21400.00	1391.00	1407.15	1402.96	1409.39	0.011709	12.01	1781.80	138.59	0.59
Reach-1	86.4	Floodplain	21400.00	1390.00	1407.04	1401.65	1408.82	0.007344	10.72	1996.78	147.07	0.51
Reach-1	86.4	Floodway	21400.00	1390.00	1407.04	1401.65	1408.82	0.007344	10.72	1996.78	147.07	0.51
Reach-1	86.3	Floodplain	21400.00	1391.00	1406.17	1401.71	1408.20	0.009422	11.43	1872.20	148.85	0.57
Reach-1	86.3	Floodway	21400.00	1391.00	1406.17	1401.71	1408.20	0.009422	11.43	1872.20	148.85	0.57
Reach-1	86	Floodplain	21400.00	1386.09	1402.67	1401.73	1406.25	0.021605	15.18	1409.51	148.56	0.87
Reach-1	86	Floodway	21400.00	1386.09	1402.67	1401.73	1406.25	0.021605	15.18	1409.51	148.56	0.87
Reach-1	85.4	Floodplain	21400.00	1387.36	1401.43	1397.25	1402.92	0.008427	9.79	2184.93	199.82	0.52
Reach-1	85.4	Floodway	21400.00	1387.36	1401.43	1397.25	1402.92	0.008427	9.79	2184.93	199.82	0.52
Reach-1	85	Floodplain	21400.00	1381.93	1400.18	1394.23	1401.15	0.003759	7.90	2710.31	229.86	0.41
Reach-1	85	Floodway	21400.00	1381.93	1400.18	1394.23	1401.15	0.003758	7.90	2710.34	229.86	0.41
Reach-1	84	Floodplain	21400.00	1377.30	1399.50	1387.98	1399.89	0.001677	5.12	4333.04	325.74	0.21
Reach-1	84	Floodway	21400.00	1377.30	1399.50	1387.98	1399.89	0.001677	5.12	4333.04	325.74	0.21

MRLEVEE-PROPOSED CONDITION Plan: Plan 01 6/21/2013



cHECk-RAS Report

HEC-RAS Project:	*mrleveepro.prj*
Plan File:	*mrleveepro.p01*
Geometry File:	*mrleveepro.g01*
Flow File:	*mrleveepro.f04*
Report Date:	*6/21/2013*

Message ID	Message	Cross sections affected	Comments
FW FW 01L	The Left encroachment station is within the channel. The Left encroachment station $encrstal$ is more than left channel bank station $stalob$. The left encroachment station should be the same as the left channel bank station.	89; 89.5; 90; 91	Floodway was set to floodplain to not allow further encroachment into the floodplain.
FW FW 03L	The left channel bank elevation of $lobelev$ is higher than the 1-percent-annual-chance WSEL of $wsel$. Relocate the left channel bank station at or below the 1-percent-annual-chance WSEL. Do not place the bank stations at the bottom of the channel. Do not place the bank stations at the low flow channel. Use the Horizontal Variation in "n" Values option in HEC-RAS to assign different "n" values to the left bank slope, low flow channel, and the right bank slope. Let HEC-RAS compute the composite "n" value based on the depth of flow.	85; 85.4; 86; 86.3; 86.4; 86.5; 87; 87.3; 87.4; 87.9; 88; 88.4; 88.5; 89; 89.5; 90; 90.5; 91; 91.4	
FW FW 03R	The right channel bank elevation of $robelev$ is higher than the 1-percent annual chance WSEL of $wsel$. Relocate the right channel bank station at or below the 1-percent annual chance WSEL. Do not place the bank stations at the bottom of the channel. Do not place the bank stations at the low flow channel. Use the Horizontal Variation in "n" Values option in HEC-RAS to assign different "n" values to the left bank slope, low flow channel, and the right bank slope. Let HEC-RAS compute the composite "n" value based on the depth of flow.	85; 85.4; 86; 86.3; 86.4; 86.5; 87; 87.3; 87.4; 87.9; 88; 88.4; 88.5; 89; 89.5; 90; 90.5; 91; 91.4	
FW FW 04L	The 1-percent-annual-chance floodplain is outside of the channel. The left station effective of $ineffstal$ for the 1-percent-annual-chance floodplain is less than the left channel bank station $stalob$. However, the left encroachment station $encstal$ is outside of the 1-percent-annual-chance floodplain. Adjust the left encroachment station so that it will be within the floodplain.	84	

FW FW 04R	The 1-percent-annual-chance floodplain is outside of the channel. The right station effective of $ineffstar$ for the 1-percent-annual-chance floodplain is greater than the right channel bank station $starob$. However, the right encroachment station $encstar$ is outside of the 1-percent-annual-chance floodplain. Adjust the right encroachment station so that it will be within the floodplain.	84	Floodway was set to floodplain to not allow further encroachment into the floodplain.
FW FW 05L	The 1-percent annual chance flood is contained within the channel. The Left encroachment station $encstal$ is outside the channel. The Left channel bank station is $stalob$. Adjust the left encroachment station so that it is the same as the left channel bank station.	86.4; 87.4; 90.5	
FW FW 06L	The left side of the floodway boundary is within the channel. The left station effective of $ineffstal$ for the floodway profile is more than the left channel bank station of $stalob$. The left encroachment station of $encstal$ is less than the left channel bank station. Adjust the left encroachment station so that it is the same as the left channel bank station.	86.4; 87.4; 90.5	
FW SW 01M1	The name of the stream is ($streamname$). Encroachment Method 1 is used. Known WS option is used for both the 1%-annual-chance flood and floodway profiles. The floodway profile starting WSEL of $knownwsfw$ is not equal to the 1%-annual-chance flood starting WSEL of $knownws100yr$ plus the allowable surcharge value of $allowsurchrg$. The Normal Depth option with the energy slope of the 1%-annual-chance flood should be used for both profiles and the plan should be rerun. This message may not be applicable when revising only a portion of a hydraulic model.	84	
FW SW 05M1	The name of the stream is ($streamname$). Encroachment Method 1 is used. The floodway starting water-surface elevation is equal to the 1%-annual-chance starting water-surface elevation. Since the floodway width is narrower than the 1%-annual-chance top width the floodway starting WSEL should be higher than the 1%-annual-chance starting WSEL. The Normal depth option with the same energy slope as the 1%-annual-chance profile must be used for the floodway profile and the plan should be rerun. This message may not be applicable when revising only a portion of a hydraulic model.	84	

MP SW 01DK	The name of the stream is ($streamname$). The flow regime is subcritical or mixed flow. Starting water-surface elevations are computed from Known WSELs as the downstream boundary condition. Provide backup information on Known water-surface elevations or use same energy slope for all the profiles as the starting boundary condition and rerun the plan.		Backup information on starting WSE included.
NT RC 05	The left overbank n-value of $nlob$ and the right overbank n-value of $nrob$ are less than or equal to the channel n-value of nch. Follow the procedure in (FHWA, 1984) to compute the n-value for the natural floodplain and the channel. Or follow the procedure in (USGS, 1977) to compute the n-value for urban development. Please submit supporting information on the evaluation of n-values.	84	n values based on 1995 FIS Restudy Muddy River. Backup information included.
XS DC 02	Constant discharge used for the entire profile for $assignedname$ flood. At least two discharges should be selected; one at the mouth and the other at the middle of the watershed or above the confluence of a tributary. Or provide explanation why only one discharge should be used. Other flood frequencies should also be checked.		Flow unchanged from effective model.
XS EC 01R	Cross section extended vertically. Flow Code will be ER. The $assignedname$ WSEL of $wsel$ is higher than the ending GR station elevation of $grelv$. The Rght_Sta_Eff is equal to the ending GR station. If there is divided flow then the cross section should be trimmed or the ineffective flow station should be used to block the divided flow. If there is no divided flow then the cross section should be expanded to cover the $assignedname$ floodplain. The HEC-RAS geometry file may need to be recreated using a GIS program. Or provide explanation why the cross section should not be expanded.	87.3	Levee is preventing flow conveyance without extending vertically.
XS LV 02L	The Left levee option is used at this river station. It is the most upstream cross section on the levee. Freeboard is computed by subtracting the 1%-annual-chance WSEl from the levee crest elevation. Left Freeboard of $lfrbrd$ is less than 3.5 feet. A without-levee analysis needs to be conducted since the freeboard does not meet the requirements of Part 65.10 of the National Flood Insurance Program regulations (FEMA, 1986). Please submit all the required models for levees.	89; 89.5; 90; 90.5; 91	Minimum 3 feet of freeboard is provided.

XS SW 01DK	The name of the stream is $streamname$. The flow regime is subcritical or mixed flow. Starting WSEL is computed from Known WSEL as the downstream boundary for $Assigned_Name$ flood. Provide backup information on Known WSEL or use energy slope as the downstream boundary.	84	Backup information on starting WSE included.

4. SUPPORTING INFORMATION (ON CD)

Site Investigation Photographs
Field Survey Information
Operation and Maintenance Plan
ESA Compliance
Topography
Geotechnical Report

5. REFERENCE MATERIALS (ON CD)

Excerpts from the *Flood Insurance Study*, 1995
Muddy River Levee Flood Hazard Mapping Study, 2010
Flood Insurance Study Clark County and Incorporated Areas, 2011
Flap Valve Manufacturer's Specifications (Rodney Hunt and Troy Valve)
HEC-RAS River Analysis System Hydraulic Reference Manual, 2008

6. IMPROVEMENT PLANS (ON CD)

Muddy River Logandale Levee

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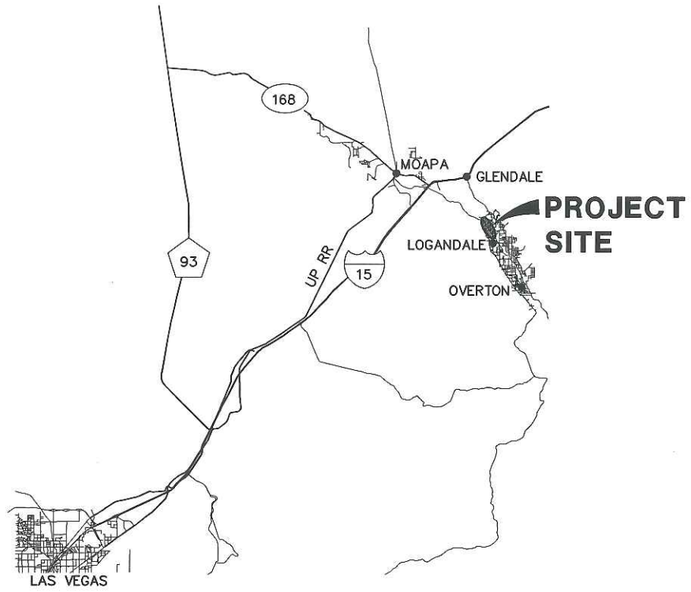
DEPARTMENT OF PUBLIC WORKS



Vicinity Map

NOT TO SCALE

CLARK COUNTY NEVADA

2013

IMPROVEMENT PLANS FOR

MUDDY RIVER LOGANDALE LEVEE

MUDDY RIVER LOGANDALE LEVEE

County Manager

Donald G. Burnette

Director of Public Works

Approved:

Denis Cederburg

Clark County Regional Flood Control District

General Manager / Chief Engineer

Approved:

Gale Wm Fraser II, PE

County Commissioners

Steve Sisolak, Chairman
Larry Brown, Vice-Chairman
Tom Collins
Lawrence Weekly
Chris Giunchigliani
Susan Brager
Mary Beth Scow

FUNDED BY

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

G.C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BLVD · LAS VEGAS, NV 89146
T: 702.804.2000 · F: 702.804.2099 · GCWALLACE.COM

AGENCY	PLANS REVIEWED BY	DATE
BAJA BROADBAND		
MOAPA VALLEY TELEPHONE		
MOAPA VALLEY WATER DISTRICT		
MUDDY VALLEY IRRIGATION COMPANY		
OVERTON POWER DISTRICT #5		
SOUTHWEST GAS COMPANY		
CLARK COUNTY WATER RECLAMATION DISTRICT		

DEPARTMENT OF PUBLIC WORKS	BY	DATE
DEPUTY DIRECTOR		
CONSTRUCTION MANAGEMENT DIVISION		
DESIGN ENGINEERING DIVISION		
MAINTENANCE MANAGEMENT DIVISION		
TRAFFIC MANAGEMENT DIVISION		
COUNTY SURVEYOR'S OFFICE		

REVISIONS NUMBER	DESCRIPTION	DATE

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

DESIGN ENGINEERING DIVISION

COVER SHEET

BID No.:

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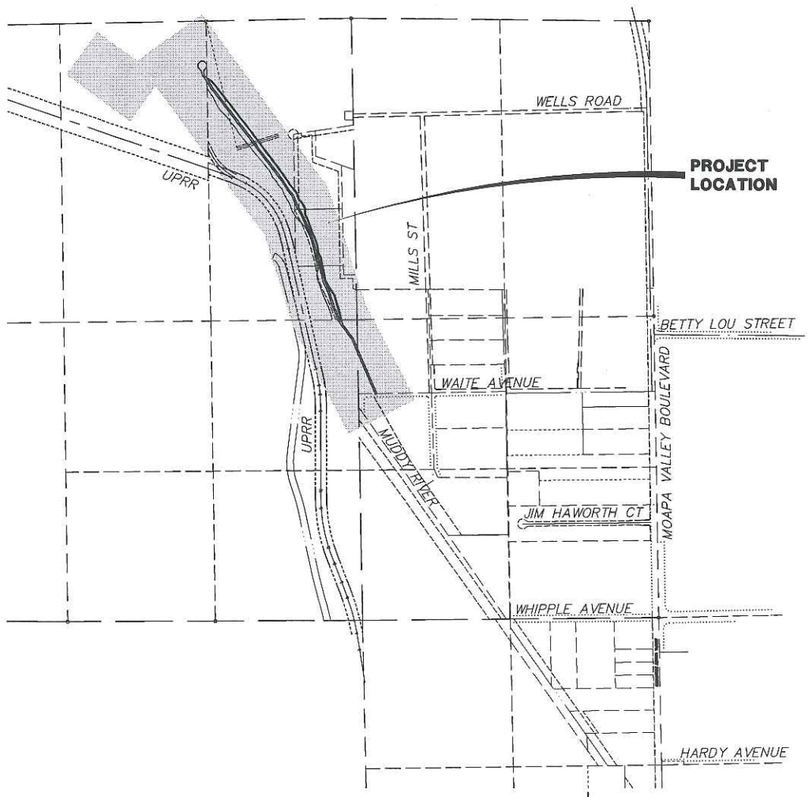
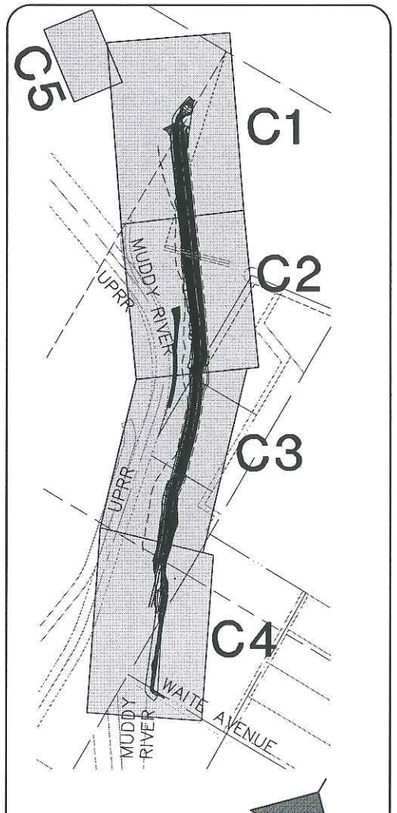
INDEX NO.	SHEET NO.	DESCRIPTION
1	G1	COVER SHEET
2	G2	LOCATION MAP, KEY MAP AND SHEET INDEX
3	G3	LEGEND, ABBREVIATIONS, NOTES, REMOVAL AND CONSTRUCTION NOTES
4	H1	HORIZONTAL CONTROL PLAN – "STA" 10+00.00 TO "STA" 20+00.00
5	H2	HORIZONTAL CONTROL PLAN – "STA" 20+00.00 TO "STA" 29+00.00
6	H3	HORIZONTAL CONTROL PLAN – "STA" 29+00.00 TO "STA" 39+00.00
7	H4	HORIZONTAL CONTROL PLAN – "STA" 39+00.00 TO "STA" 47+58.95
8	C1	PLAN – "STA" 10+00.00 TO "STA" 20+00.00
9	C2	PLAN – "STA" 20+00.00 TO "STA" 29+00.00
10	C3	PLAN – "STA" 29+00.00 TO "STA" 39+00.00
11	C4	PLAN – "STA" 39+00.00 TO "STA" 47+58.95
12	C5	BLANK
13	C6	PROFILE – "STA" 10+00.00 TO "STA" 20+00.00
14	C7	PROFILE – "STA" 20+00.00 TO "STA" 29+00.00
15	C8	PROFILE – "STA" 29+00.00 TO "STA" 39+00.00
16	C9	PROFILE – "STA" 39+00.00 TO "STA" 47+58.95
17	C10	PROFILE – 18" STORM DRAIN
18	C11	DETAILS 1
19	C12	DETAILS 2
20	C13	DETAILS 3
21	S1	GENERAL STRUCTURE NOTES AND TYPICAL DETAILS
22	S2	TYPICAL LEVEE CONCRETE SLOPE PAVING PLAN AND DETAILS



LOCATION MAP
NOT TO SCALE



KEY MAP
NOT TO SCALE

DISCLAIMER NOTE

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811 or 1-800-227-2600
AND CLARK COUNTY TRAFFIC OPERATIONS 1-702-455-7544

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
CALL BEFORE YOU DIG OVERHEAD
1-702-402-2929

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

MUDDY RIVER LOGANDALE LEVEE
LOCATION MAP, KEY MAP AND SHEET INDEX
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER – STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BLVD · LAS VEGAS, NV 89146
T: 702.804.2000 · F: 702.804.2099 · GCWALLACE.COM

SCALE
HORIZ: N/A
VERT: N/A
FIELD BOOK

DRAWING NO.
G2
SHT. OF

GENERAL NOTES

1. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITION BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND OF INGRESS AND EGRESS TO SAID CONSTRUCTION. EXTENT OF TRANSITIONS TO BE DETERMINED BY THE COUNTY ENGINEER.
2. EXISTING UTILITIES ARE LOCATED ON PLANS FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. THE CONTRACTOR SHALL BEAR FULL RESPONSIBILITY FOR THE PROTECTION OF UTILITIES AND THE ENGINEER BEARS NO RESPONSIBILITY FOR UTILITIES NOT SHOWN ON PLANS OR NOT IN THE LOCATION SHOWN ON THE PLANS. (CALL BEFORE YOU DIG 811 OR 1-800-227-2600).
3. CONSTRUCTION SURVEY: GRADES ARE GIVEN FROM TOP OF STAKES OR NAILS. THE CONTRACTORS ARE CAUTIONED TO OBSERVE THE FOLLOWING RULE IN USING THE GRADE STAKES GIVEN BY CLARK COUNTY. THREE CONSECUTIVE POINTS THAT ARE SHOWN TO BE ON THE SAME RATE OF SLOPE MUST BE USED IN COMMON IN ORDER THAT ANY VARIATION OUT OF A PERFECT STRAIGHT GRADE MAY BE DETECTED. IN CASE ANY SUCH DISCREPANCY IS FOUND, THE SAME MUST BE REPORTED OTHERWISE CLARK COUNTY WILL NOT BE RESPONSIBLE FOR ANY ERROR IN THE GRADE OF THE FINISH WORK.
4. WHEELCHAIR RAMPS SHALL BE CONSTRUCTED AT ALL STREET INTERSECTIONS PER CLARK COUNTY STANDARD DRAWING 235 EXACT LOCATION OF RAMP TO BE DETERMINED IN FIELD BY A CLARK COUNTY INSPECTOR.
5. STANDARD STREET SECTIONS PER CLARK COUNTY STANDARD DRAWINGS UNLESS OTHERWISE NOTED.
6. CURB AND GUTTER WITH A GRADE OF LESS THAN FOUR TENTHS OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING. EACH JOINT SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION.
7. FINAL ASPHALTIC CONCRETE (AC) PAVEMENT SURFACES SHALL BE ONE-HALF INCH ABOVE LIP OF THE GUTTER.
8. EXACT LOCATION OF ALL SAWCUTS TO BE DETERMINED IN THE FIELD BY A CLARK COUNTY INSPECTOR.
9. VALLEY GUTTER WITH A GRADE OF FOUR TENTHS OF ONE PERCENT OR LESS SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO INSURE PROPER DRAINAGE ACROSS ALL VALLEY GUTTERS.
10. ALL OFF-SITE IMPROVEMENT CONSTRUCTION SHALL CONFORM TO THE "UNIFORM STANDARD SPECIFICATIONS AND STANDARD DRAWINGS CLARK COUNTY AREA NEVADA" AND "CLARK COUNTY SUPPLEMENT TO UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS", LATEST REVISION.
11. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES OR STRUCTURES NOT SHOWN ON THE DRAWINGS. CONTRACTOR TO VERIFY THE EXACT LOCATION OF UTILITIES PRIOR TO START OF CONSTRUCTION. THE CONTRACTOR'S RESPONSIBILITIES REGARDING UTILITIES SHALL BE AS REQUIRED UNDER SECTION 107.17 OF THE UNIFORM STANDARD SPECIFICATIONS FOR CLARK COUNTY AREA, NEVADA AND AS PROVIDED IN THE SPECIFICATIONS. THE CONTRACTOR SHALL USE EXTREME CARE WORKING OVER OR NEAR ANY EXISTING GAS MAINS.
12. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING IMPROVEMENTS, WHICH ARE TO REMAIN IN PLACE FROM DAMAGE. ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR RECONSTRUCTED TO THE SATISFACTION OF THE ENGINEER AT THE EXPENSE OF THE CONTRACTOR.
13. FENCES, SIGNS, STRUCTURES, LIGHTS AND OTHER EXISTING IMPROVEMENTS WITHIN STREET R/W SHALL BE REMOVED WHERE SHOWN ON THE CONTRACT DRAWINGS, AND AS REQUIRED BY THE ENGINEER.
14. REPLACEMENT, RELOCATION OR RECONSTRUCTION OF ALL EXISTING IMPROVEMENTS INCLUDING FENCES, WALL SIGNS, AND ALL OTHER ITEMS APPLICABLE TO THIS CONTRACT SHALL BE AS REQUIRED BY THE ENGINEER.
15. ALL BARRICADING AND TEMPORARY TRAFFIC CONTROL DEVICES OR METHODS USED DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE "NEVADA TRAFFIC CONTROL MANUAL, 1986 PUBLISHED BY THE STATE OF NEVADA, DEPARTMENT OF TRANSPORTATION, EXCEPT AS OTHERWISE PROVIDED IN THE CONTRACT DRAWINGS.
16. THE CONTRACTOR SHALL BACKFILL AND FINAL GRADE ALL CUT OR FILL SLOPES TO MATCH EXISTING CONDITIONS TO THE SATISFACTION OF THE ENGINEER.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE VERTICAL ADJUSTMENT OF ALL EXISTING SANITARY, WATER AND STORM SEWER MANHOLES TO THE FINAL FINISH GRADES IN ACCORDANCE WITH THE DETAILS SHOWN ON THE CONTRACT DRAWINGS AND IN ACCORDANCE WITH SECTION 609 OF THE "STANDARD SPECIFICATIONS".
18. 48 HOURS PRIOR TO START OF CONSTRUCTION THE CONTRACTOR SHALL CONTACT:

OVERTON POWER DISTRICT #5	PHONE – 1-888-409-6735
MOAPA VALLEY TELEPHONE	PHONE – 1-800-227-2600
SOUTHWEST GAS CORPORATION	PHONE – 1-800-227-2600
BAJA BROADBAND	PHONE – (702) 346-5205
MOAPA VALLEY WATER DISTRICT	PHONE – (702) 397-6893
CLARK COUNTY TRAFFIC MANAGEMENT DIVISION	PHONE – (702) 455-7511
CLARK COUNTY WATER RECLAMATION DISTRICT	PHONE – (702) 434-6000
MUDDY VALLEY IRRIGATION COMPANY	PHONE – (702) 398-7310

19. PER SPECIAL PROVISIONS SECTION 637.03.03, PLEASE REFER TO THE LAS VEGAS VALLEY CONSTRUCTION SITE BEST MANAGEMENT PRACTICES GUIDANCE MANUAL, SECTION 3.5.1 FOR THE STORM WATER MANAGEMENT NOTES AND APPENDIX B FOR THE VARIOUS REQUIRED CHECKLISTS. THE MANUAL CAN BE FOUND HERE: http://lvstormwater.com/pdfs/LVV-Construction-Site-BMP-Guidance-Manual-Jan-2009.pdf

CLARK COUNTY WATER RECLAMATION DISTRICT NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IN ALL CASES, THESE STANDARDS SHALL SUPERSEDE THE UNIFORM STANDARD SPECIFICATIONS. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENTS OF THE ABOVE SPECIFICATION BOOKS.
2. THESE STANDARDS SHALL APPLY TO ALL CONSTRUCTION.
3. SEWER MAINS ONLY TO BE LAID IN SEWER TRENCHES.
4. ALL LATERALS TO BE LAID AT NOT LESS THAN MINIMUM SLOPE AS SHOWN IN THESE STANDARDS
5. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CONTROLLING AGENCY.
6. SOIL TESTING SHALL BE IN ACCORDANCE WITH SECTION 3.11 OF THESE STANDARDS.
7. ALL EXFILTRATION, INFILTRATION, AIR TESTING AND TELEVISING OF LINES SHALL BE IN ACCORDANCE WITH THESE STANDARDS.
8. CUT SHEETS MUST BE SUBMITTED TO THE AGENCY BEFORE CONSTRUCTION WILL BE PERMITTED TO START.
9. ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CONTROLLING AGENCY MUST BE CLASS "A" CONTRACTORS.

CLARK COUNTY WATER RECLAMATION DISTRICT _____ DATE

CCWRD PROJECT CONTROL NUMBER IS_____.

SIGNATURE ON THESE PLANS WILL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF CLARK COUNTY WATER RECLAMATION DISTRICT RULES, REGULATIONS, OR DESIGN AND CONSTRUCTION STANDARDS. THE APPROVAL OF THESE DRAWINGS DOES NOT GUARANTEE CAPACITY IN THE DISTRICT'S COLLECTION OR TREATMENT SYSTEM.

MOAPA VALLEY WATER DISTRICT (MVWD) NOTES

1. ALL WORK TO CONFORM TO MVWD STANDARDS. (CONSTRUCTION STANDARD PLATES AVAILABLE UPON REQUEST.)
2. ALL WORK, EXCEPT AS MODIFIED HERON OR BY NOTE 1, SHALL CONFORM TO THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA
3. WRITTEN NOTICE IS TO BE GIVEN THE MOAPA VALLEY WATER DISTRICT AT LEAST 48 HOURS PRIOR TO ACTUAL CONSTRUCTION.
4. ALL LINES TO BE INSTALLED, PRESSURE AND LEAKAGE TESTED AS PER AWWA STANDARDS. (PVC-C605, A-C PIPE-C603, DUCTILE IRON PIPE-C600).
5. ALL MAIN LINES SHALL BE DISINFECTED AS OUTLINED IN AWWA-C-651 (AS LATEST REVISED), "AWWA STANDARD FOR DISINFECTING WATER MAINS".
6. DEFLECTION ANGLES SHALL NOT EXCEED THE MANUFACTURERS SPECIFICATIONS.
7. ALL METERS SHALL BE LOCATED OUTSIDE OF DRIVEWAYS.
8. ALL VALVE BOXES TO BE PLACED OUTSIDE VALLEY GUTTERS AND ABOVE FINISHED GRADE.
9. TRACE WIRE REQUIRED TO BE INSTALLED ON ALL NEW LINES.
10. ALL NEW FIRE HYDRANTS TO BE EITHER "KENNEDY" K-81A OR "MUELLER" CENTURION 200, MECHANICAL JOINT SHOE AND TO BE INSTALLED/INSPECTED AS PER CLARK COUNTY FIRE DEPARTMENT SPECIFICATIONS.
11. ONLY MVWD STAFF IS AUTHORIZED TO OPERATE EXISTING VALVES, HYDRANTS, ETC.
12. MVWD IS LOCATED AT 601 N. MOAPA VALLEY BLVD, OVERTON, NV 89040, (702) 397-6893. HOURS: 8 A.M. TO 4:30 P.M.

NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITIES STANDARD NOTES

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 ACCUMULATED IN, THE PUBLIC RIGHTS OF WAY OF CLARK COUNTY 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 SPECIAL PROVISIONS SECTION 637.03.03 AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BMP GUIDANCE 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 THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR 100000, 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 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 THE 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.

LEGEND & ABBREVIATIONS

ABBREVIATIONS

ABAND = ABANDONED
AC = ASPHALTIC CONCRETE
ACP = ASBESTOS CEMENT PIPE
ANG PNT = ANGLE POINT
AVAR = AIR VACUUM AIR RELIEF (VALVE)
BC = BACK OF CURB
BCR = BEGIN CURB RETURN
BM = BENCHMARK
BW = BACK OF WALK
CATV = CABLE TELEVISION
CCWRD = CLARK COUNTY WATER RECLAMATION DISTRICT
CIDH = CAST-IN DRILL HOLE
CL/℄ = CENTERLINE
CLSM = CONTROLLED LOW STRENGTH MATERIAL
CMP = CORRUGATED METAL PIPE
CONC. = CONCRETE
D = DEPTH
DBCC = DIRECT BURIED COPPER CABLE
DI = DROP INLET
DIP = DUCTILE IRON PIPE
DISCH = DISCHARGE
EA. = EACH
EFF = EFFLUENT
EG = EXISTING GROUND
EGL = ENERGY GRADE LINE
ELEV./ EL = ELEVATION
EP = EDGE OF PAVEMENT
EXIST./ EX = EXISTING
FF = FINISH FLOOR
FG = FINISH GRADE
FL = FLOW LINE
FS = FINISH SURFACE
FUT = FUTURE
G = GAS
GB = GRADE BREAK
GIS = GEOGRAPHIC INFORMATION SYSTEM
HERCP = HORIZONTAL ELLIPTICAL REINFORCED CONCRETE PIPE
HGL = HYDRAULIC GRADE LINE
HP = HIGH POINT
HPG = HIGH PRESSURE GAS
I.D. = INSIDE DIAMETER
INV = INVERT
L / LT = LEFT
LF = LINEAR FEET
LP = LOW POINT
LVACTS = LAS VEGAS AREA COMPUTER TRAFFIC SYSTEM
LVVWD = LAS VEGAS VALLEY WATER DISTRICT
MJ = MECHANICAL JOINT
MVT = MOAPA VALLEY TELEPHONE COMPANY
NAVD = NORTH AMERICAN VERTICAL DATUM
NDOT = NEVADA DEPARTMENT OF TRANSPORTATION
NG = NATURAL GRADE
OHP = OVERHEAD POWER
OPD = OVERTON POWER DISTRICT
PBCBR = PORTABLE PRECAST BARRIER RAIL
PBS = PLANTMIX BITUMINOUS SURFACE
PC = POINT OF CURVE
PCC = POINT OF COMPOUND CURVE
PH = PHASE
PIP = PLASTIC IRRIGATION PIPE
POC = POINT OF CURVE
POT = POINT OF TANGENT
PRC = POINT REVERSE CURVE
PROP = PROPOSED
PT = POINT OF TANGENT
PVC = POLYVINYL CHLORIDE PIPE
$Q_{ult}100$ = 100 YEAR ULTIMATE CONDITION DESIGN FLOW
(R) = RADIAL
R / RT = RIGHT
RCB = REINFORCED CONCRETE BOX
RCP = REINFORCED CONCRETE PIPE
R/W, ROW = RIGHT-OF-WAY
SD = STORM DRAIN
SDMH = STORM DRAIN MANHOLE
SS = SANITARY SEWER
SSMH = SANITARY SEWER MANHOLE
STA = STATION
STD.DWG.NO. = STANDARD DRAWING NUMBER
SW = SIDEWALK
TC = TOP OF BACK OF CURB
TCE = TEMPORARY CONSTRUCTION EASEMENT
TEL = TELEPHONE
THK = THICK
TMH = TOP OF MANHOLE
TOE = TOE OF CHANNEL
TOP = TOP OF CHANNEL
TW = TOP OF WALL
UDACS = UNIFORM DESIGN AND CONSTRUCTION STANDARDS
UNO = UNLESS NOTED OTHERWISE
U.S. = UNITED STATES
USDCCA = UNIFORM STANDARD DRAWINGS CLARK COUNTY AREA
V.C. = VERTICAL CURVE
VCP = VERIFIED CLAY PIPE
W = WATER
W/ = WITH
WWF = WELDED WIRE FABRIC

LEGEND

(00.0) INV — EXIST. ELEVATION
00.0 INV — PROPOSED ELEVATION
SIXTEENTH SECTION LINE
QUARTER SECTION LINE
SECTION LINE
PROPERTY LINE
RIGHT-OF-WAY LINE
CENTERLINE
EASEMENT
HYDRAULIC GRADE LINE (HGL)
ENERGY GRADE LINE (EGL)
EXISTING TELEPHONE CABLE
EXISTING CHAIN-LINK FENCE
PROPOSED CHAIN-LINK FENCE
EXISTING SANITARY SEWER LINE
PROPOSED SANITARY SEWER LINE
EXISTING WATER LINE
EXISTING GAS LINE
EXISTING UNDERGROUND POWER
EXISTING OVERHEAD POWER
EXISTING STORM DRAIN
PROPOSED STORM DRAIN
EXISTING CABLE TELEVISION
EXISTING CONTOUR
PROPOSED CONTOUR
SAWCUT LINE
PROPOSED POST AND CABLE FENCE
FLOW LINE
EXISTING MANHOLE
PROPOSED MANHOLE
EXISTING FIRE HYDRANT
EXISTING VALVE
PROPOSED VALVE
PROPOSED CHANNEL/EMBANKMENT
CONSTRUCTION LIMITS
NEW CONCRETE

PROJECT BENCHMARK

CLARK COUNTY BENCHMARK 0C57 22C4A 2000

NAVD88 ELEVATION – 425.361 METERS, 1395.54 FEET

RIVET AND ROUND ALUMINUM PLATE IN A CONCRETE VAULT.
WEST SIDE OF MOAPA VALLEY BLVD. 60' SOUTH OF JENSEN AVE.
AT 4085 MOAPA VALLEY BLVD.

BASIS OF BEARINGS

NORTH 37°30'50" EAST, BEING THE BEARING ON THE LINE BETWEEN NATIONAL GEODETIC SURVEY MONUMENT N 104 C AND NATIONAL GEODETIC SURVEY MONUMENT N 104F. SAID BEARING IS BASED UPON THE NORTH AMERICAN DATUM OF 1983/94, PUBLISHED VALUES AS SHOWN BY THE NATIONAL GEODETIC SURVEY DATA SHEETS.

N 104C – 36°33'26.64218" N, 114°28'01.75665" W
Y=8,201,095.523(METERS), X=299,917.679(METERS)

N 104F – 36°36'02.04655" N, 114°25'30.17494" W
Y=8,205,930.229(METERS), X=303,629.343(METERS)

POINT OF ORIGIN FOR SCALING AND DETERMINATION OF MEAN PROJECT COMBINED FACTOR OF 0.999968450 IS 36°33'52.38181"N LATITUDE, 114°26'49.61298"W LONGITUDE USING A MEAN PROJECT ELEVATION OF 1325 FEET.

DISCLAIMER NOTE

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

REV. NO.	DATE	DESCRIPTION	APPROVED

MUDDY RIVER LOGANDALE LEVEE

LEGEND, ABBREVIATIONS, NOTES, REMOVAL AND CONSTRUCTION NOTES

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER STATE OF NEVADA — JERRY E. PRUITT — No. 11902 — Exp. 12/31/2013 — CIVIL

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

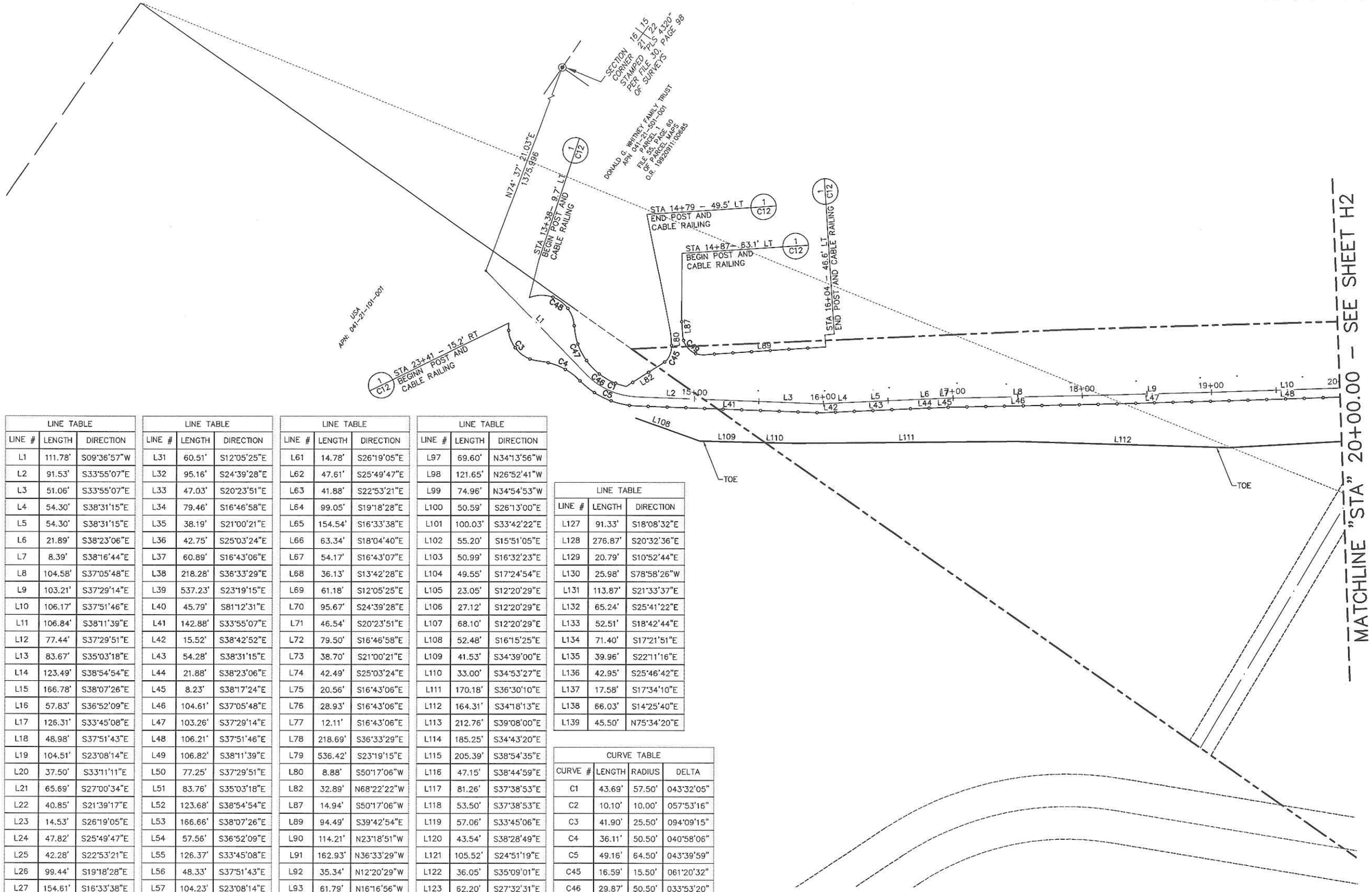
G.C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BLVD · LAS VEGAS, NV 89146
T: 702.804.2000 · F: 702.804.2099 · GCWALLACE.COM

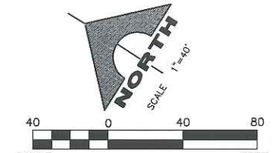
SCALE
HORIZ: N/A
VERT: N/A
FIELD BOOK

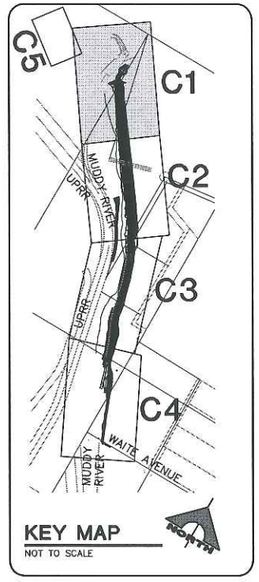
DRAWING NO. G3
SHT. OF

F:\Projects\500\500-887\DWG\Production\887-H01.dwg 06-26-13 13:37:59 rblanchard

MUDDY RIVER LOGANDALE LEVEE







LINE TABLE		
LINE #	LENGTH	DIRECTION
L1	111.78'	S09°36'57"W
L2	91.53'	S33°55'07"E
L3	51.06'	S33°55'07"E
L4	54.30'	S38°31'15"E
L5	54.30'	S38°31'15"E
L6	21.89'	S38°23'06"E
L7	8.39'	S38°16'44"E
L8	104.58'	S37°05'48"E
L9	103.21'	S37°29'14"E
L10	106.17'	S37°51'46"E
L11	106.84'	S38°11'39"E
L12	77.44'	S37°29'51"E
L13	83.67'	S35°03'18"E
L14	123.49'	S38°54'54"E
L15	166.78'	S38°07'26"E
L16	57.83'	S36°52'09"E
L17	126.31'	S33°45'08"E
L18	48.98'	S37°51'43"E
L19	104.51'	S23°08'14"E
L20	37.50'	S33°11'11"E
L21	65.69'	S27°00'34"E
L22	40.85'	S21°39'17"E
L23	14.53'	S26°19'05"E
L24	47.82'	S25°49'47"E
L25	42.28'	S22°53'21"E
L26	99.44'	S19°18'28"E
L27	154.61'	S16°33'38"E
L28	63.33'	S18°04'40"E
L29	54.44'	S16°43'07"E
L30	36.41'	S13°42'28"E

LINE TABLE		
LINE #	LENGTH	DIRECTION
L31	60.51'	S12°05'25"E
L32	95.16'	S24°39'28"E
L33	47.03'	S20°23'51"E
L34	79.46'	S16°46'58"E
L35	38.19'	S21°00'21"E
L36	42.75'	S25°03'24"E
L37	60.89'	S16°43'06"E
L38	218.28'	S36°33'29"E
L39	537.23'	S23°19'15"E
L40	45.79'	S81°12'31"E
L41	142.88'	S33°55'07"E
L42	15.52'	S38°42'52"E
L43	54.28'	S38°31'15"E
L44	21.88'	S38°23'06"E
L45	8.23'	S38°17'24"E
L46	104.61'	S37°05'48"E
L47	103.26'	S37°29'14"E
L48	106.21'	S37°51'46"E
L49	106.82'	S38°11'39"E
L50	77.25'	S37°29'51"E
L51	83.76'	S35°03'18"E
L52	123.68'	S38°54'54"E
L53	166.66'	S38°07'26"E
L54	57.56'	S36°52'09"E
L55	126.37'	S33°45'08"E
L56	48.33'	S37°51'43"E
L57	104.23'	S23°08'14"E
L58	37.74'	S33°11'11"E
L59	64.99'	S27°00'34"E
L60	40.81'	S21°39'17"E

LINE TABLE		
LINE #	LENGTH	DIRECTION
L61	14.78'	S26°19'05"E
L62	47.61'	S25°49'47"E
L63	41.88'	S22°53'21"E
L64	99.05'	S19°18'28"E
L65	154.54'	S16°33'38"E
L66	63.34'	S18°04'40"E
L67	54.17'	S16°43'07"E
L68	36.13'	S13°42'28"E
L69	61.18'	S12°05'25"E
L70	95.67'	S24°39'28"E
L71	46.54'	S20°23'51"E
L72	79.50'	S16°46'58"E
L73	38.70'	S21°00'21"E
L74	42.49'	S25°03'24"E
L75	20.56'	S16°43'06"E
L76	28.93'	S16°43'06"E
L77	12.11'	S16°43'06"E
L78	218.69'	S36°33'29"E
L79	536.42'	S23°19'15"E
L80	8.88'	S50°17'06"W
L82	32.89'	N68°22'22"W
L87	14.94'	S50°17'06"W
L89	94.49'	S39°42'54"E
L90	114.21'	N23°18'51"W
L91	162.93'	N36°33'29"W
L92	35.34'	N12°20'29"W
L93	61.79'	N16°16'56"W
L94	35.71'	N18°29'55"W
L95	83.42'	N23°57'12"W
L96	67.75'	N29°03'01"W

LINE TABLE		
LINE #	LENGTH	DIRECTION
L97	69.60'	N34°13'56"W
L98	121.65'	N26°52'41"W
L99	74.96'	N34°54'53"W
L100	50.59'	S26°13'00"E
L101	100.03'	S33°42'22"E
L102	55.20'	S15°51'05"E
L103	50.99'	S16°32'23"E
L104	49.55'	S17°24'54"E
L105	23.05'	S12°20'29"E
L106	27.12'	S12°20'29"E
L107	68.10'	S12°20'29"E
L108	52.48'	S16°15'25"E
L109	41.53'	S34°39'00"E
L110	33.00'	S34°53'27"E
L111	170.18'	S36°30'10"E
L112	164.31'	S34°18'13"E
L113	212.76'	S39°08'00"E
L114	185.25'	S34°43'20"E
L115	205.39'	S38°54'35"E
L116	47.15'	S38°44'59"E
L117	81.26'	S37°38'53"E
L118	53.50'	S37°38'53"E
L119	57.06'	S33°45'06"E
L120	43.54'	S38°28'49"E
L121	105.52'	S24°51'19"E
L122	36.05'	S35°09'01"E
L123	62.20'	S27°32'31"E
L124	38.14'	S22°09'20"E
L125	79.89'	S18°07'37"E
L126	26.02'	S22°20'17"E

LINE TABLE		
LINE #	LENGTH	DIRECTION
L127	91.33'	S18°08'32"E
L128	276.87'	S20°32'36"E
L129	20.79'	S10°52'44"E
L130	25.98'	S78°58'26"W
L131	113.87'	S21°33'37"E
L132	65.24'	S25°41'22"E
L133	52.51'	S18°42'44"E
L134	71.40'	S17°21'51"E
L135	39.96'	S22°11'16"E
L136	42.95'	S25°46'42"E
L137	17.58'	S17°34'10"E
L138	66.03'	S14°25'40"E
L139	45.50'	N75°34'20"E

CURVE TABLE			
CURVE #	LENGTH	RADIUS	DELTA
C1	43.69'	57.50'	043°32'05"
C2	10.10'	10.00'	057°53'16"
C3	41.90'	25.50'	094°09'15"
C4	36.11'	50.50'	040°58'06"
C5	49.16'	64.50'	043°39'59"
C45	16.59'	15.50'	061°20'32"
C46	29.87'	50.50'	033°53'20"
C47	36.26'	50.50'	041°08'13"
C48	48.21'	25.50'	108°19'03"
C49	24.35'	15.50'	090°00'00"

NOTE

ALL STATIONING FROM CENTERLINE OF LEVEE/ACCESS UNLESS OTHERWISE NOTED.

NOTE

FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

DISCLAIMER NOTE

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REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

MUDDY RIVER LOGANDALE LEVEE

HORIZONTAL CONTROL PLAN

"STA" 13+00.00 TO "STA" 20+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11907

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

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

SCALE	
HORIZ:	1"=40'
VERT:	
FIELD BOOK	
CCPW PROJECT #	
W.O. #	

DRAWING NO. H1

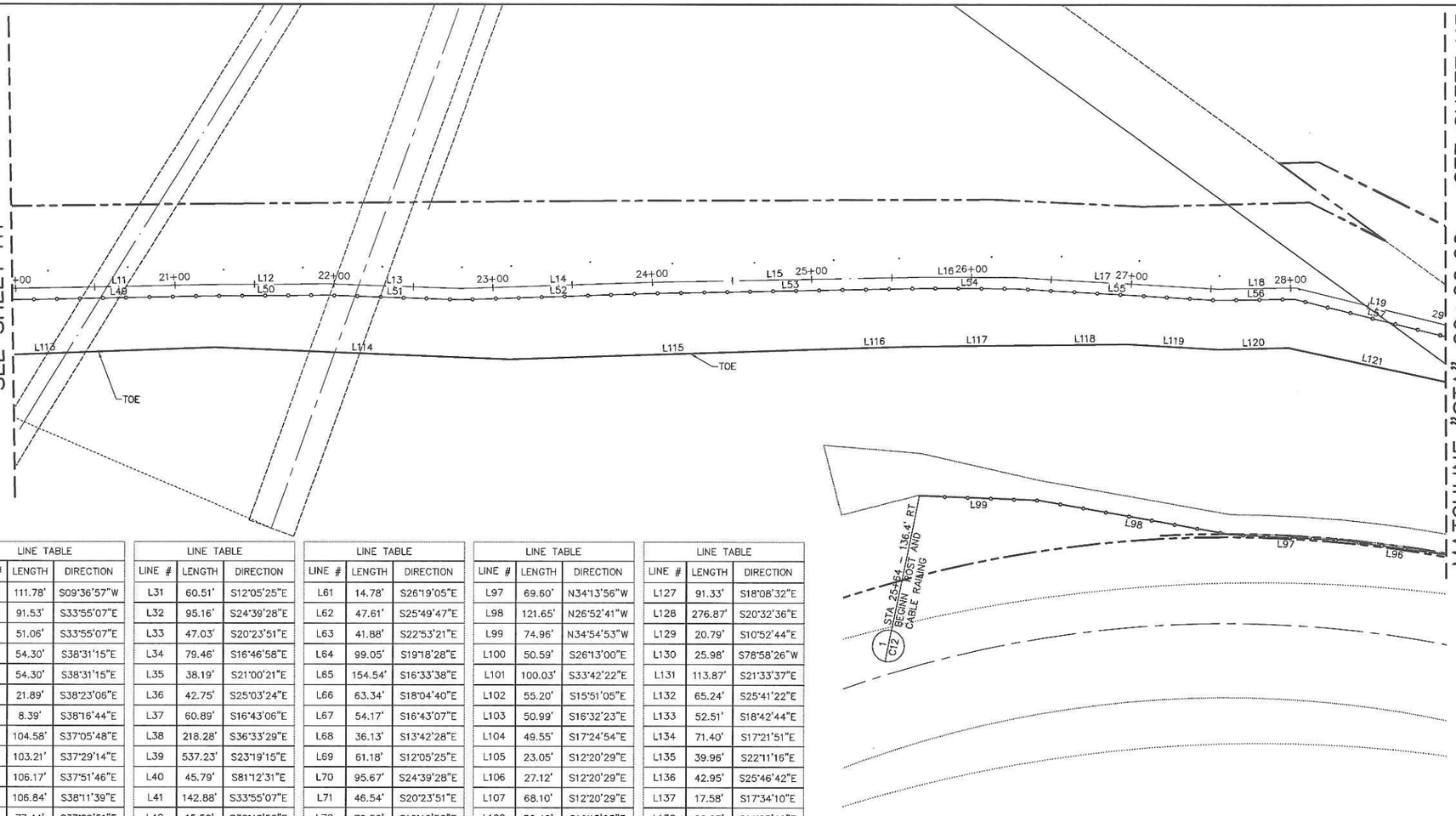
SHT. X OF X

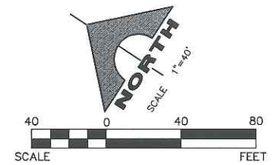
F:\Projects\500\500-887\DWG\Production\887-H01.dwg 06-26-13 13:38:04 rblanchard

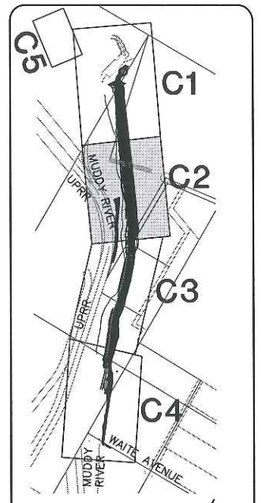
MUDDY RIVER LOGANDALE LEVEE

MATCHLINE "STA" 20+00.00 – SEE SHEET H1

MATCHLINE "STA" 29+00.00 – SEE SHEET H3







KEY MAP

NOT TO SCALE

LINE TABLE		
LINE #	LENGTH	DIRECTION
L1	111.78'	S09°36'57"W
L2	91.53'	S33°55'07"E
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L15	166.78'	S38°07'26"E
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L26	99.44'	S19°18'28"E
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L66	63.34'	S18°04'40"E
L67	54.17'	S16°43'07"E
L68	36.13'	S13°42'28"E
L69	61.18'	S12°05'25"E
L70	95.67'	S24°39'28"E
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L102	55.20'	S15°51'05"E
L103	50.99'	S16°32'23"E
L104	49.55'	S17°24'54"E
L105	23.05'	S12°20'29"E
L106	27.12'	S12°20'29"E
L107	68.10'	S12°20'29"E
L108	52.48'	S16°15'25"E
L109	41.53'	S34°39'00"E
L110	33.00'	S34°53'27"E
L111	170.18'	S36°30'10"E
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L119	57.06'	S33°45'06"E
L120	43.54'	S38°28'49"E
L121	105.52'	S24°51'19"E
L122	36.05'	S35°09'01"E
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LINE TABLE		
LINE #	LENGTH	DIRECTION
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L130	25.98'	S78°58'26"W
L131	113.87'	S21°33'37"E
L132	65.24'	S25°41'22"E
L133	52.51'	S18°42'44"E
L134	71.40'	S17°21'51"E
L135	39.96'	S22°11'16"E
L136	42.95'	S25°46'42"E
L137	17.58'	S17°34'10"E
L138	66.03'	S14°25'40"E
L139	45.50'	N75°34'20"E

CURVE TABLE			
CURVE #	LENGTH	RADIUS	DELTA
C1	43.69'	57.50'	043°32'05"
C2	10.10'	10.00'	057°53'16"
C3	41.90'	25.50'	094°09'15"
C4	36.11'	50.50'	040°58'06"
C5	49.16'	64.50'	043°39'59"
C45	16.59'	15.50'	061°20'32"
C46	29.87'	50.50'	033°53'20"
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C49	24.35'	15.50'	090°00'00"

NOTE

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NOTE

FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

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REV. NO.	DATE	DESCRIPTION	APPROVED

MUDDY RIVER LOGANDALE LEVEE

HORIZONTAL CONTROL PLAN

"STA" 20+00.00 TO "STA" 29+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER STATE OF NEVADA — JERRY E. PRUITT — No. 11902 — Exp. 12/31/2013 — CIVIL

PROJECT No: 500-887 DRAWN BY:

DESIGNED BY: CHECKED BY:

APPROVED BY

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

SCALE

HORIZ: 1"=40'

VERT:

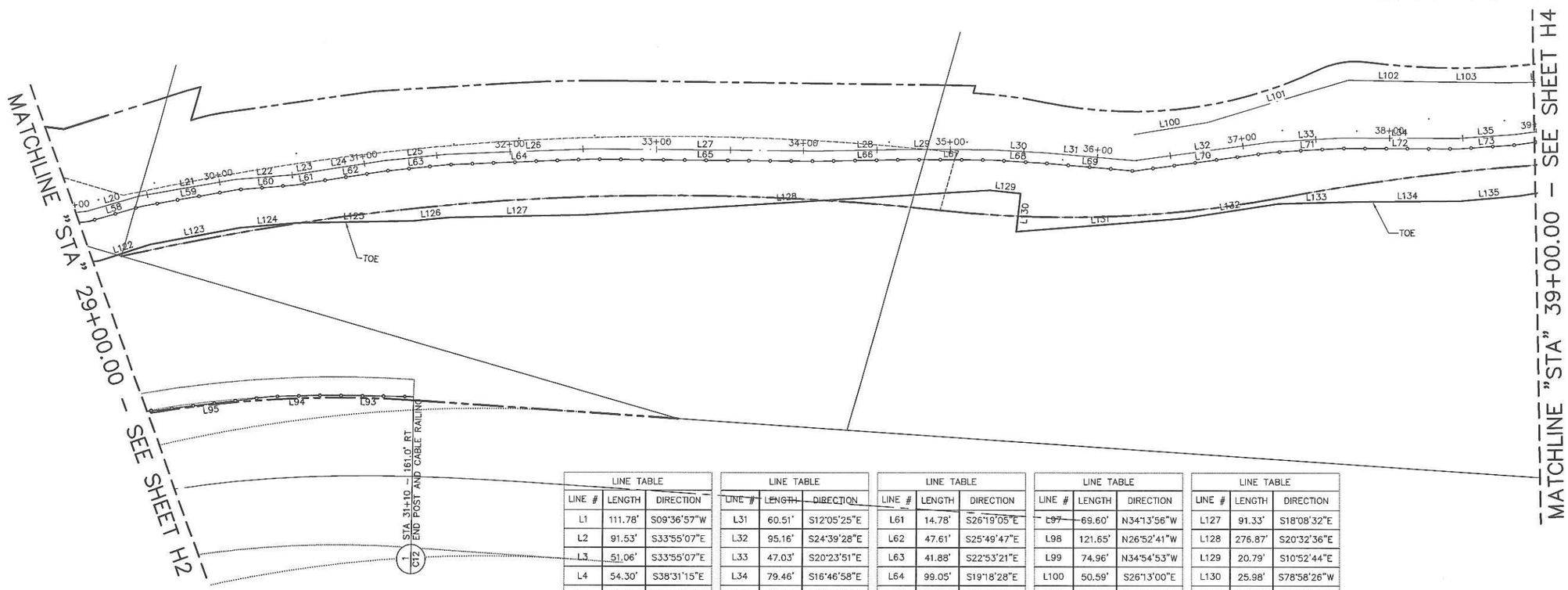
FIELD BOOK

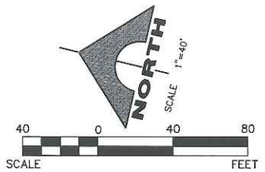
CCPW PROJECT #

W.O. #

DRAWING NO. H2

SHT. X OF X





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L3	51.06'	S33°55'07"E
L4	54.30'	S38°31'15"E
L5	54.30'	S38°31'15"E
L6	21.89'	S38°23'06"E
L7	8.39'	S38°16'44"E
L8	104.58'	S37°05'48"E
L9	103.21'	S37°29'14"E
L10	106.17'	S37°51'46"E
L11	106.84'	S38°11'39"E
L12	77.44'	S37°29'51"E
L13	83.67'	S35°03'18"E
L14	123.49'	S38°54'54"E
L15	166.78'	S38°07'26"E
L16	57.83'	S36°52'09"E
L17	126.31'	S33°45'08"E
L18	48.98'	S37°51'43"E
L19	104.51'	S23°08'14"E
L20	37.50'	S33°11'11"E
L21	65.69'	S27°00'34"E
L22	40.85'	S21°39'17"E
L23	14.53'	S26°19'05"E
L24	47.82'	S25°49'47"E
L25	42.28'	S22°53'21"E
L26	99.44'	S19°18'28"E
L27	154.61'	S16°33'38"E
L28	63.33'	S18°04'40"E
L29	54.44'	S16°43'07"E
L30	36.41'	S13°42'28"E

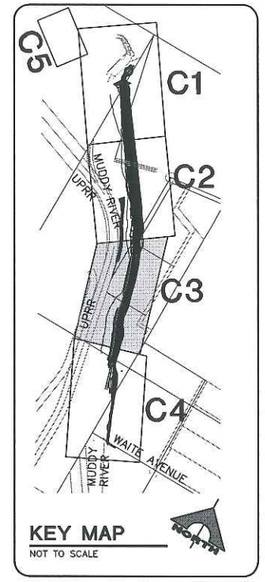
LINE TABLE		
LINE #	LENGTH	DIRECTION
L31	60.51'	S12°05'25"E
L32	95.16'	S24°39'28"E
L33	47.03'	S20°23'51"E
L34	79.46'	S16°46'58"E
L35	38.19'	S21°00'21"E
L36	42.75'	S25°03'24"E
L37	60.89'	S16°43'06"E
L38	218.28'	S36°33'29"E
L39	537.23'	S23°19'15"E
L40	45.79'	S81°12'31"E
L41	142.88'	S33°55'07"E
L42	15.52'	S38°42'52"E
L43	54.28'	S38°31'15"E
L44	21.88'	S38°23'06"E
L45	8.23'	S38°17'24"E
L46	104.61'	S37°05'48"E
L47	103.26'	S37°29'14"E
L48	106.21'	S37°51'46"E
L49	106.82'	S38°11'39"E
L50	77.25'	S37°29'51"E
L51	83.76'	S35°03'18"E
L52	123.68'	S38°54'54"E
L53	166.66'	S38°07'26"E
L54	57.56'	S36°52'09"E
L55	126.37'	S33°45'08"E
L56	48.33'	S37°51'43"E
L57	104.23'	S23°08'14"E
L58	37.74'	S33°11'11"E
L59	64.99'	S27°00'34"E
L60	40.81'	S21°39'17"E

LINE TABLE		
LINE #	LENGTH	DIRECTION
L61	14.78'	S26°19'05"E
L62	47.61'	S25°49'47"E
L63	41.88'	S22°53'21"E
L64	99.05'	S19°18'28"E
L65	154.54'	S16°33'38"E
L66	63.34'	S18°04'40"E
L67	54.17'	S16°43'07"E
L68	36.13'	S13°42'28"E
L69	61.18'	S12°05'25"E
L70	95.67'	S24°39'28"E
L71	46.54'	S20°23'51"E
L72	79.50'	S16°46'58"E
L73	38.70'	S21°00'21"E
L74	42.49'	S25°03'24"E
L75	20.56'	S16°43'06"E
L76	28.93'	S16°43'06"E
L77	12.11'	S16°43'06"E
L78	218.69'	S36°33'29"E
L79	536.42'	S23°19'15"E
L80	8.88'	S50°17'06"W
L82	32.89'	N68°22'22"W
L87	14.94'	S50°17'06"W
L89	94.49'	S39°42'54"E
L90	114.21'	N23°18'51"W
L91	162.93'	N36°33'29"W
L92	35.34'	N12°20'29"W
L93	61.79'	N16°16'56"W
L94	35.71'	N18°29'55"W
L95	83.42'	N23°57'12"W
L96	67.75'	N29°03'01"W

LINE TABLE		
LINE #	LENGTH	DIRECTION
~~L97~~	69.60'	N34°13'56"W
L98	121.65'	N26°52'41"W
L99	74.96'	N34°54'53"W
L100	50.59'	S26°13'00"E
L101	100.03'	S33°42'22"E
L102	55.20'	S15°51'05"E
L103	50.99'	S16°32'23"E
L104	49.55'	S17°24'54"E
L105	23.05'	S12°20'29"E
L106	27.12'	S12°20'29"E
L107	68.10'	S12°20'29"E
L108	52.48'	S16°15'25"E
L109	41.53'	S34°39'00"E
L110	33.00'	S34°53'27"E
L111	170.18'	S36°30'10"E
L112	164.31'	S34°18'13"E
L113	212.76'	S39°08'00"E
L114	185.25'	S34°43'20"E
L115	205.39'	S38°54'35"E
L116	47.15'	S38°44'59"E
L117	81.26'	S37°38'53"E
L118	53.50'	S37°38'53"E
L119	57.06'	S33°45'06"E
L120	43.54'	S38°28'49"E
L121	105.52'	S24°51'19"E
L122	36.05'	S35°09'01"E
L123	62.20'	S27°32'31"E
L124	38.14'	S22°09'20"E
L125	79.89'	S18°07'37"E
L126	26.02'	S22°20'17"E

LINE TABLE		
LINE #	LENGTH	DIRECTION
L127	91.33'	S18°08'32"E
L128	276.87'	S20°32'36"E
L129	20.79'	S10°52'44"E
L130	25.98'	S78°58'26"W
L131	113.87'	S21°33'37"E
L132	65.24'	S25°41'22"E
L133	52.51'	S18°42'44"E
L134	71.40'	S17°21'51"E
L135	39.96'	S22°11'16"E
L136	42.95'	S25°46'42"E
L137	17.58'	S17°34'10"E
L138	66.03'	S14°25'40"E
L139	45.50'	N75°34'20"E

CURVE TABLE			
CURVE #	LENGTH	RADIUS	DELTA
C1	43.69'	57.50'	043°32'05"
C2	10.10'	10.00'	057°53'16"
C3	41.90'	25.50'	094°09'15"
C4	36.11'	50.50'	040°58'06"
C5	49.16'	64.50'	043°39'59"
C45	16.59'	15.50'	061°20'32"
C46	29.87'	50.50'	033°53'20"
C47	36.26'	50.50'	041°08'13"
C48	48.21'	25.50'	108°19'03"
C49	24.35'	15.50'	090°00'00"



KEY MAP
NOT TO SCALE

NOTE
ALL STATIONING FROM CENTERLINE OF LEVEE/ACCESS UNLESS OTHERWISE NOTED.

NOTE
FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

DISCLAIMER NOTE

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

MUDDY RIVER LOGANDALE LEVEE

HORIZONTAL CONTROL PLAN

"STA" 29+00.00 TO "STA" 39+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER – STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

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

SCALE
HORIZ: 1"=40'
VERT:
FIELD BOOK
CCPW PROJECT #
W.O. #

DRAWING NO.
H3
SHT. X OF X

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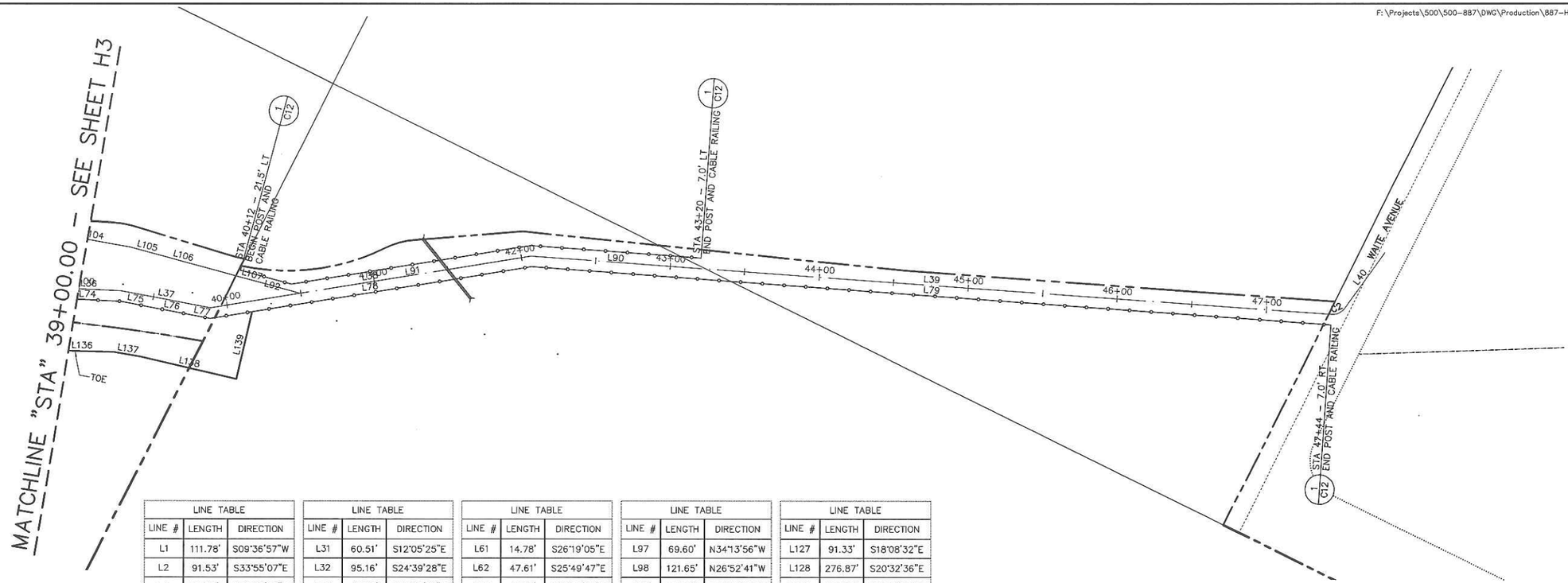
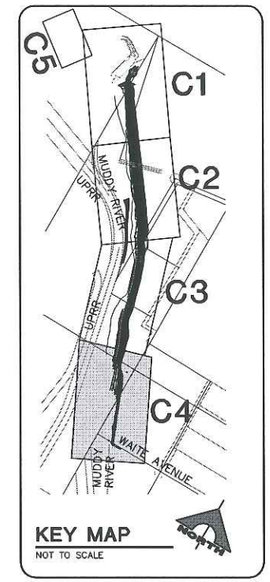
MUDDY RIVER LOGANDALE LEVEE





LINE TABLE		
LINE #	LENGTH	DIRECTION
L1	111.78'	S09°36'57"W
L2	91.53'	S33°55'07"E
L3	51.06'	S33°55'07"E
L4	54.30'	S38°31'15"E
L5	54.30'	S38°31'15"E
L6	21.89'	S38°23'06"E
L7	8.39'	S38°16'44"E
L8	104.58'	S37°05'48"E
L9	103.21'	S37°29'14"E
L10	106.17'	S37°51'46"E
L11	106.84'	S38°11'39"E
L12	77.44'	S37°29'51"E
L13	83.67'	S35°03'18"E
L14	123.49'	S38°54'54"E
L15	166.78'	S38°07'26"E
L16	57.83'	S36°52'09"E
L17	126.31'	S33°45'08"E
L18	48.98'	S37°51'43"E
L19	104.51'	S23°08'14"E
L20	37.50'	S33°11'11"E
L21	65.69'	S27°00'34"E
L22	40.85'	S21°39'17"E
L23	14.53'	S26°19'05"E
L24	47.82'	S25°49'47"E
L25	42.28'	S22°53'21"E
L26	99.44'	S19°18'28"E
L27	154.61'	S16°33'38"E
L28	63.33'	S18°04'40"E
L29	54.44'	S16°43'07"E
L30	36.41'	S13°42'28"E

LINE TABLE		
LINE #	LENGTH	DIRECTION
L31	60.51'	S12°05'25"E
L32	95.16'	S24°39'28"E
L33	47.03'	S20°23'51"E
L34	79.46'	S16°46'58"E
L35	38.19'	S21°00'21"E
L36	42.75'	S25°03'24"E
L37	60.89'	S16°43'06"E
L38	218.28'	S36°33'29"E
L39	537.23'	S23°19'15"E
L40	45.79'	S81°12'31"E
L41	142.88'	S33°55'07"E
L42	15.52'	S38°42'52"E
L43	54.28'	S38°31'15"E
L44	21.88'	S38°23'06"E
L45	8.23'	S38°17'24"E
L46	104.61'	S37°05'48"E
L47	103.26'	S37°29'14"E
L48	106.21'	S37°51'46"E
L49	106.82'	S38°11'39"E
L50	77.25'	S37°29'51"E
L51	83.76'	S35°03'18"E
L52	123.68'	S38°54'54"E
L53	166.66'	S38°07'26"E
L54	57.56'	S36°52'09"E
L55	126.37'	S33°45'08"E
L56	48.33'	S37°51'43"E
L57	104.23'	S23°08'14"E
L58	37.74'	S33°11'11"E
L59	64.99'	S27°00'34"E
L60	40.81'	S21°39'17"E

LINE TABLE		
LINE #	LENGTH	DIRECTION
L61	14.78'	S26°19'05"E
L62	47.61'	S25°49'47"E
L63	41.88'	S22°53'21"E
L64	99.05'	S19°18'28"E
L65	154.54'	S16°33'38"E
L66	63.34'	S18°04'40"E
L67	54.17'	S16°43'07"E
L68	36.13'	S13°42'28"E
L69	61.18'	S12°05'25"E
L70	95.67'	S24°39'28"E
L71	46.54'	S20°23'51"E
L72	79.50'	S16°46'58"E
L73	38.70'	S21°00'21"E
L74	42.49'	S25°03'24"E
L75	20.56'	S16°43'06"E
L76	28.93'	S16°43'06"E
L77	12.11'	S16°43'06"E
L78	218.69'	S36°33'29"E
L79	536.42'	S23°19'15"E
L80	8.88'	S50°17'06"W
L82	32.89'	N68°22'22"W
L87	14.94'	S50°17'06"W
L89	94.49'	S39°42'54"E
L90	114.21'	N23°18'51"W
L91	162.93'	N36°33'29"W
L92	35.34'	N12°20'29"W
L93	61.79'	N16°16'56"W
L94	35.71'	N18°29'55"W
L95	83.42'	N23°57'12"W
L96	67.75'	N29°03'01"W

LINE TABLE		
LINE #	LENGTH	DIRECTION
L97	69.60'	N34°13'56"W
L98	121.65'	N26°52'41"W
L99	74.96'	N34°54'53"W
L100	50.59'	S26°13'00"E
L101	100.03'	S33°42'22"E
L102	55.20'	S15°51'05"E
L103	50.99'	S16°32'23"E
L104	49.55'	S17°24'54"E
L105	23.05'	S12°20'29"E
L106	27.12'	S12°20'29"E
L107	68.10'	S12°20'29"E
L108	52.48'	S16°15'25"E
L109	41.53'	S34°39'00"E
L110	33.00'	S34°53'27"E
L111	170.18'	S36°30'10"E
L112	164.31'	S34°18'13"E
L113	212.76'	S39°08'00"E
L114	185.25'	S34°43'20"E
L115	205.39'	S38°54'35"E
L116	47.15'	S38°44'59"E
L117	81.26'	S37°38'53"E
L118	53.50'	S37°38'53"E
L119	57.06'	S33°45'06"E
L120	43.54'	S38°28'49"E
L121	105.52'	S24°51'19"E
L122	36.05'	S35°09'01"E
L123	62.20'	S27°32'31"E
L124	38.14'	S22°09'20"E
L125	79.89'	S18°07'37"E
L126	26.02'	S22°20'17"E

LINE TABLE		
LINE #	LENGTH	DIRECTION
L127	91.33'	S18°08'32"E
L128	276.87'	S20°32'36"E
L129	20.79'	S10°52'44"E
L130	25.98'	S78°58'26"W
L131	113.87'	S21°33'37"E
L132	65.24'	S25°41'22"E
L133	52.51'	S18°42'44"E
L134	71.40'	S17°21'51"E
L135	39.96'	S22°11'16"E
L136	42.95'	S25°46'42"E
L137	17.58'	S17°34'10"E
L138	66.03'	S14°25'40"E
L139	45.50'	N75°34'20"E

CURVE TABLE			
CURVE #	LENGTH	RADIUS	DELTA
C1	43.69'	57.50'	043°32'05"
C2	10.10'	10.00'	057°53'16"
C3	41.90'	25.50'	094°09'15"
C4	36.11'	50.50'	040°58'06"
C5	49.16'	64.50'	043°39'59"
C45	16.59'	15.50'	061°20'32"
C46	29.87'	50.50'	033°53'20"
C47	36.26'	50.50'	041°08'13"
C48	48.21'	25.50'	108°19'03"
C49	24.35'	15.50'	090°00'00"

NOTE

ALL STATIONING FROM CENTERLINE OF LEVEE/ACCESS UNLESS OTHERWISE NOTED.

NOTE

FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

DISCLAIMER NOTE

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REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

MUDDY RIVER LOGANDALE LEVEE

HORIZONTAL CONTROL PLAN

"STA" 39+00.00 TO "STA" 47+58.95

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY:

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

SCALE
HORIZ: 1"=40'
VERT:
FIELD BOOK
CCPW PROJECT #
W.O. #

DRAWING NO.
H4
SHT. X OF X

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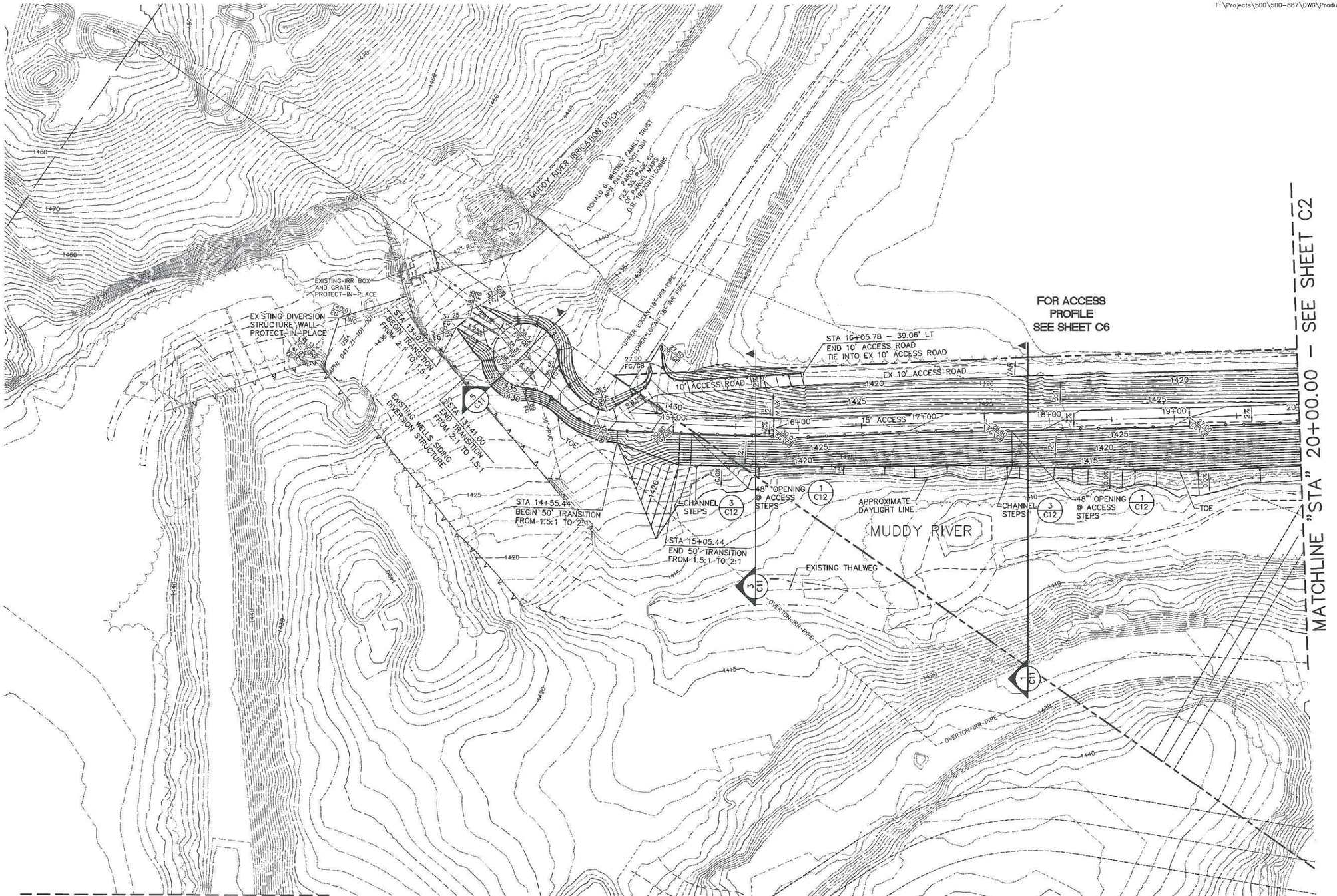
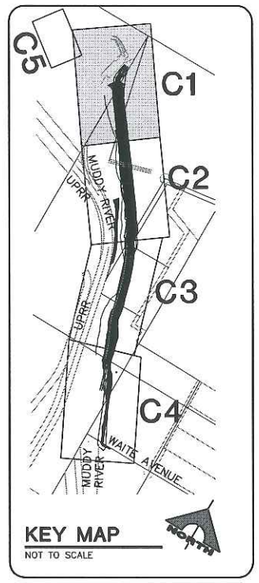
MUDDY RIVER LOGANDALE LEVEE

NORTH
SCALE 1"=40'

40 0 40 80
SCALE FEET





NOTE

ALL STATIONING FROM CENTERLINE OF LEVEE/ACCESS UNLESS OTHERWISE NOTED.

NOTE

FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

DISCLAIMER NOTE

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REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

MUDDY RIVER LOGANDALE LEVEE

PLAN

"STA" 13+00.00 TO "STA" 20+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

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

SCALE	
HORIZ:	1"=40'
VERT:	
FIELD BOOK	
CCPW PROJECT #	
W.O. #	

DRAWING NO. C1

SHT. X OF X

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MUDDY RIVER LOGANDALE LEVEE

NORTH
SCALE 1"=40'

40 0 40 80
SCALE FEET

MATCHLINE "STA" 20+00.00 – SEE SHEET C1

MATCHLINE "STA" 29+00.00 – SEE SHEET C3

RYAN N. & WENDY L WHEELER
APN 041-21-601-003
PARCEL 1
FILE 107, PAGE 44
OF PARCEL MAPS
O.R. 20060113:01519

FOR ACCESS PROFILE SEE SHEET C7

1 C12 48" OPENING @ ACCESS STEPS

EX 10' ACCESS ROAD

15' ACCESS

3 C12 CHANNEL STEPS

TOE

APPROXIMATE DAYLIGHT LINE

EXISTING THALWEG

MUDDY RIVER

STA 25+16.08
BEGIN 50' RIPRAP TRANSITION FROM 3:1 TO 2:1

STA 25+16.08
END 50' RIPRAP TRANSITION
BEGIN 75' CONCRETE TRANSITION FROM 2:1 TO 1.5:1

STA 25+16.08
END 75' TRANSITION FROM 2:1 TO 1.5:1

STA 26+50.00
BEGIN 50' TRANSITION FROM 2:1 TO 1.5:1

STA 27+00.00
END 50' TRANSITION FROM 2:1 TO 1.5:1

STA 27+30.00 31.4' R
INSTALL FLAP GATE
REMOVE 12 LF 18" PIP
INV=1406.1

A S1

CHANNEL STEPS 3 C12

9 C12

6 C11

1 C12 OPENING ACCESS STEPS

1 C11

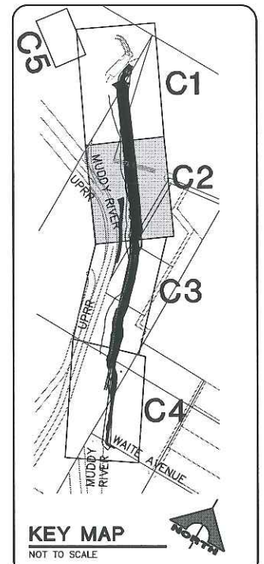
OVERTON IRR PIPE

SOUTHWESTERLY LINE OF PARCEL 1 PER FILE 55, PAGE 60 OF PARCEL MAPS

100' WIDE SAN PEDRO, LOS ANGELES & SALT LAKE RAILROAD COMPANY RIGHT-OF-WAY ST THOMAS BRANCH

UPRR

NORTHEASTERLY LINE OF PARCEL 3 PER FILE 55, PAGE 60 OF PARCEL MAPS



KEY MAP
NOT TO SCALE

NOTE
ALL STATIONING FROM CENTERLINE OF LEVEE/ACCESS UNLESS OTHERWISE NOTED.

NOTE
FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

DISCLAIMER NOTE

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REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

MUDDY RIVER LOGANDALE LEVEE

PLAN

"STA" 20+00.00 TO "STA" 29+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11907

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

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

SCALE
HORIZ: 1"=40'
VERT:
FIELD BOOK
CCPW PROJECT #
W.O. #

DRAWING NO.
C2
SHT. X OF X

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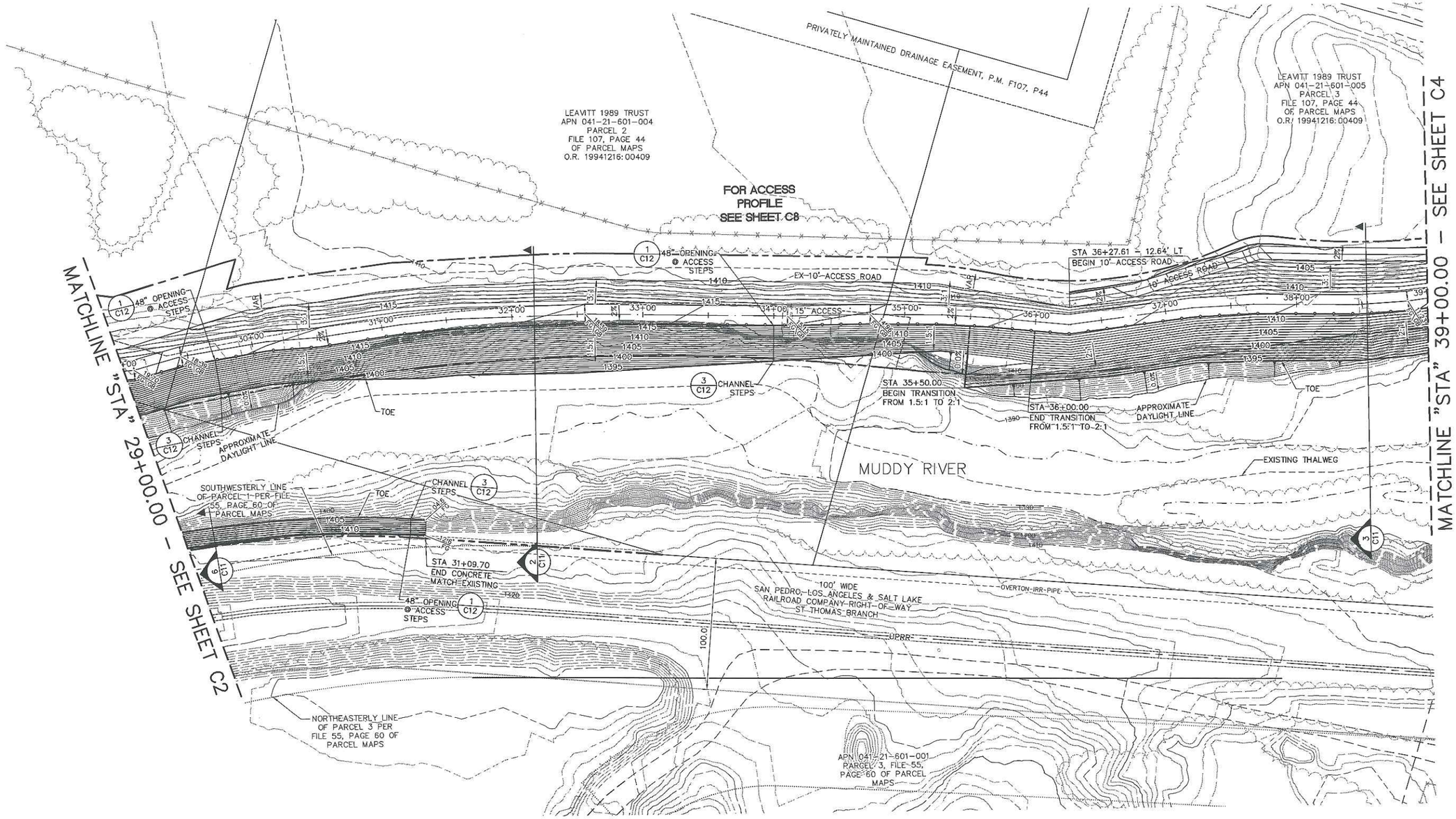
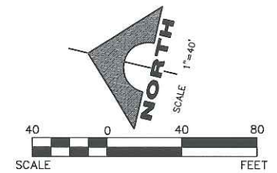
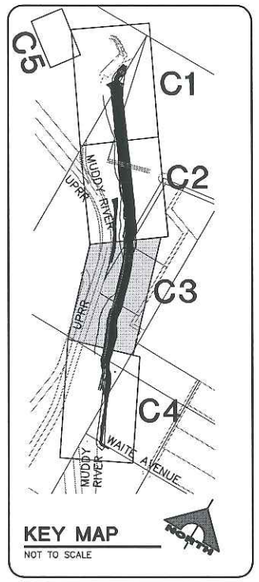
MUDDY RIVER LOGANDALE LEVEE







KEY MAP
NOT TO SCALE

NOTE
ALL STATIONING FROM CENTERLINE OF LEVEE/ACCESS UNLESS OTHERWISE NOTED.

NOTE
FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

DISCLAIMER NOTE

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REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

MUDDY RIVER LOGANDALE LEVEE
PLAN
"STA" 29+00.00 TO "STA" 39+00.00
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

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

SCALE	
HORIZ:	1"=40'
VERT:	
FIELD BOOK	
CCPW PROJECT #	
W.O. #	

DRAWING NO. C3

SHT. X OF X

F:\Projects\500\500-887\DWG\Production\887-C0XXX.dwg 06-26-13 13:39:01 rblanchard

MUDDY RIVER LOGANDALE LEVEE

NORTH
SCALE 1"=40'

40 0 40 80
SCALE FEET

MATCHLINE "STA" 39+00.00 - SEE SHEET C3

HAPPY ANDY'S FAMILY TRUST 2010
APN 041-22-301-001
O.R. 20100211:0000445

FOR ACCESS PROFILE SEE SHEET C9

HAPPY ANDY'S-18"- IRR PIPE

IRRIGATION

STA 40+20.54 - 7.50' LT
TRANSITION TO 15' ACCESS ROAD

10' ACCESS ROAD

15' ACCESS ROAD

51.6 LF 18" RCP SD @ 0.50% W/ NDOT RCP END SECTION R-2.3.1 ON EACH END

48" OPENING @ ACCESS STEPS

1 C12

TOE APPROXIMATE DAYLIGHT LINE

APPROXIMATE DAYLIGHT LINE

3 C12 CHANNEL STEPS

STA 40+15.64 - 7.50' LT
END CONCRETE SLOPE PAVING

4 C1

MUDDY RIVER

STA 47+58.95 - 14.85' LT
END 15' ACCESS ROAD
END CONSTRUCTION LIMIT
TIE INTO EX WAITE AVE
FG=(01.84)

WAITE AVENUE

LOW PNT

APN 041-22-301-025
PARCEL 1
FILE 98, PAGE 74
OF PARCEL MAPS

OPEN

OVERTON-IRR-PIPE

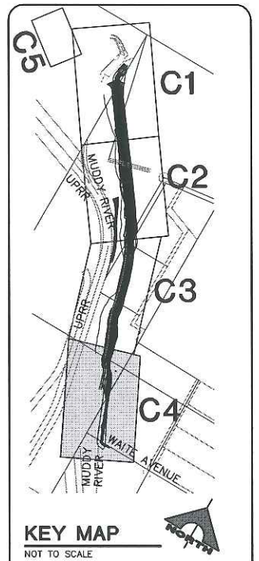
100.0'

SAN PEDRO, LOS ANGELES & SALT LAKE RAILROAD COMPANY RIGHT-OF-WAY
ST THOMAS BRANCH

UPRR

WEAPT-ISOTOPE, L.L.C.
APN: 041-21-701-002
O.R. 20120823:02927

OVERTON-IRR-PIPE



KEY MAP
NOT TO SCALE

NOTE
ALL STATIONING FROM CENTERLINE OF LEVEE/ACCESS UNLESS OTHERWISE NOTED.

NOTE
FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

DISCLAIMER NOTE

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REV. NO.	DATE	DESCRIPTION	APPROVED

MUDDY RIVER LOGANDALE LEVEE

PLAN

"STA" 39+00.00 TO "STA" 47+58.95

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

G.C. WALLACE COMPANIES
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1555 S. RAINBOW BOULEVARD · LAS VEGAS, NV 89146
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SCALE
HORIZ: 1"=40'
VERT:
FIELD BOOK
CCPW PROJECT #
W.O. #

DRAWING NO. C4
SHT. X OF X

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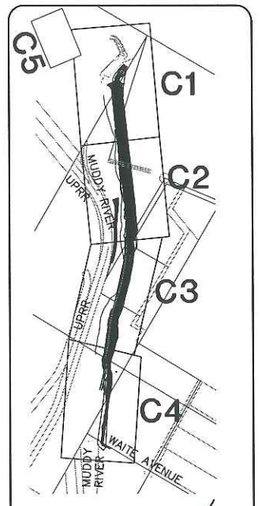

KEY MAP
NOT TO SCALE

NOTE
ALL STATIONING FROM CENTERLINE OF LEVEE/ACCESS UNLESS OTHERWISE NOTED.

NOTE
FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

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REV. NO.	DATE	DESCRIPTION	APPROVED

MUDDY RIVER LOGANDALE LEVEE
PLAN

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
No. 11902
Exp. 12/31/2013
CIVIL

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

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ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BOULEVARD · LAS VEGAS, NV 89146
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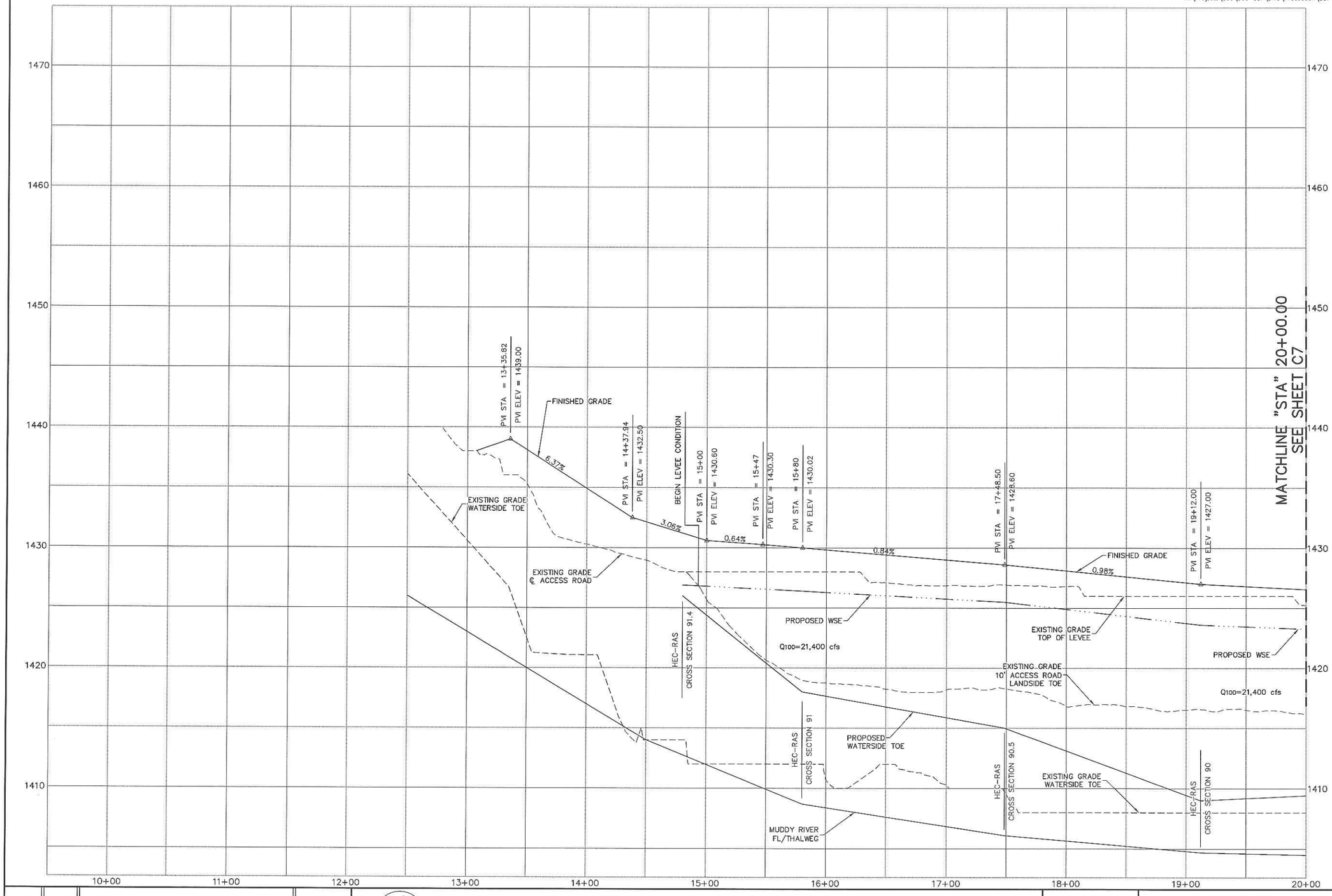
SCALE
HORIZ: 1"=20'
VERT:
FIELD BOOK
CCPW PROJECT #
W.O. #

DRAWING NO.
C5
SHT. X OF X



MUDDY RIVER LOGANDALE LEVEE

NOTE

ALL STATIONING FROM CENTERLINE OF LEVEE/ACCESS UNLESS OTHERWISE NOTED.

NOTE

FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

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REV. NO.	DATE	DESCRIPTION	APPROVED

MUDDY RIVER LOGANDALE LEVEE

PROFILE

"STA" 10+00.00 TO "STA" 20+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11907

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

G.C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BOULEVARD · LAS VEGAS, NV 89146
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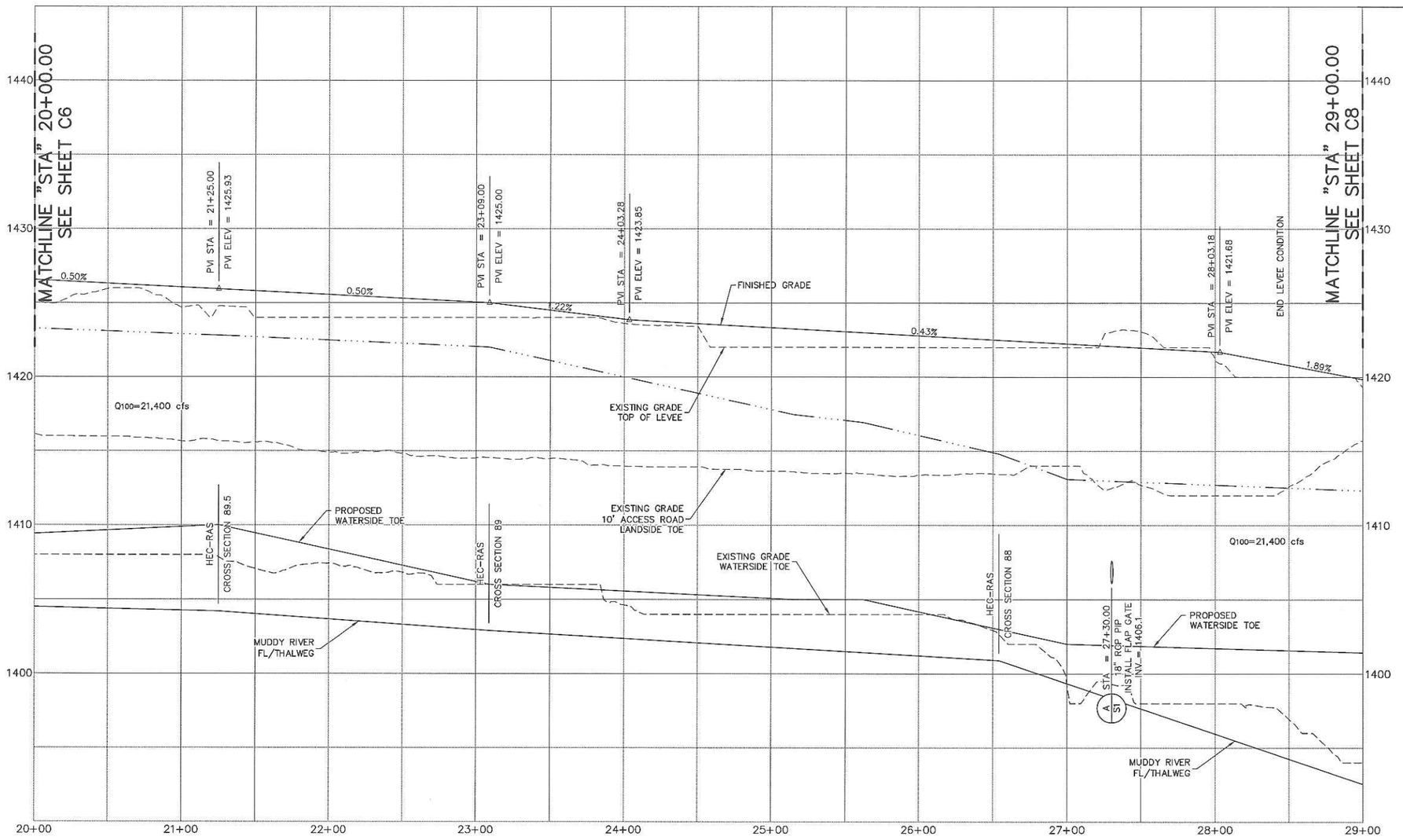
SCALE	
HORIZ:	1"=40'
VERT:	1"=4'
FIELD BOOK	
CCPW PROJECT #	
W.O. #	

DRAWING NO. C6

SHT. X OF X



NOTE

ALL STATIONING FROM CENTERLINE OF LEVEE/ACCESS UNLESS OTHERWISE NOTED.

NOTE

FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

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REV. NO.	DATE	DESCRIPTION	APPROVED

MUDDY RIVER LOGANDALE LEVEE

PROFILE

"STA" 20+00.00 TO "STA" 29+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

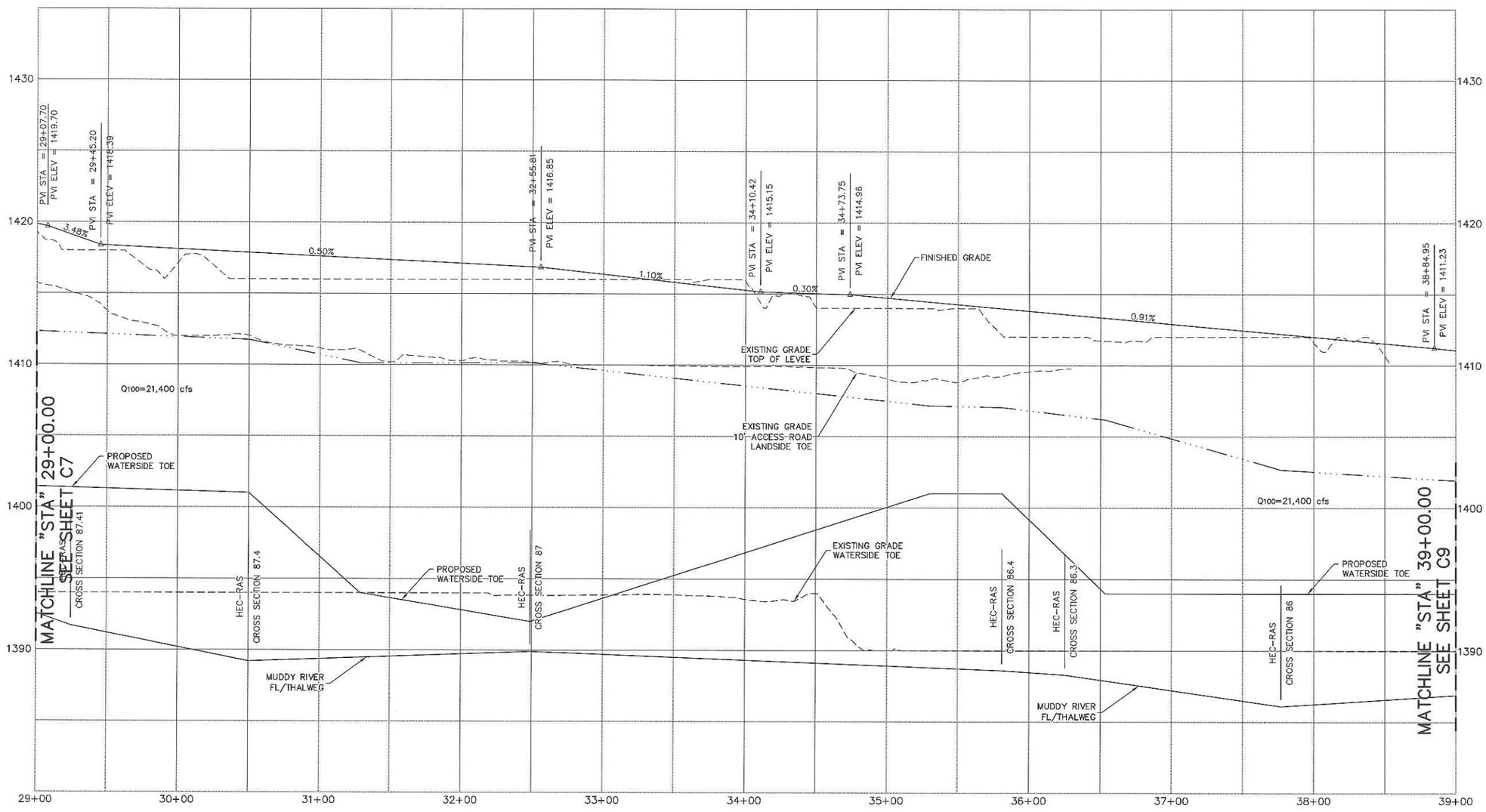
PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

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

SCALE
HORIZ: 1"=40'
VERT: 1"=4'
FIELD BOOK
CCPW PROJECT #
W.O. #

DRAWING NO. C7

SHT. X OF X



NOTE

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NOTE

FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

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REV. NO.	DATE	DESCRIPTION	APPROVED

MUDDY RIVER LOGANDALE LEVEE

PROFILE

"STA" 29+00.00 TO "STA" 39+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

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

SCALE	
HORIZ:	1"=40'
VERT:	1"=4'
FIELD BOOK	
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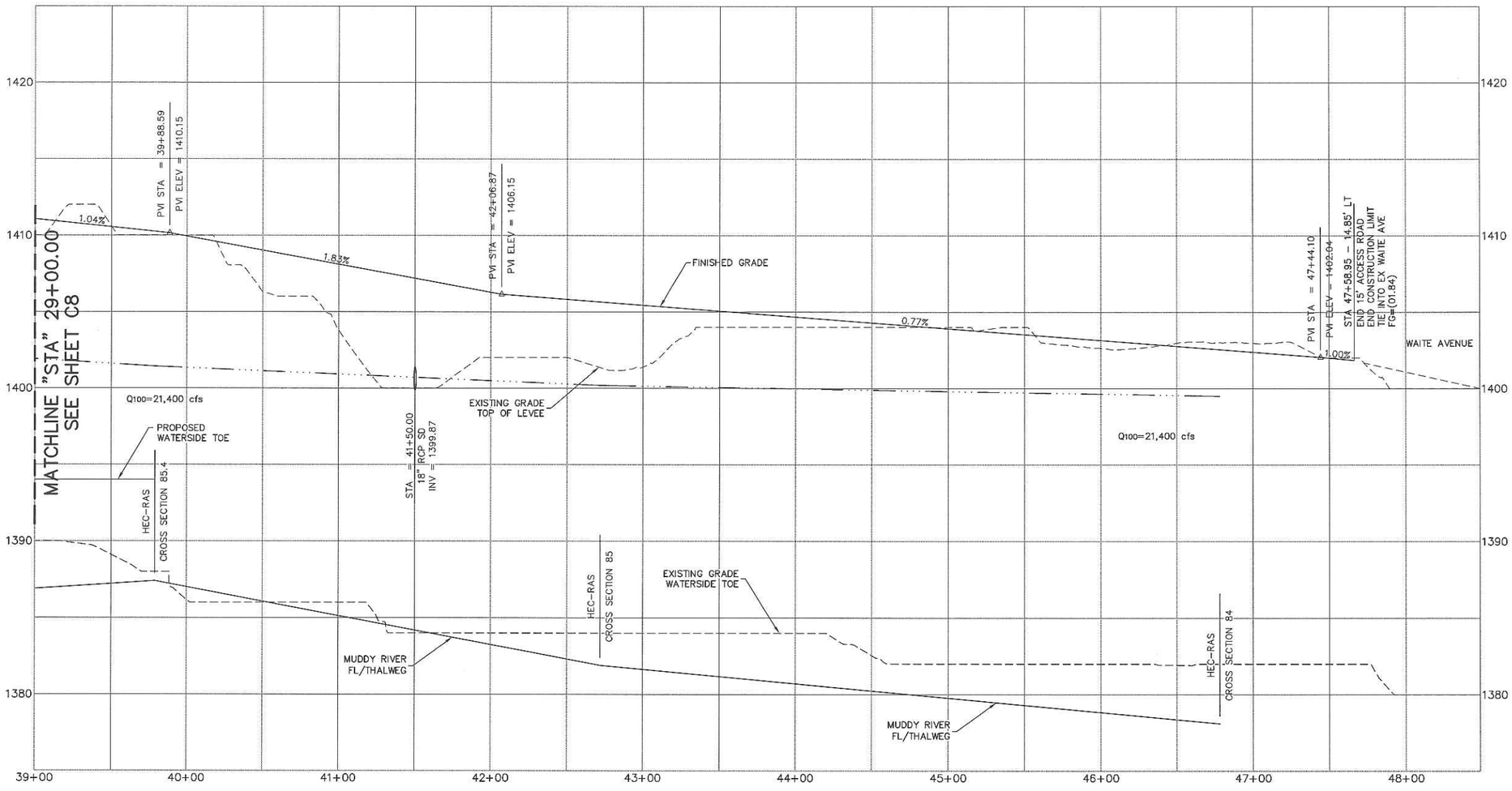
W.O. #	

DRAWING NO. C8

SHT. X OF X



NOTE

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NOTE

FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

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REV. NO.	DATE	DESCRIPTION	APPROVED

MUDDY RIVER LOGANDALE LEVEE

PROFILE

"STA" 39+00.00 TO "STA" 47+58.95

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

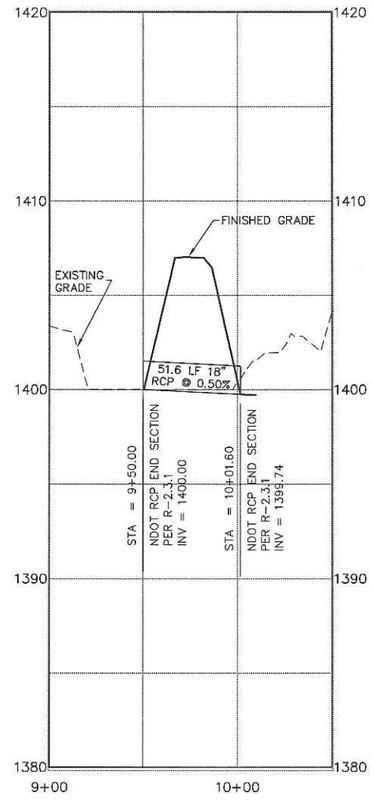
PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

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

SCALE	
HORIZ:	1"=40'
VERT:	1"=4'
FIELD BOOK	
CCPW PROJECT #	
W.O. #	

DRAWING NO. C9

SHT. X OF X



18" RCP STORM DRAIN PROFILE

SCALE: HORIZ. 1" = 40' (SEE SHEET C4 FOR PLANS) 1/C10
VERT. 1" = 4'

NOTE

ALL STATIONING FROM CENTERLINE OF LEVEE/ACCESS UNLESS OTHERWISE NOTED.

NOTE

FOR BASIS OF BEARING AND BENCHMARK, SEE SHEET G3

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REV. NO.	DATE	DESCRIPTION	APPROVED

MUDDY RIVER LOGANDALE LEVEE

PROFILE

18" RCP STORM DRAIN

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11903

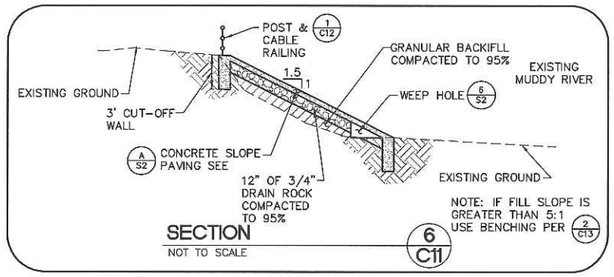
PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY:

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

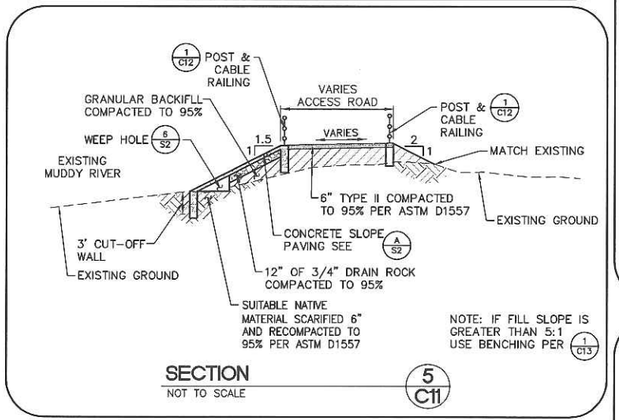
SCALE	
HORIZ:	1"=40'
VERT:	1"=4'
FIELD BOOK	
CCPW PROJECT #	
W.O. #	

DRAWING NO. C10

SHT. X OF X



SECTION 6/C11
NOT TO SCALE



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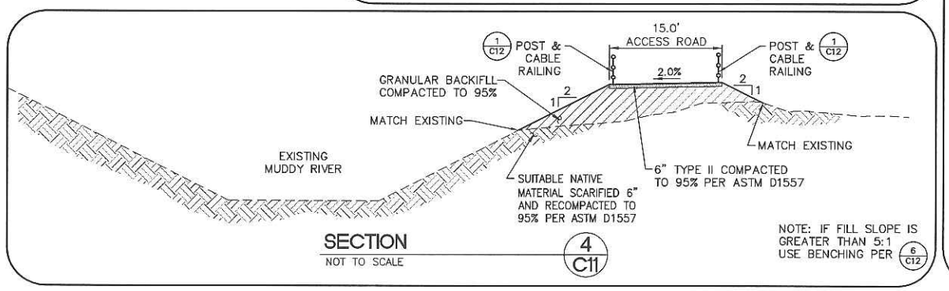

SECTION 4/C11
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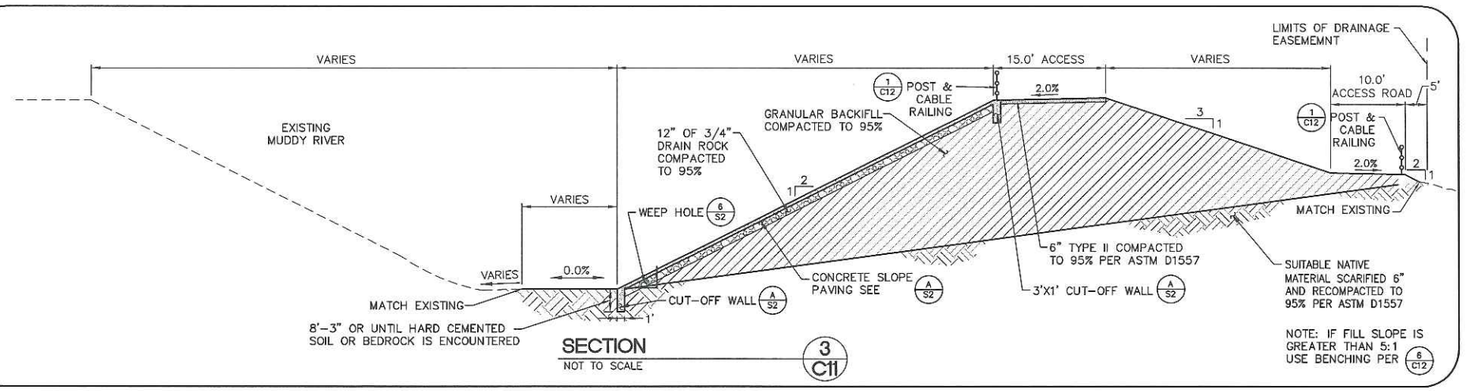

SECTION 3/C11
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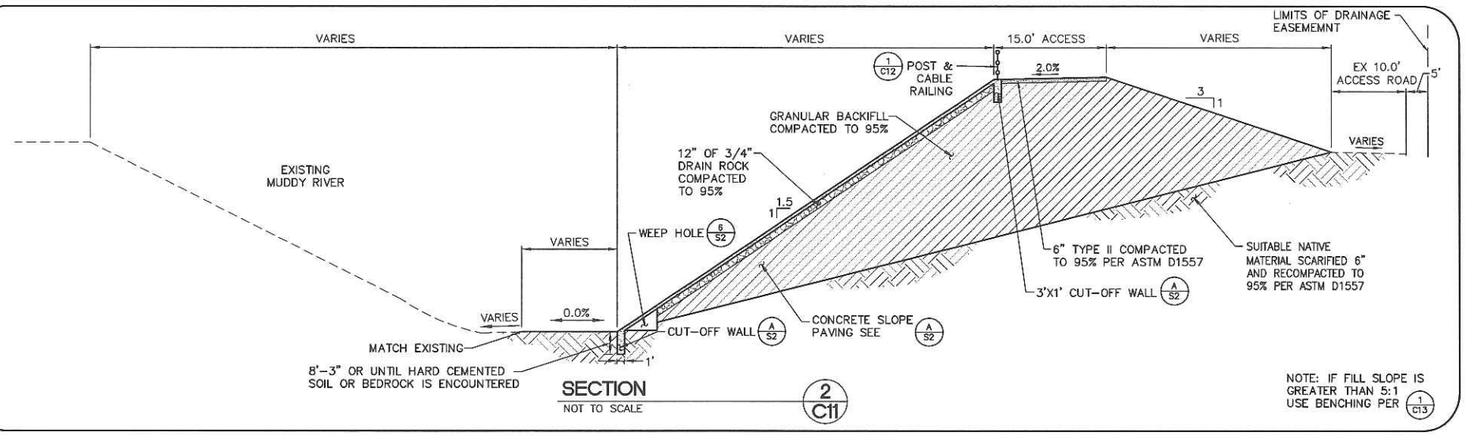

SECTION 2/C11
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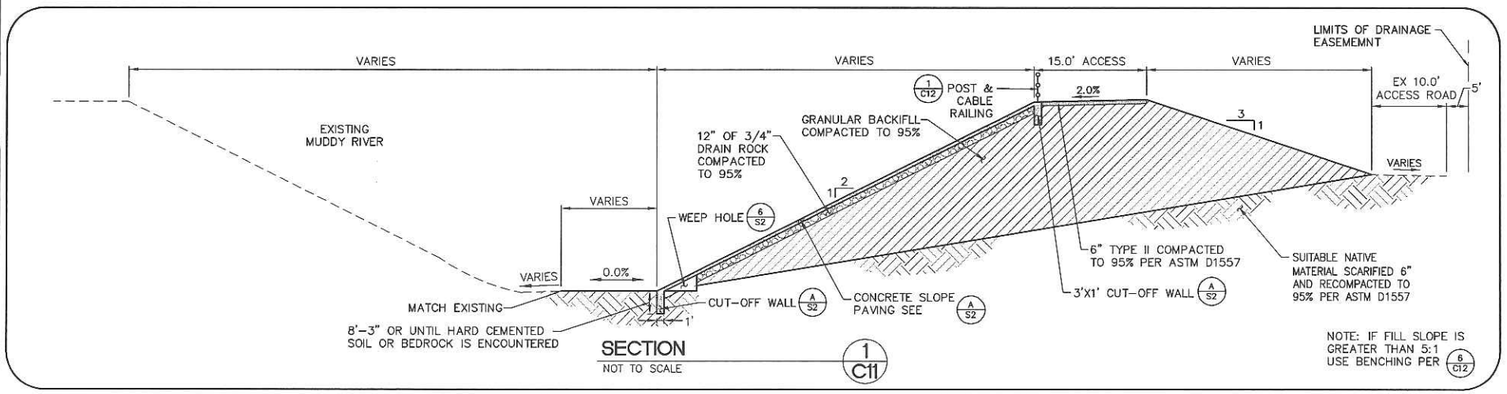


SECTION 1/C11
NOT TO SCALE

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

MUDDY RIVER LOGANDALE LEVEE
DETAILS 1

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

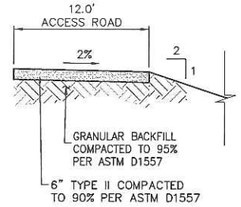
PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

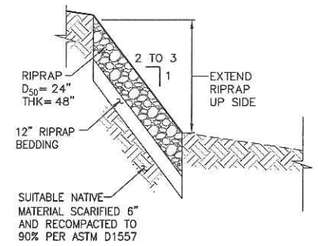
G.C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BOULEVARD · LAS VEGAS, NV 89146
T: 702.804.2000 · F: 702.804.2299 · GCWALLACE.COM

SCALE
HORIZ: NONE
VERT:
FIELD BOOK
CCPW PROJECT #
W.O. #

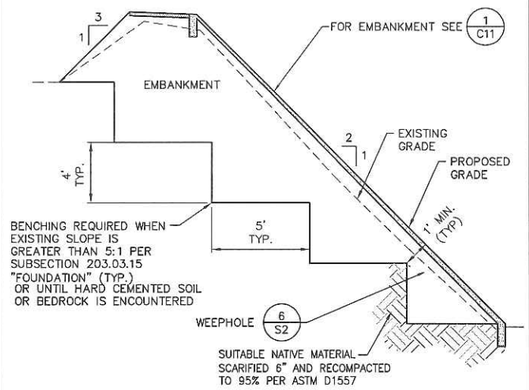
DRAWING NO. C11
SHT. X OF X



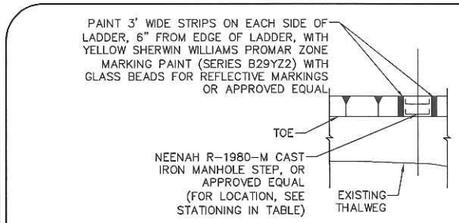
SECTION
NOT TO SCALE
10 C12



RIPRAP SECTION
NOT TO SCALE
9 C12

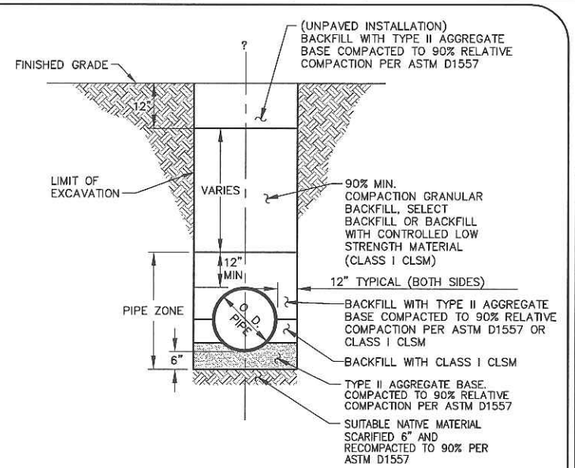


2:1 BENCHING AND BACKFILL DETAIL
NOT TO SCALE
6 C12



LOCATION	
LEFT	RIGHT
15+15.00	26+70.00
17+70.00	31+00.00
23+70.00	--
29+70.00	--
34+00.00	--
40+00.00	--

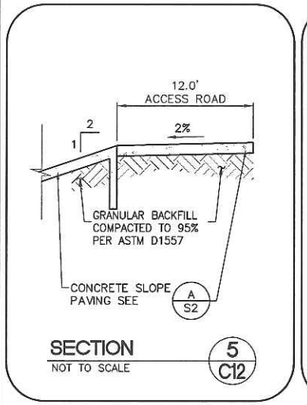
CHANNEL STEP DETAIL
NOT TO SCALE
3 C12



NOTES:

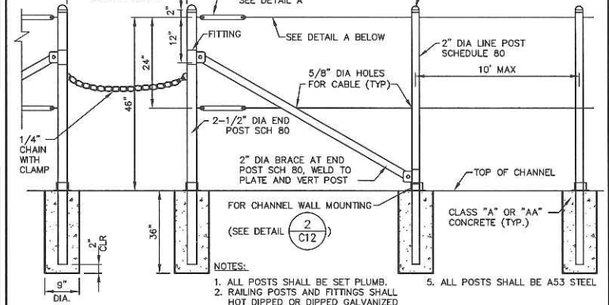
1. NO STONES OR LUMPS GREATER THAN 3" PERMITTED IN TRENCH 2' OR LESS IN WIDTH.
2. TRENCH WIDTH, BEDDING, SUBGRADE AND RCP TRENCH REQUIREMENTS FOR INSTALLATIONS SHALL CONFORM TO OSHA REGULATIONS. SLOPES SHOWN ARE BASED ON TYPE "B" SOILS. OTHER SLOPES AND/OR SHORING MAY BE APPLICABLE DEPENDING ON SOIL CONDITIONS. CONTRACTOR TO VERIFY DURING CONSTRUCTION. (NOT A SEPARATE PAY ITEM)
3. CRUSHED ROCK MAY BE USED FOR PIPE BEDDING ONLY IF MATERIAL USE HAS BEEN SPECIFICALLY APPROVED BY CLARK COUNTY. SEE STANDARD DRAWING NO. 505 FOR PIPE BEDDING METHODS.

RCP TRENCH DETAIL
NOT TO SCALE
8 C12



SECTION
NOT TO SCALE
5 C12

NOT USED
NOT TO SCALE
4 C12



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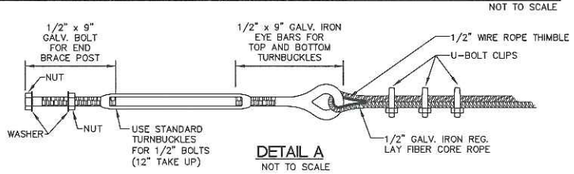
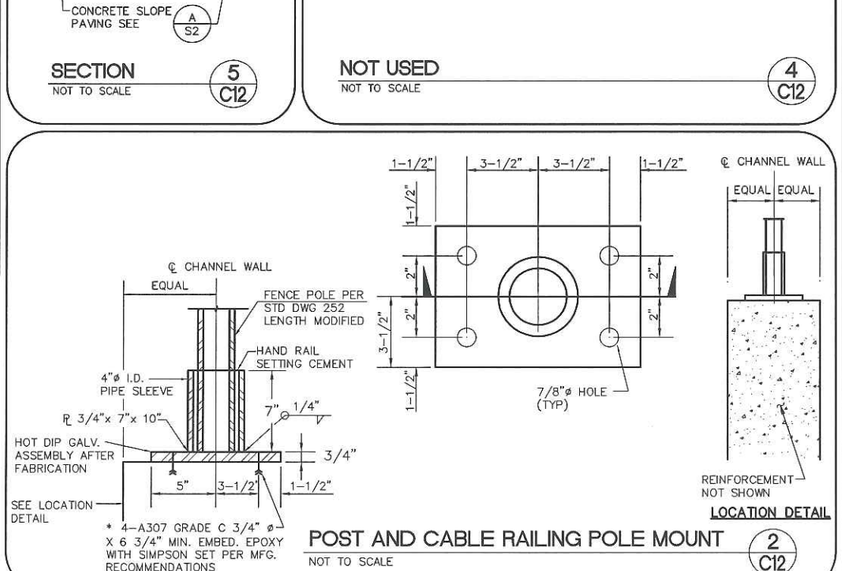


POST AND CABLE RAILING
NOT TO SCALE
1 C12



SECTION
NOT TO SCALE
7 C12

POST AND CABLE RAILING POLE MOUNT
NOT TO SCALE
2 C12

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

MUDDY RIVER LOGANDALE LEVEE
DETAILS 2

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

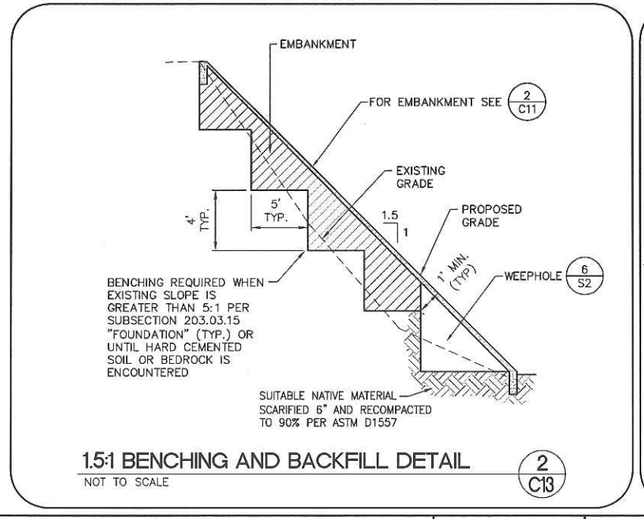
PROFESSIONAL ENGINEER STATE OF NEVADA
JERRY E. PRUITT
Exp. 12/31/2013
CIVIL
No. 11902

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

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

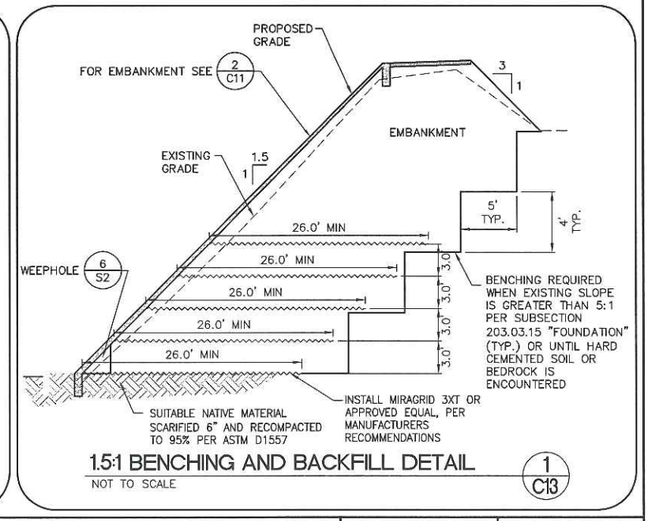
SCALE
HORIZ: NONE
VERT:
FIELD BOOK
CCPW PROJECT #
W.O. #

DRAWING NO.
C12
SHT. X OF X



1.5:1 BENCHING AND BACKFILL DETAIL 2 C13

NOT TO SCALE



1.5:1 BENCHING AND BACKFILL DETAIL 1 C13

NOT TO SCALE

REV. NO.	DATE	DESCRIPTION	APPROVED

MUDDY RIVER LOGANDALE LEVEE

DETAILS 3

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
JERRY E. PRUITT
No. 11902
Exp. 12/31/2013
CIVIL

PROJECT No: 500-887 DRAWN BY:
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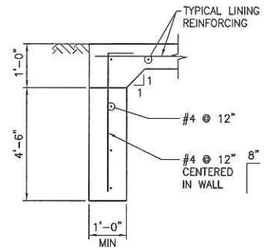
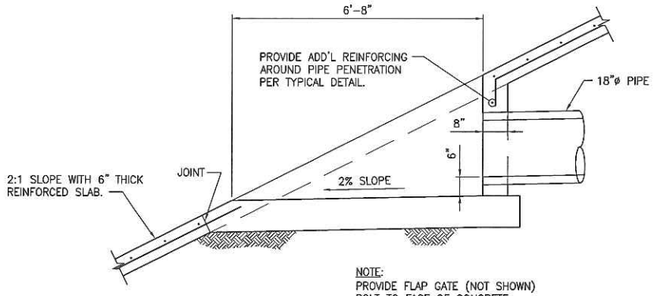
SCALE
HORIZ: NONE
VERT:
FIELD BOOK
CCPW PROJECT #
W.O. #

DRAWING NO. C13

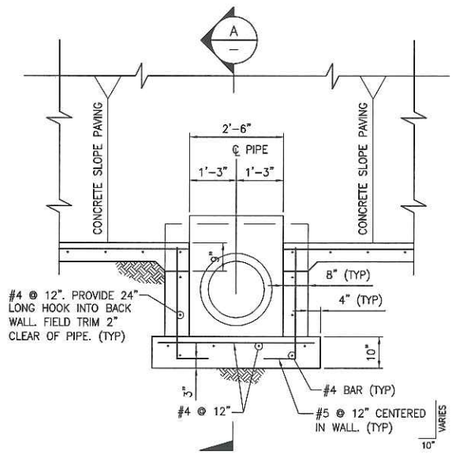
SHT. X OF X



B CUT-OFF WALL DETAIL
SCALE: NTS



A SECTION
SCALE: 1/2" = 1'-0"



4 TYPICAL PIPE OUTLET DETAIL
SCALE: 1/2" = 1'-0"

3 NOT USED
SCALE:

2 NOT USED
SCALE: NTS

1 NOT USED
SCALE:

GENERAL STRUCTURAL NOTES

1. DESIGN SPECIFICATIONS: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 5TH EDITION, 2010 WITH INTERIM REVISIONS.
2. CONSTRUCTION SPECIFICATIONS: UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA.
3. EXISTING UTILITIES: THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES WITHIN THE WORK AREA, AND PROVIDING PROTECTION FOR THE VARIOUS UTILITIES AFFECTED PRIOR TO PROCEEDING WITH THE WORK.
4. CONCRETE: CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF f'c=4,500 PSI AND A MAXIMUM WATER TO CEMENT RATIO, BY WEIGHT, OF 0.45. USE TYPE V CEMENT PER ASTM C-150. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS NOTED OTHERWISE.
5. REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE ASTM A615 GRADE 60. DIMENSIONS ARE FROM OUT TO OUT OF BARS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 2" UNLESS NOTED OTHERWISE. HOOKS MAY BE ROTATED OR TILTED AS NECESSARY TO PROVIDE THE PROPER CLEARANCES.
6. BEDDING MATERIAL: BEDDING MATERIAL SHALL BE 6-INCHES OF CLARK COUNTY TYPE II AGGREGATE BASE COMPACTED TO 95% OF THE MAXIMUM DRY DENSITY AS ESTABLISHED BY ASTM TEST METHOD D-1557. EXPOSED NATIVE SOILS IN BOTTOMS OF EXCAVATIONS SHALL BE SCARIFIED TO A DEPTH OF 6-INCHES, MOISTURE-CONDITIONED TO WITHIN 2% OF OPTIMUM MOISTURE CONTENT AND COMPACTED TO 95% PER ASTM D-1557.
7. INVERTS, SLOPES, BEARINGS, ALIGNMENTS, AND ELEVATIONS SHOWN ARE FOR "REFERENCE ONLY". INFORMATION ON CIVIL DRAWINGS SHALL GOVERN.
8. CONTRACTOR SHALL PROVIDE SLOPE STABILIZATION, SHEETING, BRACING, AND/OR SHORING AS REQUIRED TO PROTECT EXISTING EMBANKMENTS, STRUCTURES, AND UNDERGROUND ITEMS.
9. REFER TO CIVIL PLANS FOR FINISHED GRADE ELEVATIONS.

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

MUDDY RIVER LOGANDALE LEVEE

GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

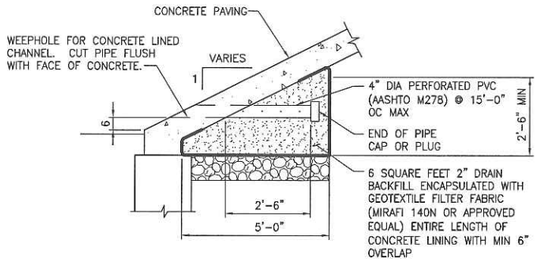
PROFESSIONAL ENGINEER - STATE OF NEVADA
DAVID A. TURNER
No. 18979
Exp. 08/30/2014
CIVIL / STRUCTURAL

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

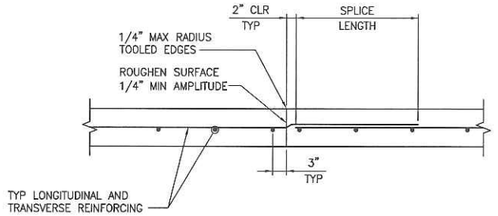
G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BOULEVARD · LAS VEGAS, NV 89146
T: 702.804.2000 · F: 702.804.2299 · GCWALLACE.COM

SCALE
HORIZ: 1"=40'
VERT:
FIELD BOOK
CCPW PROJECT #
W.O. #

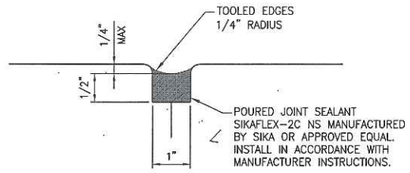
DRAWING NO. S1
SHT. X OF X



6 WEEPHOLE DETAIL
SCALE: NTS



5 CONSTRUCTION JOINT DETAIL
SCALE: NTS

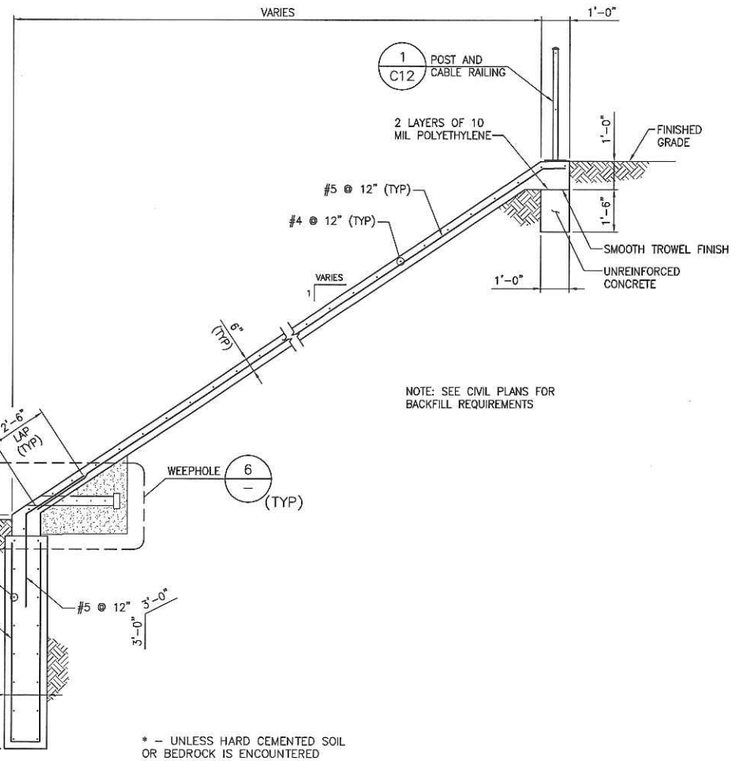


NOTE:
JOINT MUST BE TOOLED, SAW-CUTTING IS NOT ALLOWED.

4 SEALANT DETAIL
SCALE: NTS

CONCRETE SLOPE PAVING NOTES

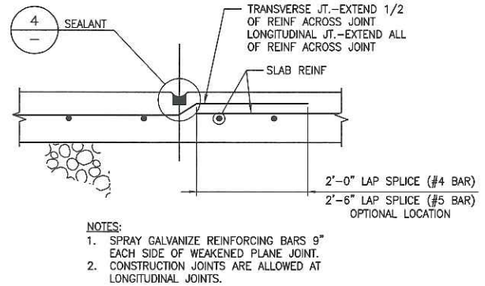
1. TRANSVERSE AND LONGITUDINAL JOINTS IN SLOPE PAVING WILL BE REQUIRED AT THE END OF EACH CONTINUOUS POURING OPERATION. SEE TYPICAL CONSTRUCTION JOINT DETAIL. TRANSVERSE CONSTRUCTION JOINTS SHALL NOT BE PLACED WITHIN 30 FEET OF AN EXPANSION JOINT.
2. ALL TRANSVERSE JOINTS IN SLOPE PAVING SHALL BE IN THE SAME PLANE. NO STAGGERING OF JOINTS WILL BE PERMITTED UNLESS SHOWN OTHERWISE. TRANSVERSE CONSTRUCTION JOINTS SHALL BE NORMAL OR RADIAL TO CENTERLINE OF CONSTRUCTION.
3. ALL SINGLE LAYER REINFORCEMENT SHALL BE PLACED IN THE CENTER OF CONCRETE UNLESS NOTED OTHERWISE.
4. IN CURVED PAVING SECTIONS, TRANSVERSE BARS SHALL BE PLACED NORMAL TO THE CENTERLINE.
5. IN CURVED PAVING SECTIONS, THE MAXIMUM SPACING OF BARS SHALL NOT EXCEED THAT SHOWN FOR TYPICAL SECTIONS. STEEL SHALL BE PLACED RADIALLY FROM THE MAXIMUM SPACING.
6. IN CURVED PAVING SECTIONS, TRANSVERSE JOINTS SHALL BE NORMAL TO CENTERLINE AND SHALL NOT EXCEED 30' MAX SPACING.
7. AT THE BEGINNING AND ENDING OF ALL POURS, A COMPLETE CURTAIN OF MAIN REINFORCEMENT SHALL BE PLACED 3-INCHES FROM THE TRANSVERSE CONSTRUCTION, CONTRACTION AND EXPANSION JOINTS.
8. WEEPHOLES ARE REQUIRED AT 15-FEET OC MAX PER THE TYPICAL WEEPHOLE DETAIL.
9. WEAKENED PLANE JOINTS TO BE CENTERED WITH WEEPHOLES WHEN JOINTS OCCUR.



NOTE: SEE CIVIL PLANS FOR BACKFILL REQUIREMENTS

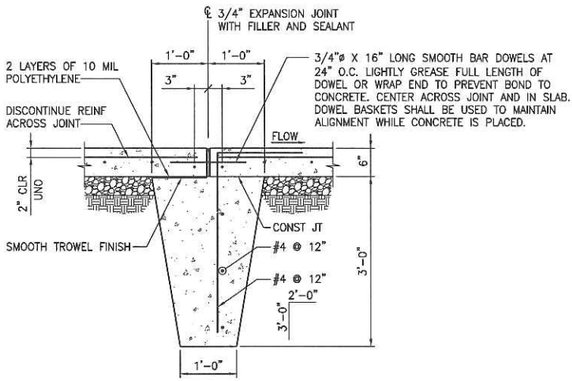
* - UNLESS HARD CEMENTED SOIL OR BEDROCK IS ENCOUNTERED

A TYPICAL CONCRETE SLOPE PAVING SECTION
SCALE: 3/8" = 1'-0"

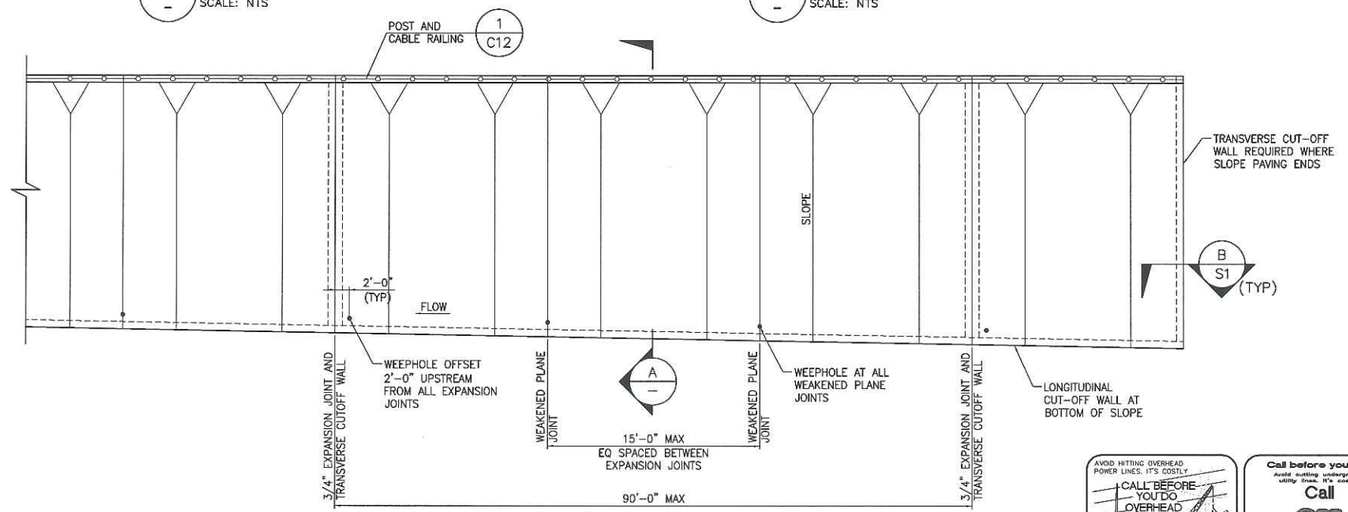


NOTES:
1. SPRAY GALVANIZE REINFORCING BARS 9" EACH SIDE OF WEAKENED PLANE JOINT.
2. CONSTRUCTION JOINTS ARE ALLOWED AT LONGITUDINAL JOINTS.

3 WEAKENED PLANE JOINT
SCALE: NTS



2 EXPANSION JOINT/CUTOFF WALL DETAIL
SCALE: NTS



1 TYPICAL CONCRETE SLOPE PAVING
SCALE: NTS

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
CALL BEFORE YOU DO OVERHEAD
1-702-593-6111

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
or 1-800-227-2600

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

MUDDY RIVER LOGANDALE LEVEE

TYPICAL CONCRETE SLOPE PAVING PLAN AND DETAILS
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER STATE OF NEVADA
DAVID A. TURNER
Exp. 06/30/2014
CIVIL / STRUCTURAL
No. 18979

PROJECT No: 500-887 DRAWN BY:
DESIGNED BY: CHECKED BY:
APPROVED BY

G. C. WALLACE COMPANIES
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SCALE	
HORIZ:	1"=40'
VERT:	
FIELD BOOK	
CCPW PROJECT #	
W.O. #	

DRAWING NO. S2

SHT. X OF X

7. ELECTRONIC FILES (ON CD)

Report PDF
HEC-RAS Model
Supporting Information
Reference Materials
Improvement Plans
GIS Shape Files