January 2005

Abbott Wash Conveyance System

Conditional Letter of Map Revision

City of Mesquite, Nevada

05-09-0588R

Prepared for

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

Prepared by

PBSJ

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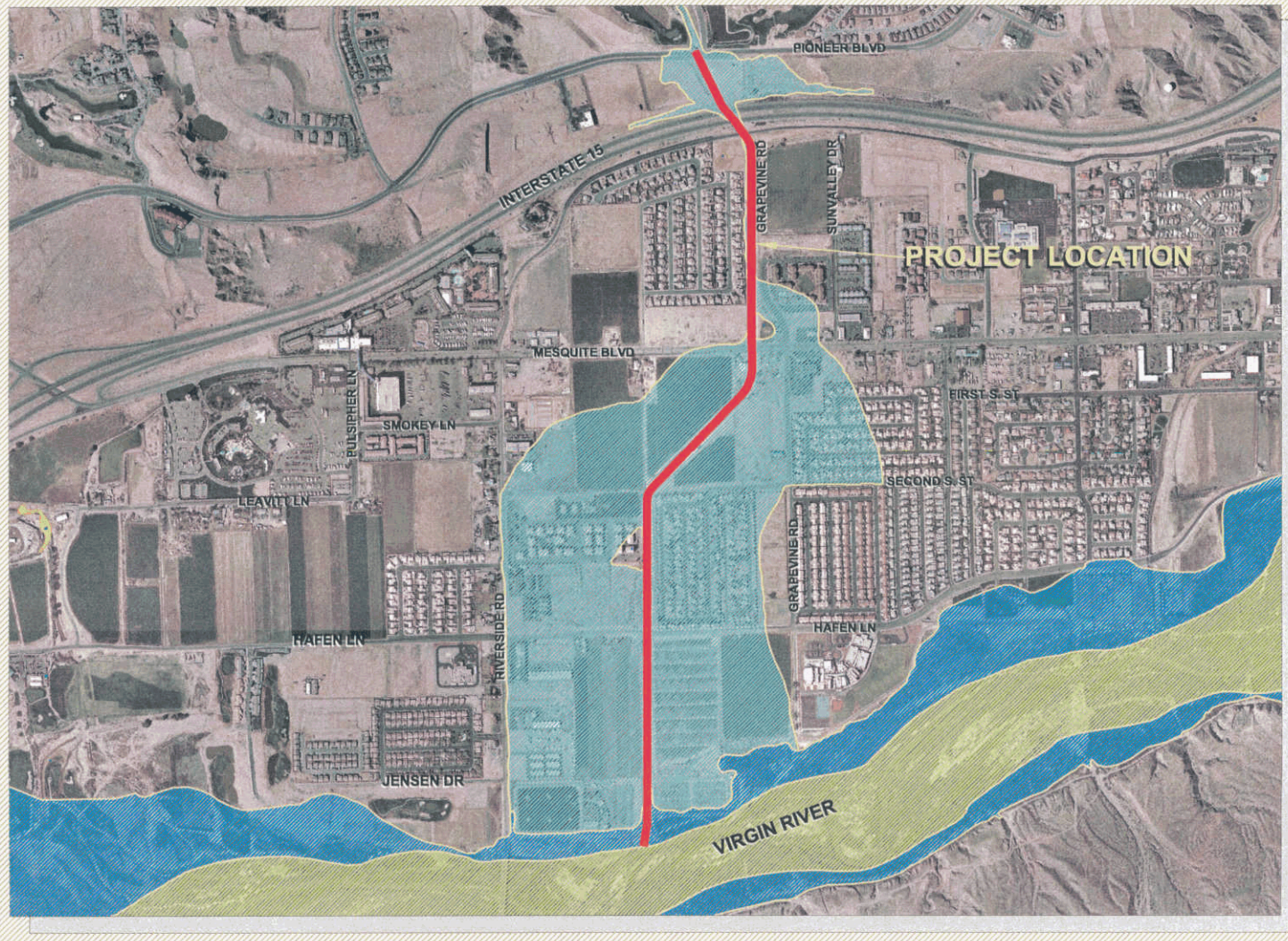

Request for Conditional Letter of Map Revision

Abbott Wash Conveyance System

Located
Between The Virgin River and Interstate I-15
City of Mesquite
Clark County, Nevada

05-09-0588R

Prepared for:

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
600 South Grand Central Parkway, Suite 300
Las Vegas, NV 89155

Prepared by:

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PBS&J

January 2005

TABLE OF CONTENTS

1.0 INTRODUCTION **3**

2.0 PURPOSE AND SITE DESCRIPTION **4**

2.1 Purpose 4
2.2 Location 4
2.3 Existing Flood Control Facilities 4
2.4 FEMA Floodzone Information 4

3.0 HYDROLOGY **5**

3.1 Effective vs. Design Flow 5
3.2 Reference Hydrology 5

4.0 HYDRAULICS **6**

4.1 Computer Modeling 6
4.2 Model Description 6

5.0 RESULTS **7**

6.0 CONCLUSION **8**

7.0 REFERENCES **9**

APPENDICES

A. FEMA FORMS

FEMA 'Overview and Concurrence Form' – MT-2 Form 1
FEMA 'Riverine Hydrology & Hydraulics Form' – MT-2 Form 2
FEMA 'Hydraulic Structures Form' – MT-2 Form 3
Statement of Explanations

B. FIGURES

Figure 1 – Area/Vicinity Map
Figure 2 – CCRFCD Flood Control Drainage Basin Map
Figure 2A – CCRFCD Flood Control Plan & Facilities Inventory
Figure 3 – FEMA Flood Zone Map
Figure 3A – DFIRM Flood Zone Map
Figure 4 – FEMA Annotated Flood Zone Map
Figure 4A – Proposed Flood Zone Delineation Map
Figure 5 – Workmap

C. REFERENCE HYDROLOGY

1998 Abbott and Pulsipher Washes FIS Restudy Hydrology
Bulloch Brothers Design Flow Hydrology
HEC-1 Model, Standard Form 4 and Velocity Estimate Calculations

D. REFERENCE HYDRAULICS

Abbott Wash HEC-RAS Analysis
Abbott Wash Scour Analysis

E. DESIGN PLANS

Abbott Wash Conveyance System Improvement Plans
NDOT Construction Plans – I-15 Culverts

F. DATA CD

Electronic Hydrologic and Hydraulic Model Files
Design Plans
Figures

1.0 INTRODUCTION

PBS&J has prepared a request for a Conditional Letter of Map Revision (CLOMR) for the proposed Abbott Wash Conveyance System on behalf of the Clark County Regional Flood Control District (CCRFCD). The purpose of the study is to evaluate the removal of an existing Zone A flood zone based on the construction of a proposed flood control facility (see Figure 1-Vicinity Map & Figure 3A).

The proposed facility is more or less within the alignment of the existing Abbott Wash that runs north to south through the City of Mesquite. The proposed channel will convey flow from the upstream watershed south to its confluence with the Virgin River, see Figure 3A. The Abbott Wash channel was designed by Bulloch Brothers Engineering, Inc. (BBE). The proposed Abbott Wash Conveyance System will consist of the following primary components:

1. Gabion outfall structure at the confluence with the Virgin River
2. Dual 14'x 9' RCB's at water treatment plant access road (Jensen Dr)
3. (4) 11'x 8' RCB's at Hafen Lane (existing, to be maintained)
4. Dual 14'x 9' RCB's at 2nd South Street
5. Dual 14'x 9' RCB's at Mesquite Boulevard
6. Dual 14'x 9' RCB's at Grapevine/I-15 Interchange
7. Approximately 20 side drains for future drainage connection
8. Approximately 6,400-feet of rectangular concrete lined channel

As described in the BBE Design Report (2002), the system allows for the adequate collection and conveyance of existing and future condition 100-year flows. Additional details on the proposed Abbott Wash Channel can be found in the approved design plans located in Appendix F.

This project will be constructed in two phases. The construction plans in Appendix E show Phase 2 as "Not Included" on sheet 14-16 of 26. Phase 2 will be constructed by the Nevada Department of Transportation as part of the Grapevine/I-15 overpass. Final plans for Phase 2 are included in Appendix F. The HEC-RAS model incorporates and this CLOMR request addresses both phases from the Virgin River to pioneer Boulevard.

2.0 PURPOSE AND SITE DESCRIPTION

2.1 PURPOSE

The Abbott Wash is one of three principal drainage features that convey flood flows through the City of Mesquite. Abbott Wash, Town Wash and Pulsipher Wash, along with the majority of the city drain south to the Virgin River. The portion of the Abbott Wash between I-15 and the Virgin River is predominantly unlined and partially graded. The tributary watershed originates in the mountains north of Mesquite in Lincoln County and is approximately 8 square miles. The Abbott Wash is aligned mostly north-south and is adjacent to residential and commercial developments. Under current conditions the Abbott Wash does not have sufficient capacity and a 100-year event could cause significant flooding to the overbank areas. In recent years the City of Mesquite has experienced increased growth thus necessitating the need for flood control facilities, such as the one addressed in this report. Therefore, this CLOMR has been prepared to address the proposed facility for the purpose of flood zone removal.

2.2 LOCATION

The project area is located in the northeast corner of Clark County within Sections 8, 17, and 20, Township 13 South, Range 71 East, Mount Diablo Base & Meridian, Clark County, Nevada. Specifically, the area between I-15 and the Virgin River and between Riverside Road and Grapevine Road. Please refer to Figure 1 – Vicinity Map.

2.3 EXISTING FLOOD CONTROL FACILITIES

The 2001 Master Plan Update (MPU) serves as a planning tool for the implementation of existing and proposed flood control facilities within the City of Mesquite. The MPU shows the alignment of the proposed Abbott Wash Channel (see Figure 2A). As previously discussed, the flows collected by the subject facility drains to the Virgin River. Refer to the tables immediately following Figure 2A that provides detailed information on each existing or proposed facility discussed in this section.

2.4 FEMA FLOODZONE INFORMATION

Figure 3 is a reproduction of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for Clark County, Nevada, Community Panel No. 32003C0387E, dated September 27, 2002. Figure 3 shows the Zone A floodzone in relation to the proposed facility. Also refer to Figure 3A that shows the DFIRM floodzone delineations for the subject area.

3.0 HYDROLOGY

3.1 EFFECTIVE VS. DESIGN FLOW

Three flow rates have been established for the Abbott Wash between Pioneer Boulevard and its confluence with the Virgin River. The effective FIS discharge of 3,020 cfs at Pioneer Boulevard is derived from the 1999 FIS Restudy by G.C. Wallace per Case No. 99-09-457P (see Appendix C). The 2001 City of Mesquite MPU shows a 100-year discharge ranging between 1,471 cfs at the upstream end of the proposed improvements to 2,975 cfs at the Virgin River confluence. The design discharge from BBE (2002) ranges from 2,790 cfs at the upstream end of the proposed improvements (Pioneer Boulevard) to 4,000 cfs at the Virgin River. Note that the design hydrology accounted for additional area to subbasin A10 (226 acres) and included the flow from an unnamed wash that added approximately 0.62 sq mi (397 acres) of tributary area. This is further discussed in the reference hydrology material from BBE presented in Appendix C. It is reasonable to use the design flow rate for the purpose of this CLOMR request.

3.2 REFERENCE HYDROLOGY

The hydrologic model utilized to calculate runoff is the HEC-1 Flood Hydrograph Package, Version 4.1, developed by the U.S. Army Corps of Engineers Hydrologic Engineering Center. The methodology and calculations used to determine the hydrologic parameters in the HEC-1 modeling are included in Appendix C. The local parameters for computing runoff have been developed in accordance with the Clark County Regional Flood Control District's Hydrologic Criteria and Drainage Design Manual.

The HEC-1 model submitted in this CLOMR is derived from the 2001 MPU for the City of Mesquite. The model was updated by Bulloch Brothers Engineering to reflect current conditions and additional tributary area as described above.

The HEC-1 model prepared by BBE (2002) is included in the Drainage Study Report, see Appendix C.

4.0 HYDRAULICS

4.1 COMPUTER MODELING

Hydraulic modeling of the proposed Abbott Wash channel was performed in conformance with the local standards as specified in the Hydrologic Criteria and Drainage Design Manual using the U.S. Army Corps of Engineers' River Analysis System (HEC-RAS) program, version 3.0.1. HEC-RAS allows the user to perform steady and unsteady flow river hydraulic calculations.

4.2 MODEL DESCRIPTION

A single HEC-RAS model was prepared for this project to analyze the proposed channel. However, two sets of conditions were modeled as described in the design document found in Appendix C. The HEC-RAS model was run using two different downstream boundary conditions. One condition has the Virgin River and the Abbott Wash peaking with the 100-year flow; therefore, the downstream boundary condition was set using the BFE established for the Virgin River (100-year tailwater depth). The second condition models the Abbott Wash with no flow in the Virgin River (no tailwater depth) and thus the downstream boundary condition was set using a normal depth slope. Both models show that the proposed Abbott Wash channel has sufficient conveyance capacity. A more detailed discussion of the channel design can be found in the reference drainage report in Appendix C. Also refer to Appendix D for the hardcopy output of the HEC-RAS model and Appendix F for the digital version of the HEC-RAS model.

5.0 RESULTS

The results for the proposed Abbott Wash Channel are based on the hydrology/hydraulics prepared by BBE. The proposed channel shows containment of the 100-year flood. Please refer to Appendix D for the hardcopy out of the HEC-RAS model and Appendix F for the digital HEC-RAS input/output files.

6.0 CONCLUSION

We believe that based on the data and supporting calculations contained within this Conditional Letter of Map Revision application, the flood zone revisions proposed in this report will be warranted once the project is completed. Please refer to Figures 3 and 4, FEMA Flood Zone Map and Annotated FEMA Flood Zone Map.

7.0 REFERENCES

HCDDM — *Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual.* Prepared for: Clark County Regional Flood Control District. Adopted August 12, 1999.

HEC-1 — HEC-1 Flood Hydrograph Package Version 4.1. U.S. Army Corps of Engineers, Hydrologic Engineering Center, June 1998.

HEC-RAS — U.S. Army Corps of Engineers' River Analysis System (HEC-RAS) Version 3.0.1, Hydrologic Engineering Center, May 2003.

MPU 01 — *CCRFCD 2001 Master Plan Update for City of Mesquite.* Prepared for Clark County Regional Flood Control District. Prepared by Pentacore, 2001.

SCS — *Soil Survey of Las Vegas Valley Area Nevada 1985.* United States Department of Agriculture, Soil Conservation Service.

GCW — *Draft Abbott and Pulsipher Washes FIS Restudy, Technical Data Support Notebook Vol 2 of 2.* Prepared by G.C. Wallace Inc, dated October 1998.

BBE — *Technical Drainage Study for Abbott Wash Conveyance Project.* Prepared by Bulloch Brothers Engineering, Inc., dated June 2002.

APPENDIX A

FEMA MT-2 Forms

MT-2 FORM 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour 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, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). 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.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☒ CLOMR: A letter from 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 FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

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
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
320003	Clark County	NV	32003C	0387E	09/27/02

2. Flooding Source: Abbott Wash

3. Project Name/Identifier: Request for Conditional Letter of Map Revision for Abbott Wash Conveyance System

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 ☐ 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 types of flooding and structures (check all that apply)

Types of Flooding:	☒ Riverine	☐ Coastal	☐ Shallow Flooding (e.g., Zones AO and AH)
	☐ Alluvial fan	☐ Lakes	☐ Other (Attach Description)
Structures:	☒ Channelization	☐ Levee/Floodwall	☒ Bridge/Culvert
	☐ Dam	☐ Fill	☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $4,000

☒ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/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: Brian K. Loffman, CFM	Company: PBS&J	
Mailing Address: 2270 Corporate Circle Suite 100 Henderson, NV 89074	Daytime Telephone No.: (702) 263-7275	Fax No.: (702) 263-7200
	E-Mail Address: bloffman@pbsj.com	
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 requirement that no fill be 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. 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: J. Allen Bell, P.E., City Engineer		Telephone No.: (702) 346-5295
Community Name: City of Mesquite Public Works	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. 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: Mathew S. Baird, P.E., CFM	License No.: NV 13684	Expiration Date: 12/31/06
Company Name: PBS&J	Telephone No.: (702) 263-7275	Fax No.: (702) 263-7200
Signature:		Date:

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

Seal (Optional)

MT-2 FORM 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3 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, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). 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.**

Flooding Source: Abbott Wash
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 2) ☐ 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.)	FIS (cfs)	Revised (cfs)
City of Mesquite, Nevada	8.10	3,020	4,000

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

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☐ 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. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/fhm/en_modl.shtm.

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

Was sediment transport considered? ☐ 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.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.)	
			Effective	Proposed/Revised
Downstream Limit	Virgin River	1+13	n/a	1550.00
Upstream Limit	Pioneer Boulevard	79+91.56	n/a	1619.48

2. Hydraulic Method Used

Hydraulic Analysis HEC-RAS [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/fhm/frm_soft.shtm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☒ No

4. Models Submitted

Duplicate Effective Model*	Natural File Name: na	Floodway File Name: na
Corrected Effective Model*	Natural File Name: na	Floodway File Name: na
Existing or Pre-Project Conditions Model	Natural File Name: na	Floodway File Name: na
Revised or Post-Project Conditions Model	Natural File Name: 5103.prj	Floodway File Name: na
Other - (attach description)	Natural File Name: na	Floodway File Name: na

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/fhm/en_modl.shtm.

C. MAPPING REQUIREMENTS

A **certified topographic 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.).

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,** 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 of revision.

D. COMMON REGULATORY REQUIREMENTS

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

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.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☐ No

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

MT-2 FORM 3

Riverine Structures Form

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Abbott Wash
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 Structure

1. **Name of Structure: Abbott Channel**

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

   Location of Structure: Approximately 150' downstream of Pioneer Boulevard to confluence with the Virgin River

   Downstream Limit/Cross Section: 1+00

   Upstream Limit/Cross Section: 64+00

2. **Name of Structure: Dual 14'x9' RCB's**

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

   Location of Structure: I-15 crossing with Abbott Wash

   Downstream Limit/Cross Section: 71+50

   Upstream Limit/Cross Section: 73+00

3. **Name of Structure: Dual 14'x9' RCB's**

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

   Location of Structure: 2nd South Street at crossing with Abbott Wash

   Downstream Limit/Cross Section: 33+50

   Upstream Limit/Cross Section: 34+25

NOTE: For more structures, attach additional pages as needed.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
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PAPERWORK REDUCTION ACT

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Flooding Source: Abbott Wash
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 Structure

A.4 **Name of Structure: Dual 14'x9' RCB's**

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

Location of Structure: Mesquite Boulevard at crossing with Abbott Wash

Downstream Limit/Cross Section: 50+00

Upstream Limit/Cross Section: 51+00

A.5 **Name of Structure: (4) 11'x8' RCB's**

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

Location of Structure: Hafen Lane crossing with Abbott Wash

Downstream Limit/Cross Section: 20+00

Upstream Limit/Cross Section: 21+00

A.6 **Name of Structure: Dual 14'x9' RCB's**

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

Location of Structure: Water Treatment Access Road at crossing with Abbott Wash

Downstream Limit/Cross Section: 7+00

Upstream Limit/Cross Section: 7+25

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source: Abbott Wash

Name of Structure: Abbott Channel

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☒ Energy dissipator

2. Drawing Checklist

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

3. Hydraulic Considerations

The channel was designed to carry 4,000 (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):

4. 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.

C. BRIDGE/CULVERT

Flooding Source: Abbott Wash

Name of Structure: Culvert Crossings listed in Section A

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New 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): HEC-RAS
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

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.

D. DAM

Flooding Source:

Name of Structure:

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

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

   ☐ Private organization Name of the agency or organization:

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

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

4. 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.

5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

6. 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	to
☐ 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:
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:
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers:
4. A layout detail for the embankment protection measures. Sheet Numbers:
5. Location, layout, and size and shape of the levee *embankment features, foundation treatment, floodwall* structure, closure structures, and pump stations. Sheet Numbers:

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

2. Freeboard (continued)

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

(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 landside is:

b. The maximum levee slope floodside is:

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

d. Embankment material is protected by (describe what kind):

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 to								
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

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

4. Embankment Protection (continued)

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):

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:

☐ Overall height: Sta. ; height ft.

☐ Limiting foundation soil strength:

Sta. , depth to

strength ϕ = degrees, c = psf

slope: SS = (h) to (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.):

c. Summary of stability analysis results:

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		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:

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 hours.

Attach engineering analysis to support construction plans.

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one):

☐ UBC (1988) or ☐ 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. 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 ft. to ft.

c. Settlement of the levee crest is determined to be primarily from :

☐ Foundation consolidation
☐ Embankment compression
☐ Other (Describe):

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.

f. 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.

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:

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.

E. LEVEE/FLOODWALL (CONTINUED)

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.

11. Maintenance Plan

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No
If No, please attach supporting documentation.

12. Operations and Maintenance Plan

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

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.

EXPLANATIONS

Statement of Explanations

MT-2 Form 1

C. Clark County Regional Flood Control District will submit fee upon receiving an invoice from FEMA

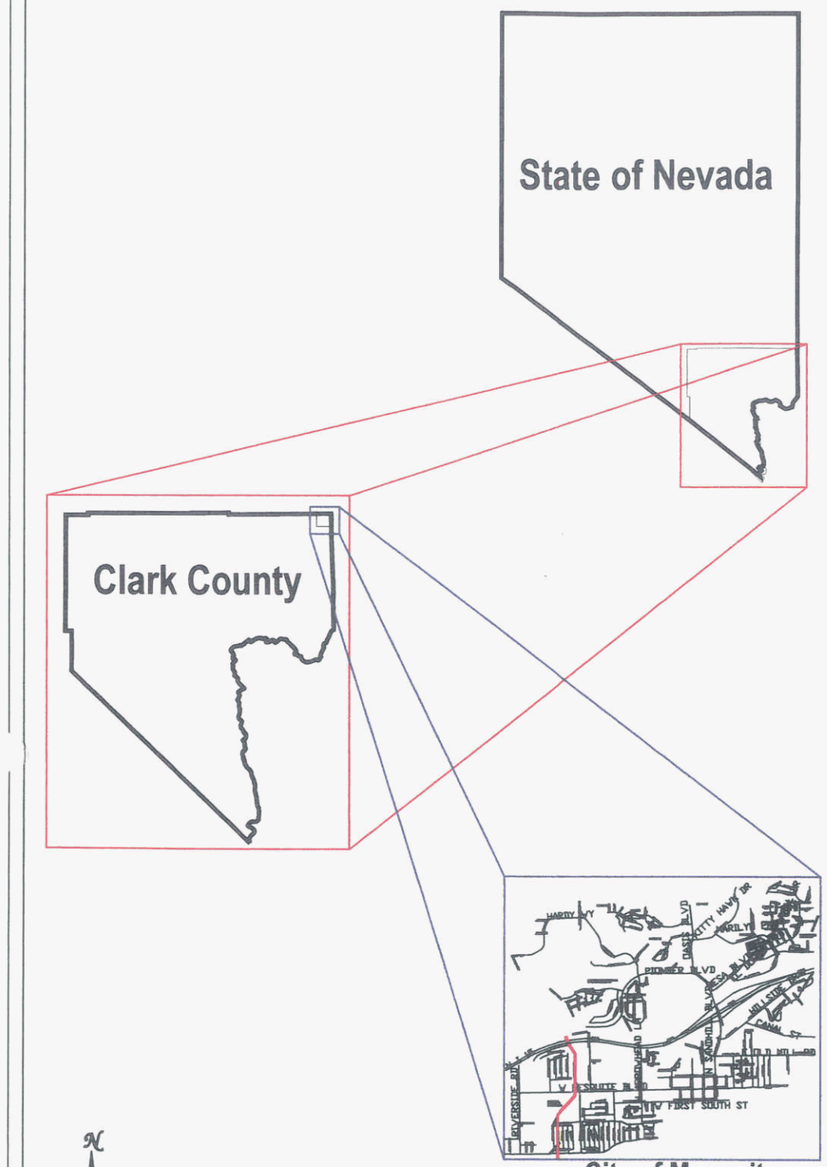
Statement of Explanation for following sections:

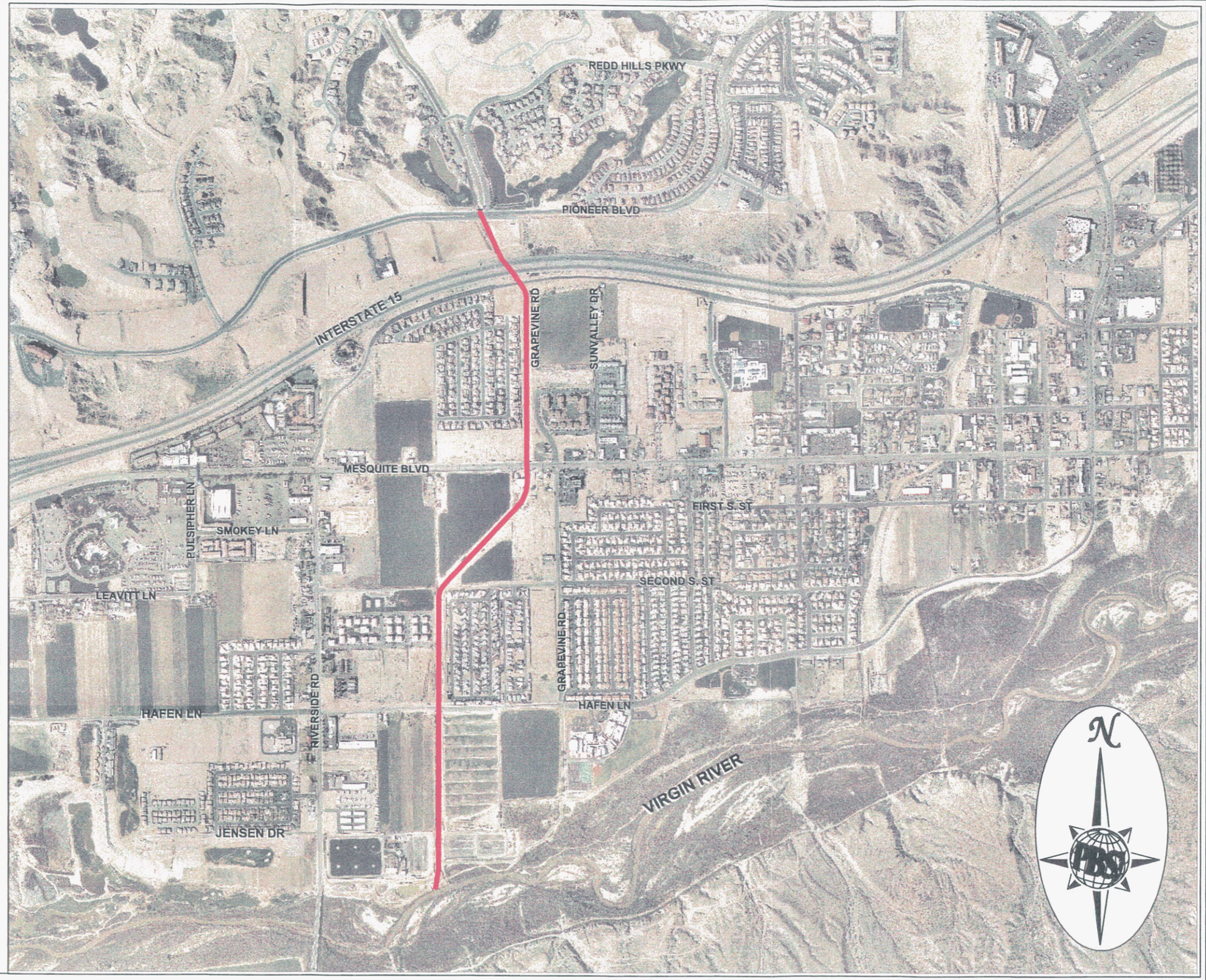
MT-2 Form 3, Section B & C

Explanation: Sediment transport was not considered due to the steepness of Abbott Wash channel and associated high flow velocities. Any sediment entering the system would be transported to the outlet and then into the Virgin River.

APPENDIX B

Figures





GRAPHIC SCALE

1200 0 600 1200 2400 4800

(IN FEET)

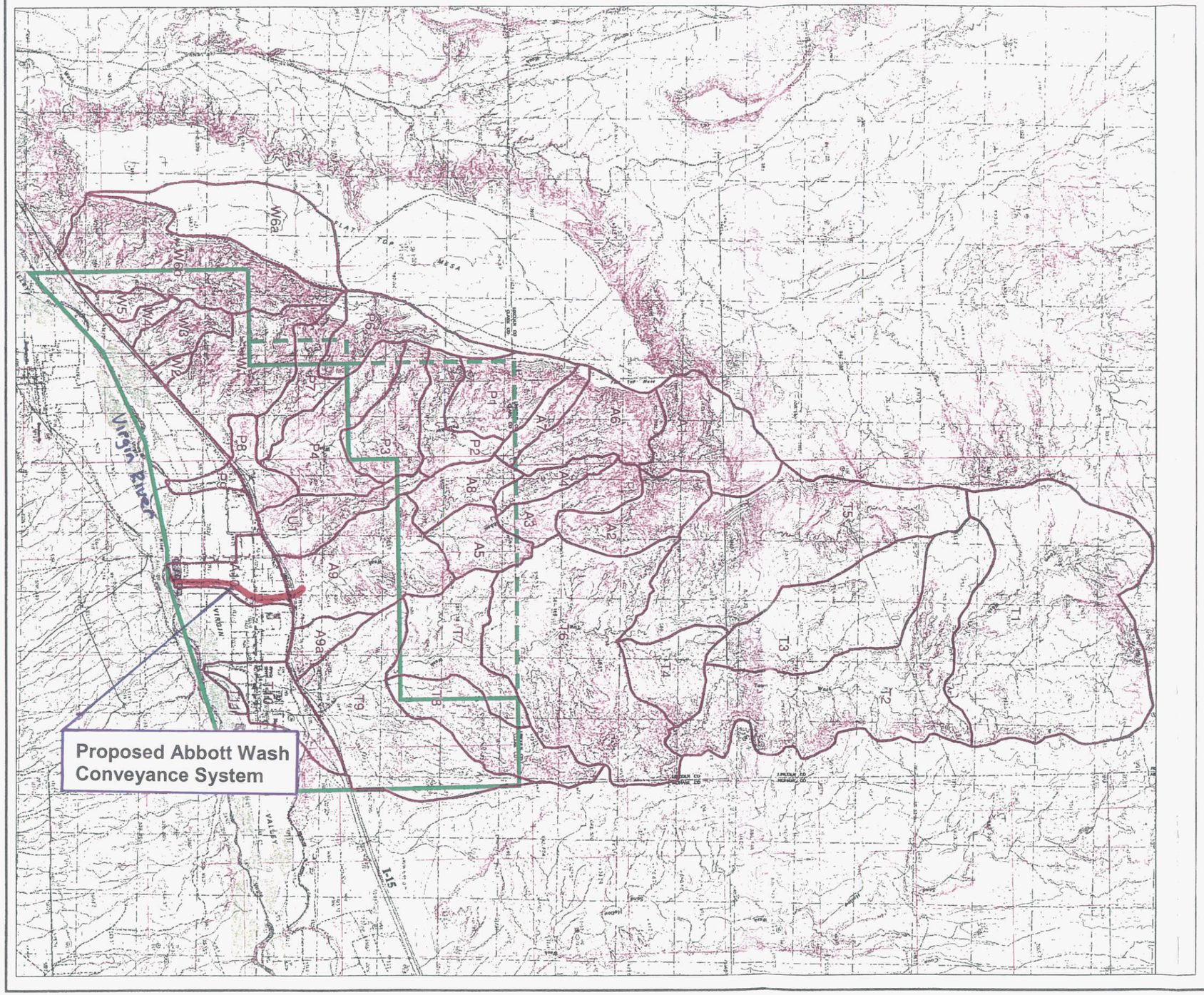
1 inch =1200 ft.

FIGURE 1: AREA - VICINITY MAP

Abbot Wash Conveyance System CLOMR

PBSJ
2270 Corporate Circle
Suite 100
Henderson, Nevada 89074
Tele: 702-263-7275
Fax: 702-263-7200
ENGINEERING · PLANNING · SURVEYING · CONSTRUCTION SERVICES

FIGURE 1



CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

City of Mesquite MPU 2001 Drainage Basins

Watershed Boundaries

Mesquite City Limits

Future Mesquite City Limits

Figure 5

0 — 1/2 Mile — 1 Mile — 2 Miles

N W S E

September 07, 2001

Scale: 1 inch = 1 mile

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Geographic Information Systems
6763 West Charleston Blvd.
Las Vegas, Nevada 89146

For Reference only. Pentacore assumes no liability for the accuracy of the data delineated hereon.

D.N.G.

FIGURE 2

TABLE ES-1
RECOMMENDED FLOOD CONTROL FACILITIES
Town Wash

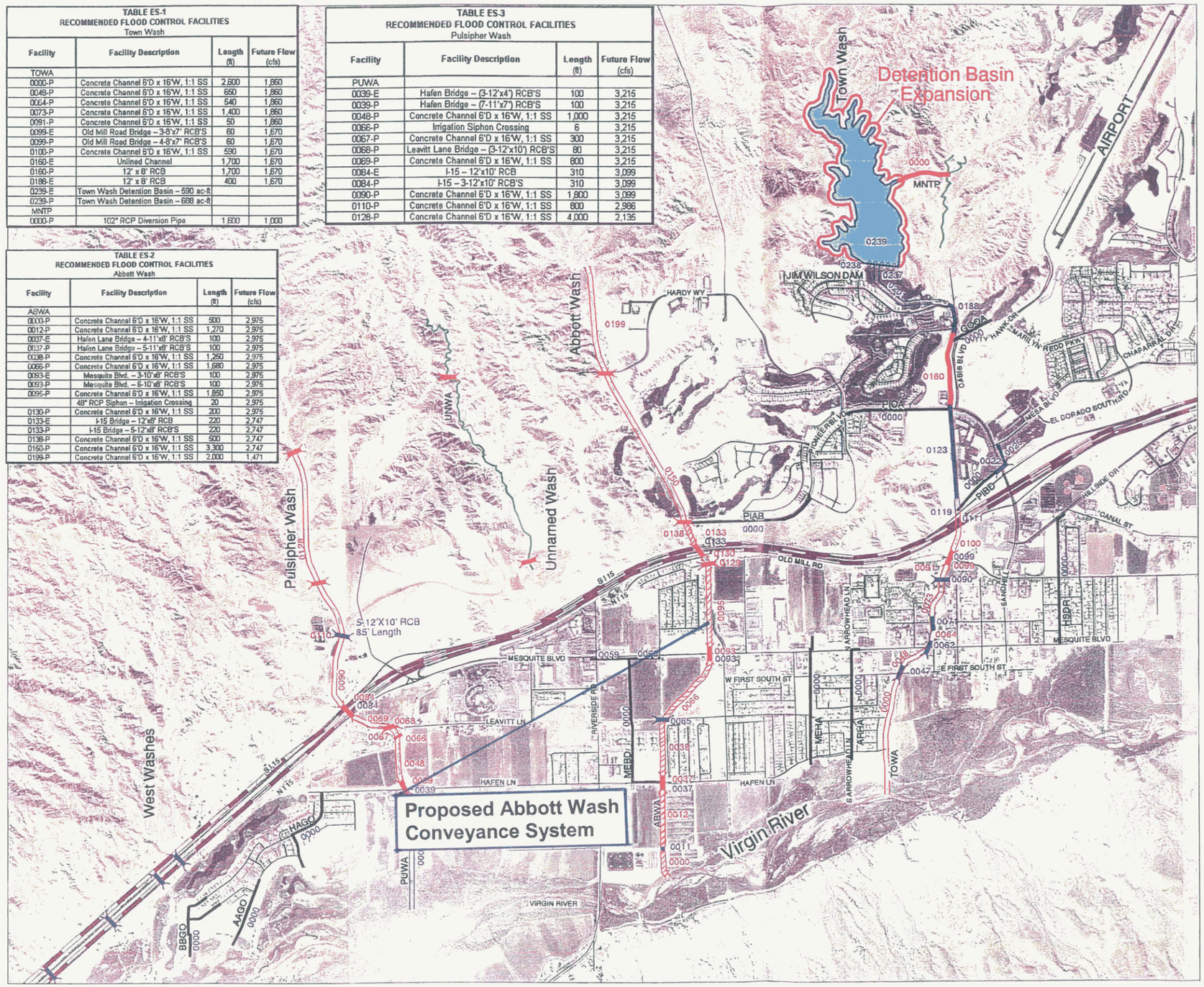
Facility	Facility Description	Length (ft)	Future Flow (cfs)
TOWA			
0000-P	Concrete Channel 6'D x 16'W, 1:1 SS	2,600	1,860
0048-P	Concrete Channel 6'D x 16'W, 1:1 SS	650	1,860
0064-P	Concrete Channel 6'D x 16'W, 1:1 SS	540	1,860
0073-P	Concrete Channel 6'D x 16'W, 1:1 SS	1,400	1,860
0091-P	Concrete Channel 6'D x 16'W, 1:1 SS	50	1,860
0099-E	Old Mill Road Bridge – 3-8'x7' RCB'S	60	1,670
0099-P	Old Mill Road Bridge – 4-8'x7' RCB'S	60	1,670
0100-P	Concrete Channel 6'D x 16'W, 1:1 SS	590	1,670
0160-E	Unlined Channel	1,700	1,670
0160-P	12' x 8' RCB	1,700	1,670
0188-E	12' x 8' RCB	400	1,670
0239-E	Town Wash Detention Basin – 590 ac-ft		
0239-P	Town Wash Detention Basin – 688 ac-ft		
MNTP			
0000-P	102" RCP Diversion Pipe	1,600	1,000

TABLE ES-2
RECOMMENDED FLOOD CONTROL FACILITIES
Abbott Wash

Facility	Facility Description	Length (ft)	Future Flow (cfs)
ABWA			
0000-P	Concrete Channel 6'D x 16'W, 1:1 SS	500	2,975
0012-P	Concrete Channel 6'D x 16'W, 1:1 SS	1,270	2,975
0037-E	Hafen Lane Bridge – 4-11'x8' RCB'S	100	2,975
0037-P	Hafen Lane Bridge – 5-11'x8' RCB'S	100	2,975
0038-P	Concrete Channel 6'D x 16'W, 1:1 SS	1,250	2,975
0066-P	Concrete Channel 6'D x 16'W, 1:1 SS	1,680	2,975
0093-E	Mesquite Blvd. – 3-10'x8' RCB'S	100	2,975
0093-P	Mesquite Blvd. – 6-10'x8' RCB'S	100	2,975
0095-P	Concrete Channel 6'D x 16'W, 1:1 SS	1,850	2,975
	48" RCP Siphon – Irrigation Crossing	20	2,975
0130-P	Concrete Channel 6'D x 16'W, 1:1 SS	200	2,975
0133-E	I-15 Bridge – 12'x8' RCB	220	2,747
0133-P	I-15 Bridge – 5-12'x8' RCB'S	220	2,747
0138-P	Concrete Channel 6'D x 16'W, 1:1 SS	500	2,747
0150-P	Concrete Channel 6'D x 16'W, 1:1 SS	3,300	2,747
0199-P	Concrete Channel 6'D x 16'W, 1:1 SS	2,000	1,471

TABLE ES-3
RECOMMENDED FLOOD CONTROL FACILITIES
Pulsipher Wash

Facility	Facility Description	Length (ft)	Future Flow (cfs)
PUWA			
0039-E	Hafen Bridge – (3-12'x4') RCB'S	100	3,215
0039-P	Hafen Bridge – (7-11'x7') RCB'S	100	3,215
0048-P	Concrete Channel 6'D x 16'W, 1:1 SS	1,000	3,215
0066-P	Irrigation Siphon Crossing	6	3,215
0067-P	Concrete Channel 6'D x 16'W, 1:1 SS	300	3,215
0068-P	Leavitt Lane Bridge – (3-12'x10') RCB'S	80	3,215
0069-P	Concrete Channel 6'D x 16'W, 1:1 SS	800	3,215
0084-E	I-15 – 12'x10' RCB	310	3,099
0084-P	I-15 – 3-12'x10' RCB'S	310	3,099
0090-P	Concrete Channel 6'D x 16'W, 1:1 SS	1,800	3,099
0110-P	Concrete Channel 6'D x 16'W, 1:1 SS	800	2,986
0128-P	Concrete Channel 6'D x 16'W, 1:1 SS	4,000	2,135



CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

City of Mesquite MPU 2001 Recommended Plan

Aerial Photo
Sept. 2000

- Existing Channel
- Proposed Channel & Linear Park
- Natural Wash
- Local Facility
- Existing Culvert
- Proposed Pipe/Box Culvert
- Existing Bridge/Culvert
- Proposed Bridge/Culvert
- Future Bridge/Culvert

Figure ES-1

2000 1000 0 2000
(IN FEET)

N W E S

September 07, 2001

Scale: 1 inch = 2000 feet

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8763 West Charleston Blvd.
Las Vegas, Nevada 89146

For Reference only. Pentacore assumes no liability for the accuracy of the data delineated hereon.

D.N.S.

FIGURE 2A

TABLE 12 Cont.
RECOMMENDED FLOOD CONTROL FACILITIES
Town Wash

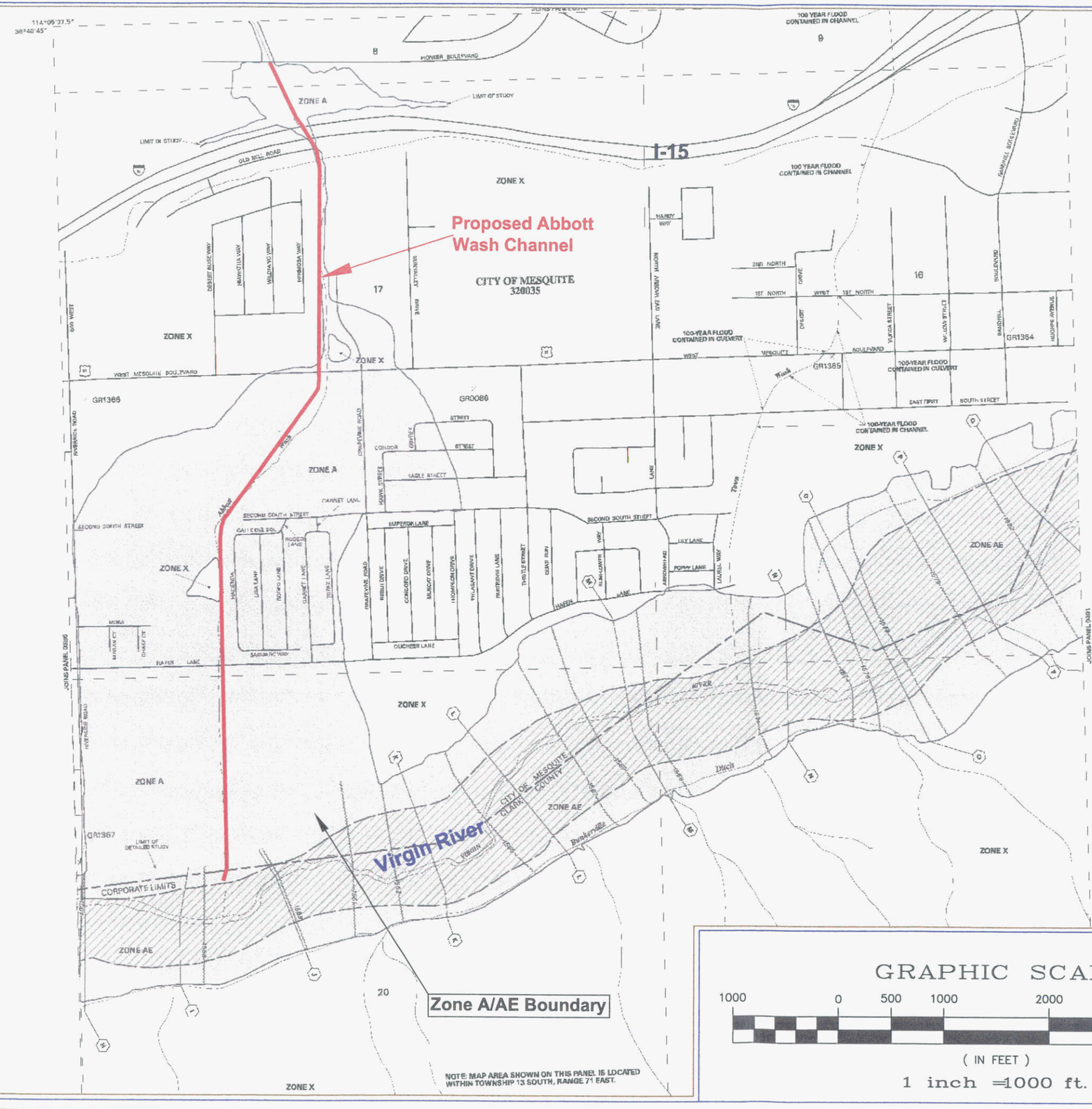
Facility	Facility Description	Length (ft)	Future Flow (cfs)	Phase	Estimated Cost
0160-E	Unlined Channel	1,700	1,670		Existing
0160-P	12' x 8' RCB	1,700	1,670	II	$2,265,000
0188-E	12' x 8' RCB	400	1,670		Existing
0239-E	Town Wash Detention Basin – 590 ac-ft				Existing
0239-P	Town Wash Detention Basin – 688 ac-ft			II	$0
MNTP					
0000-P	102" RCP Diversion Pipe	1,600	1,000	II	$1,658,000
	Phase II Total Cost				**$3,923,000**

TABLE 13
RECOMMENDED FLOOD CONTROL FACILITIES
Abbott Wash

Facility	Facility Description	Length (ft)	Future Flow (cfs)	Phase	Estimated Cost
ABWA					
0000-P	Concrete Channel 6'D x 16'W, 1:1 SS	500	2,975		
0012-P	Concrete Channel 6'D x 16'W, 1:1 SS	1,270	2,975	I	$329,000
0038-P	Concrete Channel 6'D x 16'W, 1:1 SS	1,250	2,975	I	$324,000
0066-P	Concrete Channel 6'D x 16'W, 1:1 SS	1,680	2,975	I	$436,000
0093-E	Mesquite Blvd. – 3-10'x8' RCB'S	100	2,975	I	Existing
0093-P	Mesquite Blvd. – 6-10'x8' RCB'S	100	2,975	I	$239,000
0095-P	Concrete Channel 6'D x 16'W, 1:1 SS	1,850	2,975	I	$480,000

TABLE 13 Cont.
RECOMMENDED FLOOD CONTROL FACILITIES
Abbott Wash

Facility	Facility Description	Length (ft)	Future Flow (cfs)	Phase	Estimated Cost
	48" RCP Siphon – Irrigation Crossing (May Be Required)	20			
0130-P	Concrete Channel 6'D x 16'W, 1:1 SS	200	2,975	I	$51,000
0133-E	I-15 Bridge – 12'x8' RCB	220	2,747	I	Existing
0133-P	I-15 Bridge – 5-12'x8' RCB'S	220	2,747	I	$879,000
0138-P	Concrete Channel 6'D x 16'W, 1:1 SS	500	2,747	I	$129,000
0150-P	Concrete Channel 6'D x 16'W, 1:1 SS	3,300	2,747	I	$856,000
0199-P	Concrete Channel 6'D x 16'W, 1:1 SS	2,000	1,471	I	$519,000
	Phase I Total Cost				**$4,242,000**
0037-E	Hafen Lane Bridge – 4-11'x8' RCB'S	100	2,975	II	Existing
0037-P	Hafen Lane Bridge – 5-11'x8' RCB'S	100	2,975	II	$126,000
	Phase II Total Cost				**$126,000**



PANEL 0387 E

FIRM

FLOOD INSURANCE RATE MAP

CLARK COUNTY, NEVADA AND INCORPORATED AREAS

PANEL 387 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MESQUITE, CITY OF	320035	0387	E
CLARK COUNTY, UNINCORPORATED AREAS	320028	0387	E

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
32003C0387 E

MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency

N

GRAPHIC SCALE

1000 0 500 1000 2000 4000

(IN FEET)

1 inch =1000 ft.

FIGURE 3
FEMA MAP

PBSJ
2270 Corporate Circle
Suite 100
Henderson, Nevada 89074
Telephone: 702/263-7275
Fax: 702/263-7200
ENGINEERING · PLANNING · SURVEYING · CONSTRUCTION SERVICES

LEGEND

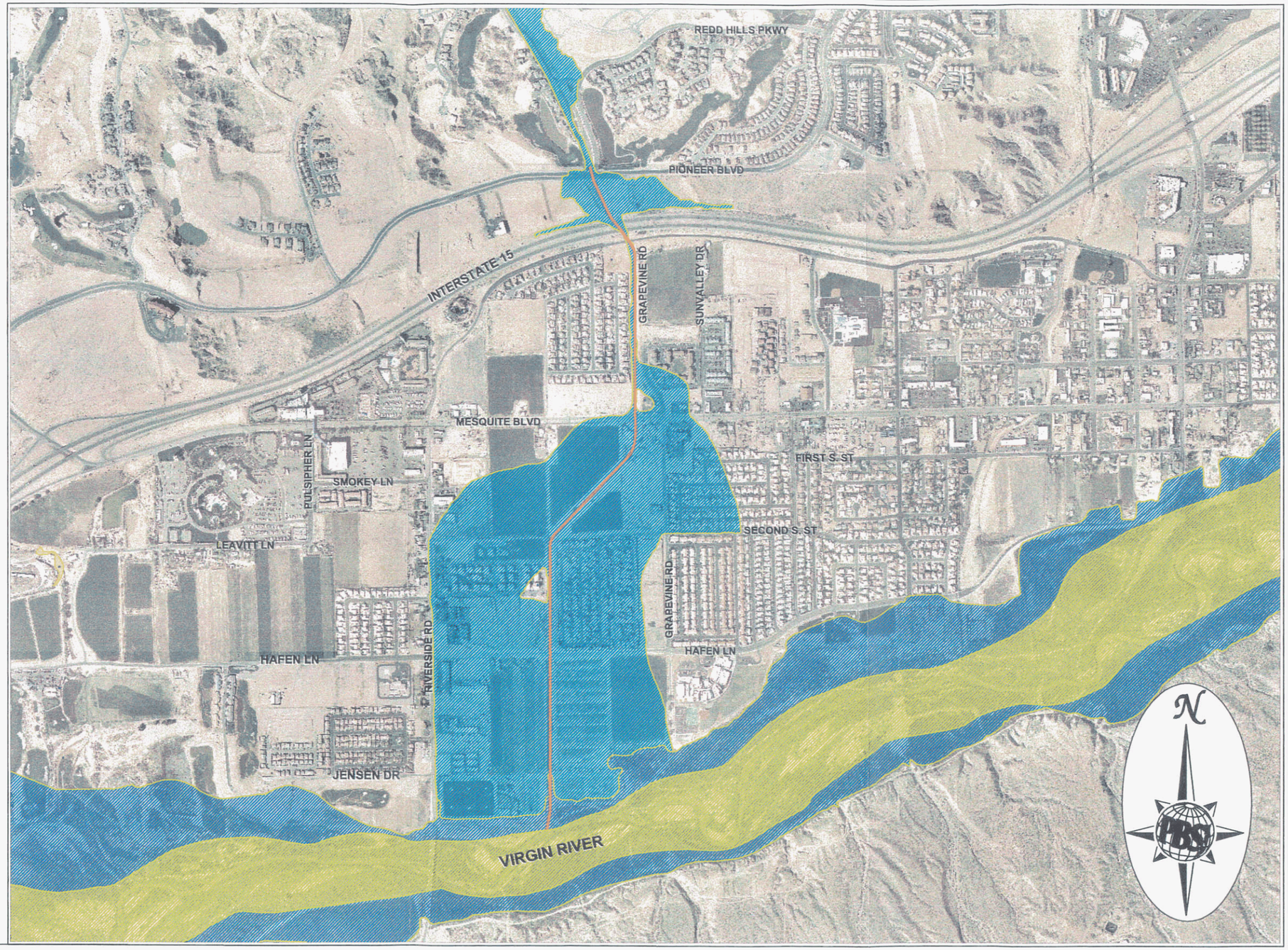
Zone A Floodzone

Zone AE Floodway

Zone AE Floodzone

Proposed Abbott Wash Facility Alignment

Note: Aerial Photo as of April 2004



GRAPHIC SCALE

1200 0 600 1200 2400 4800

(IN FEET)

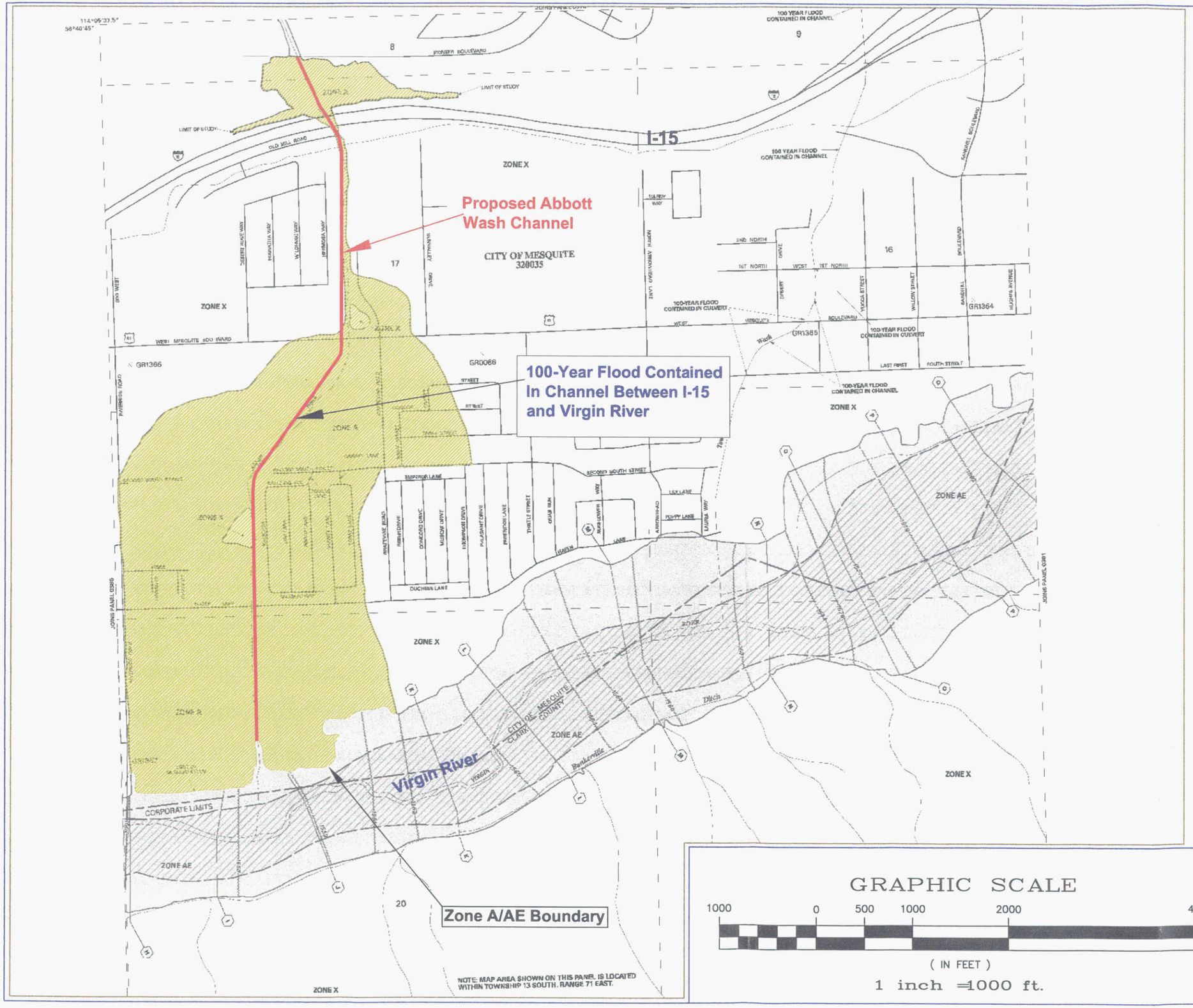
1 inch =1200 ft.

FIGURE 3A: DFIRM FLOODZONE MAP

Abbot Wash Conveyance System CLOMR

PBSJ
2270 Corporate Circle
Suite 100
Henderson, Nevada 89074
Tele: 702-263-7275
Fax: 702-263-7200
ENGINEERING · PLANNING · SURVEYING · CONSTRUCTION SERVICES

FIGURE 3A



PANEL 0387 E

FIRM

FLOOD INSURANCE RATE MAP

CLARK COUNTY, NEVADA AND INCORPORATED AREAS

PANEL 387 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MESQUITE, CITY OF	320035	0387	E
CLARK COUNTY, UNINCORPORATED AREAS	320003	0387	E

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 32003C0387 E

MAP REVISED: SEPTEMBER 27, 2002

Federal Emergency Management Agency

Zone A area to be removed

N

GRAPHIC SCALE

1000 0 500 1000 2000 4000

(IN FEET)

1 inch = 1000 ft.

FIGURE 4
ANNOTATED FEMA MAP

PBSJ
2270 Corporate Circle
Suite 100
Henderson, Nevada 89074
Telephone: 702/263-7275
Fax: 702/263-7200
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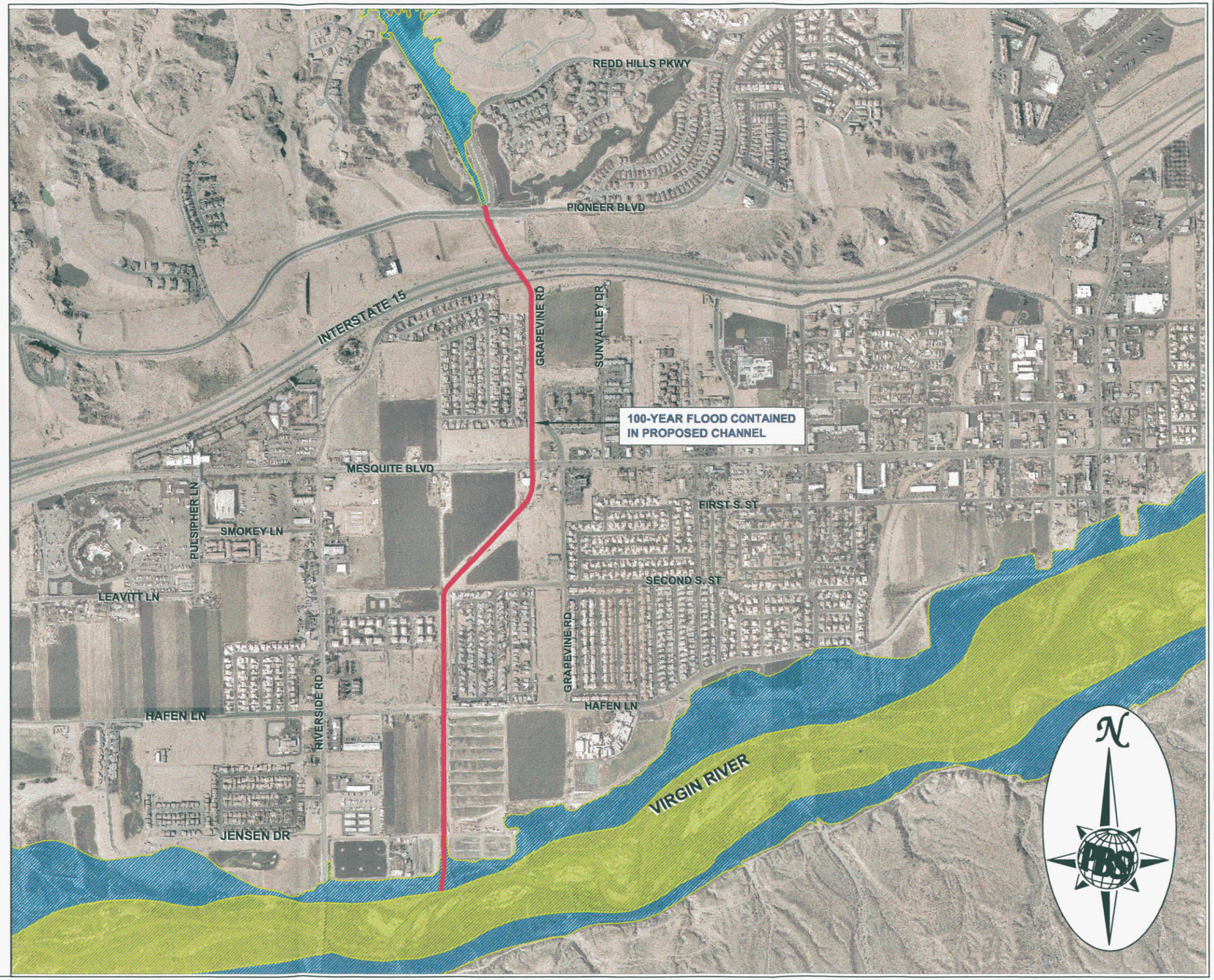
LEGEND

- Zone A Floodzone
- Zone AE Floodzone
- Zone AE Floodway
- Proposed Abbott Wash Facility Alignment



RFCD
2004 DEC 30 AM 9:26

Note: Aerial Photo as of April 2004

GRAPHIC SCALE

1200 0 600 1200 2400 4800

(IN FEET)

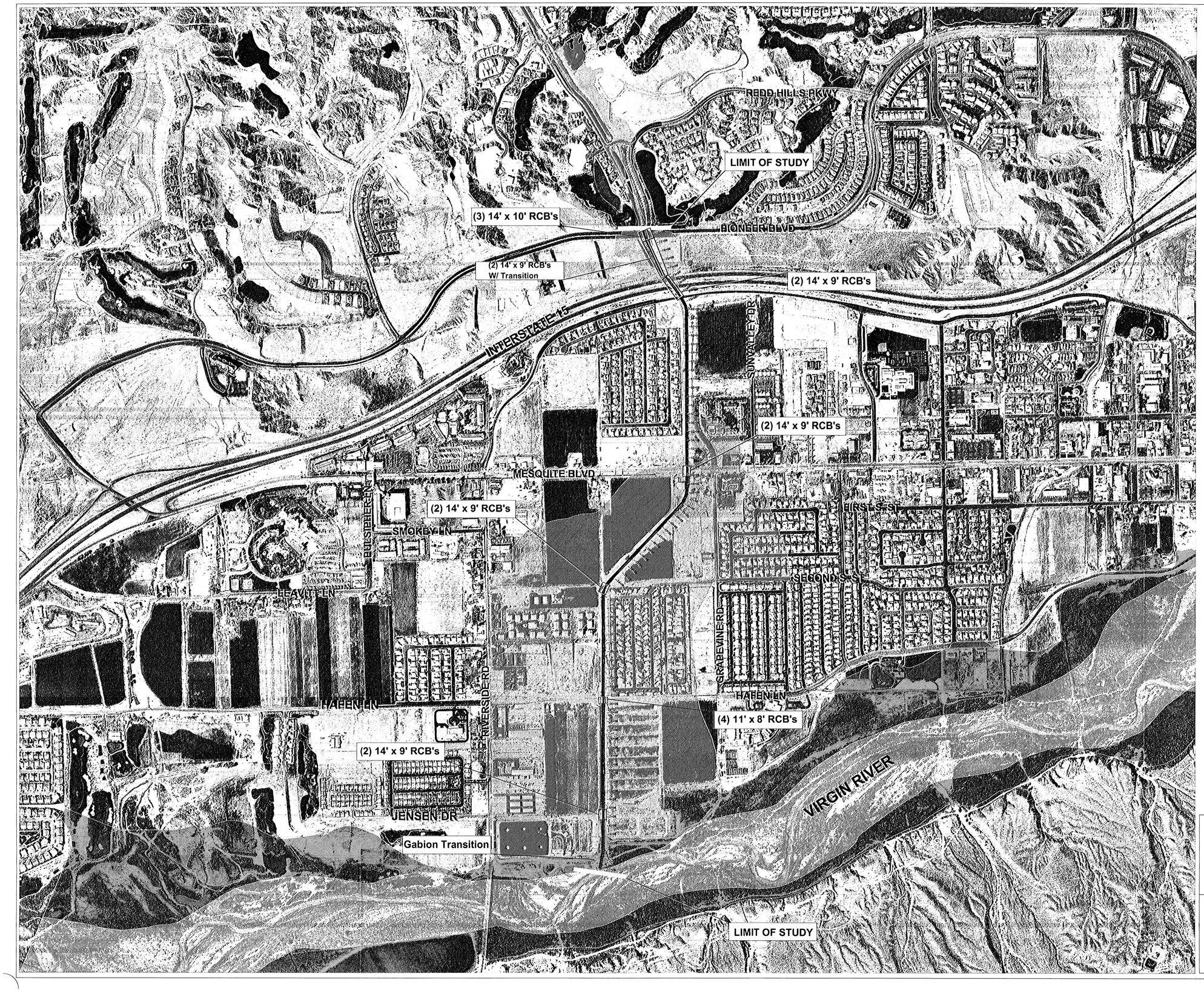
1 inch = 1200 ft.

FIGURE 4A: PROPOSED FLOODZONE MAP

Abbot Wash Conveyance System CLOMR

PBSJ
2270 Corporate Circle
Suite 100
Henderson, Nevada 89074
Tele: 702-263-7275
Fax: 702-263-7200
ENGINEERING · PLANNING · SURVEYING · CONSTRUCTION SERVICES

FIGURE 4A



Legend

- Proposed Concrete Rectangular Channel 28.5' Bottom Width & 8.5' High
- Zone A
- Zone AE
- Zone AE Floodway
- 22+00 — Channel Station

Note

Aerial photo as of April 2004.

I hereby certify that the information used to prepare this CLOMR is in substantial conformance with the proposed channel improvement plans located in Appendix E.

Matthew S. Baird, NV 13684 Date

N

GRAPHIC SCALE

500 0 250 500 1000 2000

(IN FEET)
1 inch = 500ft.

FIGURE 5

ABBOTT WASH CONVEYANCE SYSTEM CLOMR

WORKMAP

PBS&J
2270 Corporate Circle
Suite 100 Henderson,
Nevada 89014
Telephone: 702/263-7275
Fax: 702/263-7200

ENGINEERING • PLANNING • SURVEYING • CONSTRUCTION SERVICES

FIGURE 5

APPENDIX C

Reference Hydrology

1998 ABBOTT & PULSIPHER WASHES FIS RESTUDY

G.C Wallace Inc.

CC 29.1

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT



DRAFT
ABBOTT AND PULSIPHER WASHES FIS RESTUDY

TECHNICAL SUPPORT DATA NOTEBOOK
Volume II of II

Mesquite, Clark County, Nevada

Submitted by: Clark County Regional Flood Control District

Study Contractor: G. C. Wallace, Inc.

Date Submitted: October 1998



G. C. WALLACE
Engineering/Arch

Federal Emergency Management Agency

Washington, D.C. 20472

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 99-09-457P

The Honorable Charles Horne
Mayor, City of Mesquite
10 East Mesquite Boulevard
Mesquite, NV 89027

Community: City of Mesquite, NV
Community No.: 320035
Panels Affected: 32003C0379 D and 0387 D
Effective Date of This Revision: MAY 15 2000

102-I-C

Dear Mayor Horne:

This responds to a request that the Federal Emergency Management Agency (FEMA) revise the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Clark County, Nevada and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated February 4, 1999, Mr. Kevin L. Eubanks, P.E., Assistant General Manager, Clark County Regional Flood Control District, requested that FEMA revise the FIRM and FIS report to show the effects of more detailed hydrologic and hydraulic analyses along Abbott Wash from approximately 6,750 feet upstream to just downstream of Interstate Highway 15 (I-15) and along Pulsipher Wash from approximately 10,750 feet upstream to approximately 3,100 feet downstream of I-15.

All data required to complete our review of this request were submitted with letters from Mr. Eubanks and Mr. Michael J. Ludwig, G. C. Wallace, Inc.

We have completed our review of the submitted data and the flood data shown on the effective FIRM and in the effective FIS report and have determined that we have sufficient information to revise the flood data shown on the effective FIRM along Abbott Wash, but cannot revise the flood data shown on the effective FIRM along Pulsipher Wash as requested until additional concerns regarding the submitted hydraulic analyses for that wash have been resolved. These concerns will be summarized in a separate letter to Mr. Eubanks. Based on our review of the submitted data, we have revised the FIRM and FIS report to modify the floodplain boundary delineations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) along Abbott Wash from approximately 1,600 feet upstream to just downstream of I-15. As a result of the modifications, the width of the Special Flood Hazard Area (SFHA), the area that would be inundated by the base flood, for Abbott Wash increased in some areas and decreased in other areas. In addition, an SFHA designated Zone A, with no base flood elevations determined, was added along Abbott Wash from approximately 6,450 feet upstream to approximately 1,600 feet upstream of I-15. The modifications are shown on the enclosed annotated copies of FIRM Panel(s) 32003C0379 D and 32003C0387 D and affected portions of the Summary of Discharges Table. This Letter of Map Revision (LOMR) hereby revises the above-referenced panel(s) of the effective FIRM and the affected portions of the FIS report, both dated August 16, 1995.

Because this revision request also affects the unincorporated areas of Clark County, a separate LOMR for that community was issued on the same date as this LOMR.

The modifications are effective as of the date shown above. The map panel(s) as listed above and as modified by this letter will be used for all flood insurance policies and renewals issued for your community.

A review of the determination made by this LOMR and any requests to alter this determination should be made within 30 days. Any request to alter the determination must be based on scientific or technical data.

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This LOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for these new data. We encourage you to disseminate the information reflected by this LOMR throughout the community, so that interested persons, such as property owners, local insurance agents, and mortgage lenders, may benefit from the information. We also encourage you to prepare a related article for publication in your community's local newspaper. This article should describe the changes that have been made and the assistance that officials of your community will give to interested persons by providing these data and interpreting the NFIP maps.

This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and is in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed minimum NFIP criteria. These criteria are the minimum and do not supersede any State or local requirements of a more stringent nature. This includes adoption of the effective FIRM to which the regulations apply and the modifications described in this LOMR. Our records show that your community has met this requirement.

A Consultation Coordination Officer (CCO) has been designated to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally Ziolkowski
Director, Mitigation Division
Federal Emergency Management Agency, Region IX
The Presidio of San Francisco, Building 105
San Francisco, California 94129-1250
(415) 923-7177

FEMA makes flood insurance available in participating communities; in addition, we encourage communities to develop their own loss reduction and prevention programs. Through the *Project Impact: Building Disaster Resistant Communities* initiative, launched by FEMA Director James Lee Witt in 1997, we seek to focus the energy of businesses, citizens, and communities in the United States on the importance of reducing their susceptibility to the impact of all natural disasters, including floods, hurricanes, severe storms, earthquakes, and wildfires. Natural hazard mitigation is most effective when it is planned for and implemented at the local level, by the entities who are most knowledgeable of local conditions and whose economic stability and safety are at stake. For your information, we are enclosing a copy of a pamphlet describing this nationwide initiative. For additional information on *Project Impact*, please visit our Web site at **www.fema.gov/impact**.

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the CCO for your community at the telephone number cited above. If you have any questions regarding this LOMR, please contact the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Max H. Yuan, P.E., Project Engineer
Mitigation Directorate
Hazards Study Branch

For: Matthew B. Miller, P.E., Chief
Hazards Study Branch
Mitigation Directorate

Enclosures

cc: The Honorable Bruce Woodbury
Chairman, Clark County
Board of Commissioners

Mr. Allen Bell, P.E.
Director of Public Works
City of Mesquite

Mr. Kevin L. Eubanks, P.E.
Assistant General Manager
Clark County Regional Flood Control District

Mr. Michael J. Ludwig
G. C. Wallace, Inc.

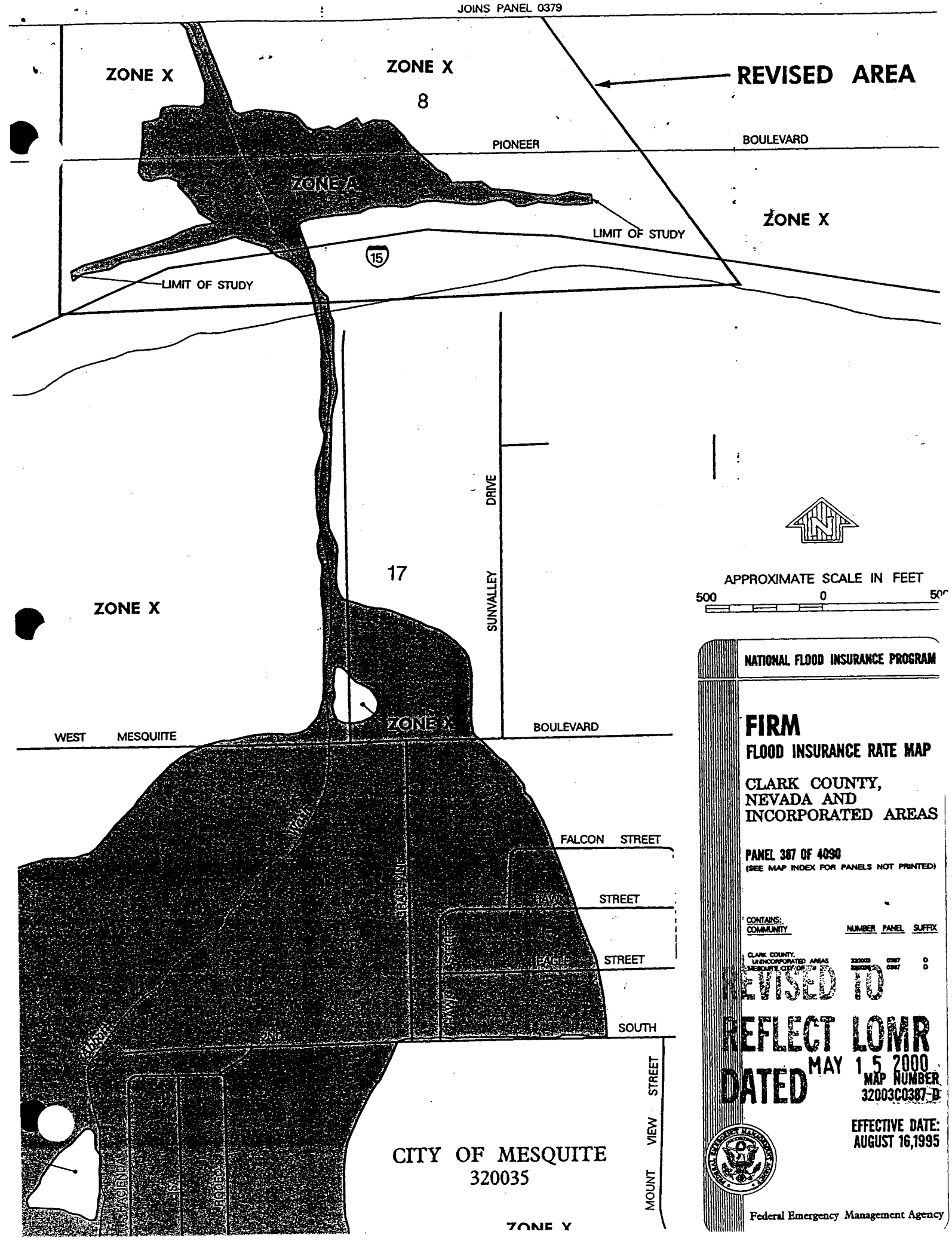

JOINS PANEL 0379
ZONE X
ZONE X
8
REVISED AREA
PIONEER
BOULEVARD
ZONE A
ZONE X
LIMIT OF STUDY
15
LIMIT OF STUDY
17
DRIVE
SUNVALLEY
ZONE X
APPROXIMATE SCALE IN FEET
500
0
ZONE X
WEST
MESQUITE
BOULEVARD
FALCON
STREET
STREET
STREET
SOUTH
STREET
VIEW
MOUNT
CITY OF MESQUITE
320035
ZONE X
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY,
NEVADA AND
INCORPORATED AREAS
PANEL 387 OF 4090
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY
NUMBER
PANEL
SUFFIX
CLARK COUNTY,
UNINCORPORATED AREAS
320003
0387
D
MESQUITE, CITY OF
320035
0387
D
REVISED TO
REFLECT LOMR
DATED MAY 15 2000
MAP NUMBER
32003C0387 D
EFFECTIVE DATE:
AUGUST 16,1995
Federal Emergency Management Agency

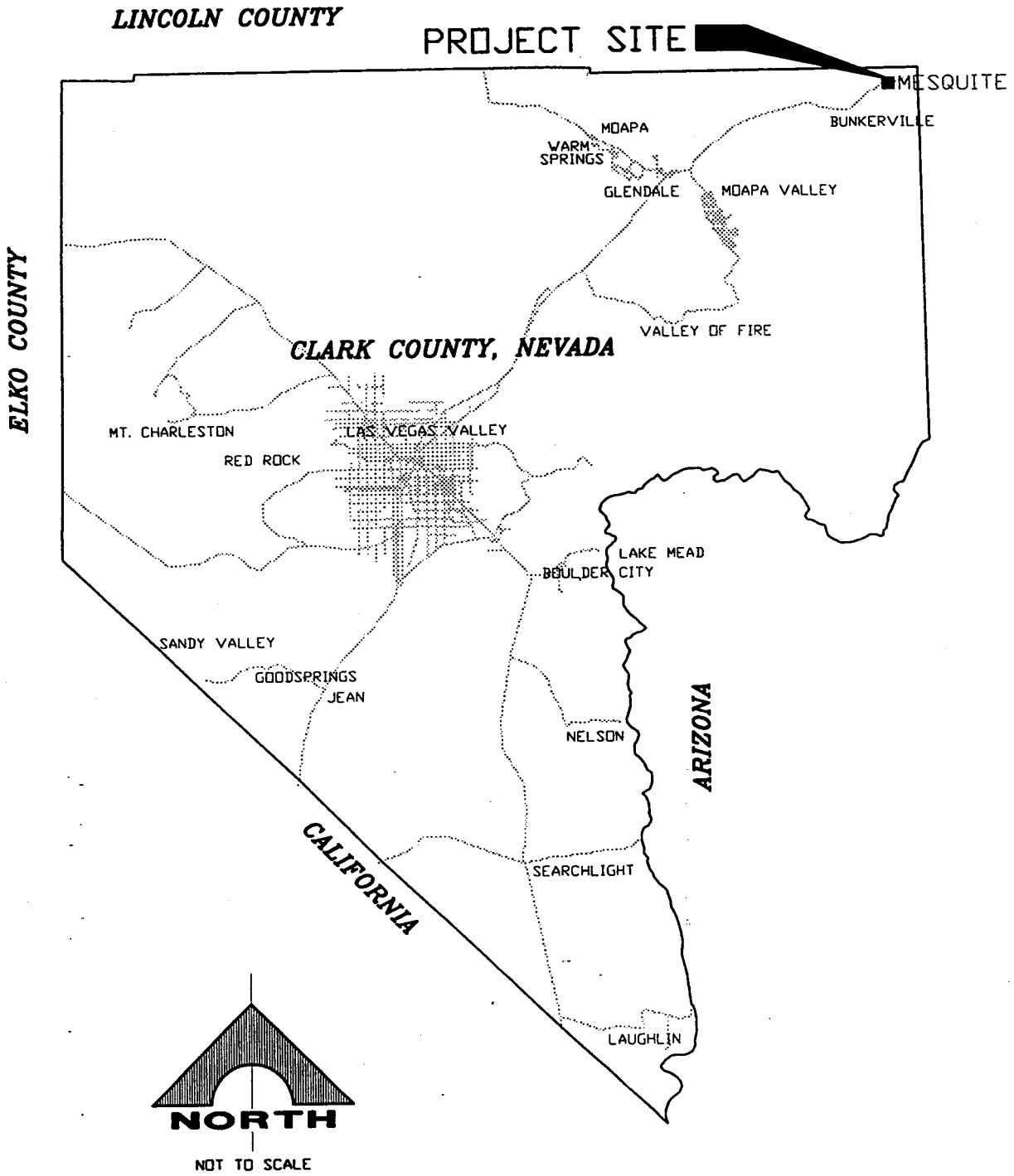
Table 3. Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
Alluvial Fan In Eastern Henderson	5.54	370	2,200	3,600	--[1]
Alluvial Fan In Western Henderson	76	1,490	13,300	23,370	--[1]
Abbott Wash Above Interstate 15	6.4	--[1]	--[1]	3,020	--[1]
Blue Diamond Fan At Apex	69.5	2,010	8,800	14,820	42,550
Bridge Canyon Wash At Apex	7.3	650	2,680	4,430	12,240
Colorado River At Laughlin	169,300	--[1]	--[1]	40,000[2]	--[1]
Dripping Springs Wash At Apex	4.5	460	1,910	3,150	8,710
Duck Creek At Robindale Road	136.5	--[1]	--[1]	11,500	--[1]
Duck Creek At Confluence with Duck Creek Tributary	119.5	--[1]	--[1]	11,000	--[1]
Duck Creek Above Interstate 15	71.5	--[1]	--[1]	9,700	--[1]
Duck Creek Tributary At Confluence with Duck Creek	46.2	--[1]	--[1]	6,300	--[1]
Duck Creek Tributary Above Interstate 15	44.2	--[1]	--[1]	5,700	--[1]

REVISED DATA

[1]Discharge not available
[2]Established by the Colorado River Floodway Protection Act, Public Law 99-450

REVISED TO REFLECT LOMR DATED MAY 15 2000



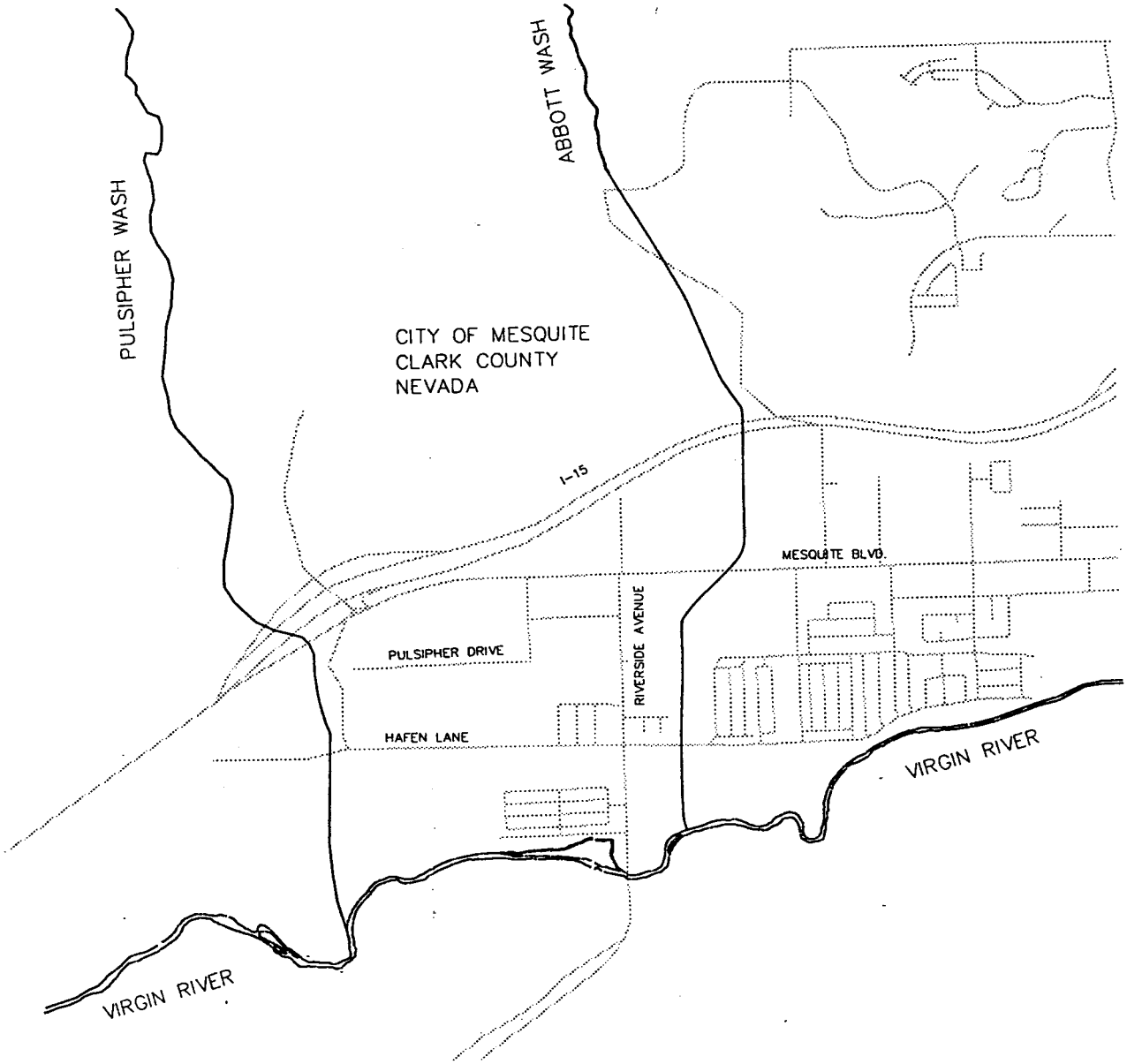
ABBOTT AND PULSIPHER WASHES

FIS RESTUDY

FIGURE 1
VICINITY MAP

G.C. WALLACE, INC.
Engineering/Architecture 1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

JOB NO. 30.035 PLOTTED: 5/21/98



NORTH

NOT TO SCALE

ABBOTT AND PULSIPHER WASHES
FIS RESTUDY

FIGURE 2
LOCATION MAP

G.C. WALLACE, INC.
Engineering/Architecture 1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

JOB NO. 0.035 PLOTTED: 7/28/98

2.3 Principal Flood Problems

2.3.1 Abbott Wash

The Abbott Wash does not have significant flood problems north of the I-15 culvert. However, the I-15 culvert (12-foot wide by 8-foot high reinforced concrete box) does not have the capacity to pass the total flow in the Abbott Wash of 3,156 cfs during the 100-year storm event. This will result in a backwater affect several hundred feet upstream of the culvert and overtopping of I-15. The Abbott Wash south of I-15 is considered outside the limit of study. The flooding problems are discussed in greater detail in Section 3.3.1, Modeling Results.

2.3.2 Pulsipher Wash

The Pulsipher Wash does not have significant flood problems north of the I-15 culvert. However, the I-15 culvert (12-foot wide by 10-foot high reinforced concrete box) does not have the capacity to pass the total flow in the Pulsipher Wash of 3,478 cfs during the 100-year storm event at this location. This will result in a backwater affect several hundred feet upstream of the culvert. A breakout of 1,239 cfs during the 100-year storm event will occur at the left bank of the I-15 culvert. The Pulsipher Wash is also perched south of I-15, without the capacity to convey the 100-year event which will result in breakouts at several locations along this reach. Additionally, the culvert at Hafen Lane (3 - 12.1-foot wide by 4.1-foot high reinforced concrete boxes) also does not have the capacity to pass the flow in the Pulsipher Wash, which will result in overtopping of Hafen Lane. The flooding problems are discussed in greater detail in Section 3.3.2, Modeling Results.

2.4 Flood Protection Measures

No new construction is associated with this project. Maintenance of the existing facilities is provided by COM and funded by the CCRFCD.

2.4.1 Abbott Wash

No significant flood control facilities such as levees, dams, or detention basins have been constructed within this reach.

2.4.2 Pulsipher Wash

No significant flood control facilities such as levees, dams, or detention basins have been constructed within this reach.

3.0 ENGINEERING METHODS

3.1 Hydrologic Analysis

3.1.1 Introduction

Rainfall patterns in the study area are generally the result of two distinctly different meteorological events. High intensity, short-duration thunderstorms typically occurring in the late summer months of July, August, and September. These late summer storms can produce high runoff rates over small geographical areas. During the winter months, precipitation generally results from frontal and pacific storm movements with longer durations, lower intensities, and larger aerial coverages.

This section summarizes the existing conditions of the Abbott and Pulsipher Washes drainage basins presented in the City of Mesquite Flood Control Master Plan Update (MPU). The study area covered by the MPU analysis included the Abbott Wash, Pulsipher Wash, Town Wash, and the Virgin River drainage areas. The purpose of this analysis is to develop acceptable discharges for use in the Abbott and Pulsipher Washes FIS Restudy.

The HEC-1 models constructed for the Effective Flood Insurance Study were not available. However, the report portion of the Flood Insurance Study for the City of Mesquite, Nevada, Clark County, dated September 1990 (Reference 5) was available and indicates that the Effective FIS used a 3-hour storm duration

in its hydrologic analyses. The CCRFCD Manual has adopted a 6-hour storm duration. Therefore, the basis of the hydrologic analyses for this FIS Restudy are the HEC-1 models developed by CH2M Hill for the MPU, dated September 1995 (Reference 4) which utilize a 6-hour storm duration. Peak discharges have been computed for proposed FIS concentration points during the 100-year storm event using the May 1991 Version 4.6.2 of the HEC-1 Flood Hydrograph Package. Subbasins are shown on Figure D-2 of the MPU, dated September 1995, included here as Figure 3.

3.1.2 Modifications to the Hydrologic Model from the 1995 MPU

The HEC-1 models from the MPU for the Abbott and Pulsipher Washes have been revised for use in this FIS Restudy.

The MPU HEC-1 analyses accounted for detention at the I-15 culverts. The HEC-1 analyses prepared for the FIS Restudy do not take credit for any detention at the I-15 culverts. Also, GCW determined that the depth-area-reduction factors used in the MPU HEC-1 analyses are for the entire watershed which does not yield the proper discharges at upstream concentration points. Therefore, additional precipitation values were entered in the HEC-1 models, increasing the runoff at all concentration points.

3.1.3 Summary of Results

The existing conditions HEC-1 model was executed for the Abbott Wash. The Abbott Wash has a peak discharge during a100-year storm event of 3,156 cfs at Concentration Point 40. As shown in Table 1, flow rates decrease downstream of Concentration Point 40 at Concentration Point 50 (3,023 cfs) and Concentration Point 60 (3,044 cfs) due to routing in the HEC-1 model. The greatest flow rate (3,156 cfs) located at Concentration Point 40 was selected. These quantities are referenced from the modified HEC-1 model of the MPU. See Figure 3 for concentration point locations. Results are shown in Table 1. This table lists the descriptions, tributary areas, appropriate DARF, peak discharges, and proposed adopted peak discharges for each appropriate concentration point.

TABLE 1
SUMMARY OF RESULTS FOR THE ABBOTT WASH WATERSHED DURING THE 100-YEAR STORM EVENT
ABBOTT AND PULSIPHER WASHES FIS RESTUDY
MESQUITE, CLARK COUNTY, NEVADA

Concentration Point *	Description	Overall Storm			Adopted Discharge (cfs)
		Area (sq mi)	DARF	Peak Q (cfs)	
40	Abbott Wash 7,800 feet north of I-15	4.73	0.91	3,156	3,156
50	Abbott Wash at I-15	6.39	0.90	3,023	3,156
60	Abbott Wash at Virgin River	6.90	0.89	3,044	3,156

*See Figure 3

The existing conditions HEC-1 model was executed for the Pulsipher Wash. The Pulsipher Wash has peak discharges during a 100-year storm event of 2,078 cfs at Concentration Point 10, 2,318 cfs at Concentration Point 20, 3,474 cfs at Concentration Point 30, 3,478 cfs at Concentration Point 50, and 3,549 cfs at Concentration Point 60. These quantities are referenced from the modified HEC-1 model of the MPU. See Figure 3 for concentration point locations. Results are shown in Table 2. This table lists the descriptions, tributary areas, appropriate DARF, peak discharges, and proposed adopted peak discharges for each appropriate concentration point.

ABBOTT WASH DESIGN FLOW HYDROLOGY

Bulloch Brothers Engineering, Inc.

TECHNICAL DRAINAGE STUDY

Completed For

The Abbott Wash Conveyance Project

A Regional Flood Control Facility
From North of I-15 To The Virgin River
Located in Mesquite, Nevada

Submitted for Design Flow Hydrology And Hydraulics of Channel Alignment & Geometry

rcvd 8.16.02

Prepared For:
The City of Mesquite / 10 East Mesquite Boulevard
Mesquite, Nevada 89027 / Phone: (702) 346-5295

In Conjunction with:
Clark County Regional Flood Control District
600 South Grand Central Parkway Ste 300
Las Vegas, Nevada 89106-4511 / Phone: (702) 455-3139

Prepared by:
Bulloch Brothers Engineering, Inc. / 561 West Mesquite Boulevard, Suite 4
Mesquite, Nevada 89027 / Phone: (702) 346-5101

JUNE 2002

TABLE OF CONTENTS

Description		Page
I	**Title Page**	
	Standard Form 1	i
	Standard Form 2	ii
	Table of Contents	vii
II	**Introduction, General Location and Development Description**	1
	A. Location of Property	1
	Fig. 1 Location Map	2
	Fig. 2 Regional Flood Control Facilities	3
	B. Description of Property	1
	Intent of Review	4
III.	**Drainage Basin Description, Design Flow for Channel Improvements**	4
	Basin Description / Master Planning Information / Floodplain Information	4
	Base Hec-1 Model / Previous Drainage Reports	5
	Revisions to Base Hec-1 Model	5
	Increase Overall Watershed Size, Justify Utilizing SDN3 Storm Distribution	5
	Verify Rainfall	6
	Green-Ampt Parameters for Sub-basin A10	7
	Lag Time	7
	Routing Modifications	7
	Combination Point Modifications	8
	Summary of Revised Hec-1 Results	8

(Table of Contents Cont.)

Description ..... Page

IV. **Discussion of Hydraulic Analysis for Channel Improvements** 8

Existing Condition 8

Developed Condition 9

Proposed Channel Alignment & Geometry 9

HEC-RAS Analysis Discussion 10

Steady Flow Parameters 10

HEC-RAS Results 11

Proposed use of Existing Culverts under I-15 & Mesq. Blvd. for pedestrian access 11

Maintenance Access Road & Vehicular Access at Bottom of Channel 11

Safety Requirements & Micellaneous 12

V. **Conclusions** 12

VI. **References** 13

VII. **Appendices** 15

Note: Overall Plan and Profile for Proposed Channel / Drainage Plan Included with submittal

A Report of Hydrologic and Hydraulic Calculations for the The Abbott Wash Conveyance Project

Introduction, General Location And Development Description:

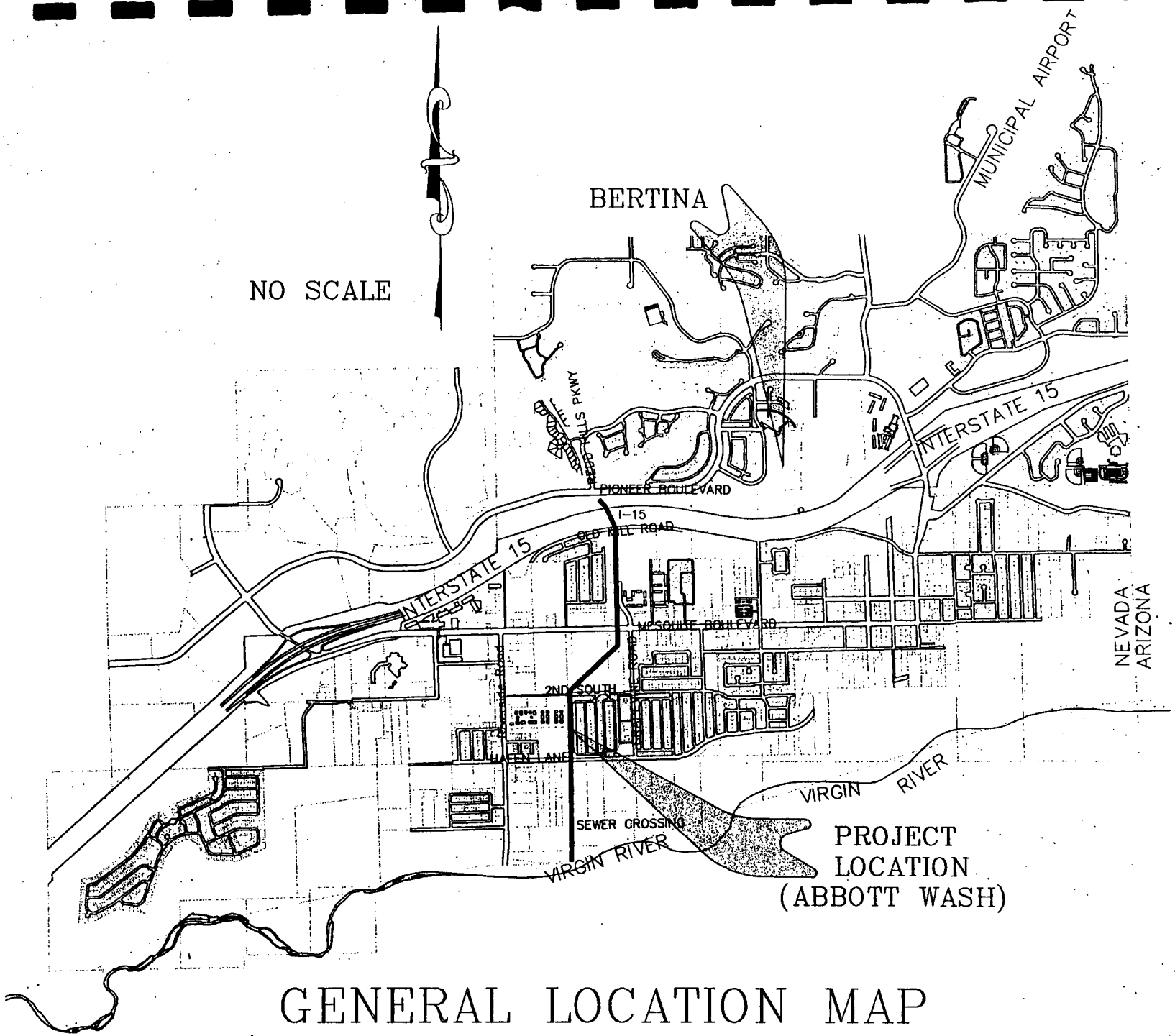
Abbott Wash is a regional flood control facility. The lower portion of this wash is located within the City of Mesquite, Clark County, Nevada. This channel passes under I-15, Old Mill Road, Mesquite Blvd. (U.S. 91), future 2nd South Road, and Hafen Lane. The proposed channel improvement for this project are located within Section 17, Township 13 South, Range 71 East. The Plan & Profile sheets identify the Tracts through which the proposed channel runs. The channel passes through Tracts 41, 42, 39, and 49 which are all located south of I-15. The existing channel runs mostly north south. Abbott Wash is the Regional Flood Control facility for the Abbott Wash Watershed which extends north of Mesquite into Lincoln County. This facility is surrounded by many developments located within the City of Mesquite both north and south of I-15. Figure 1 on page 2 provides a general location map. Currently *"The City of Mesquite Flood Control Master Plan Update 2001"* (MPU-2001), completed by Pentacore for Clark County Regional Flood Control District, recommends improvements for the existing Abbott Wash channel between I-15 and the Virgin River. Figure 2 located on Page 3, referenced from the current MPU-2001, identifies proposed recommendations for Abbott Wash.

The proposed improvements will begin approximately 200 feet south of Pioneer Blvd. and end at the Virgin River. The easements included or required for this project include approximately 14 to 16 acres. Presently there are portions of the proposed alignment which require the City of Mesquite to obtain additional Right-of-Way in order to complete the channel improvements. In these cases the proposed channel easements are either inadequate, or the channel lies within property owned by private individuals other than the City of Mesquite. The City is currently in the process of negotiating the required property. Historically this facility is an earthen wash used to convey intermittent storm runoff. Typically the wash is dry. However, irrigation tail-water used for agricultural purposes is occasionally directed into this wash. The lower reaches of this wash lay within the area of populace for the City of Mesquite. The lower reaches are currently defined as beginning at Hardy Way, a public road approximately 4,000 feet north of I-15, and ending at the confluence of the Virgin River. Improvements for the section of Abbott Wash located between Hardy Way and Pioneer Blvd. were previously designed by G.C. Wallace, Inc. (Engineers/Planners/-Surveyors) located in Las Vegas. The construction of those improvements were completed recently. The *"Abbott Wash Conveyance Project"* extends the Abbott Wash improvements from approximately 200 feet south of Pioneer Blvd. to the Virgin River. This project is funded through Clark County Regional Flood Control District (CCRFCD).

The existing channel between I-15 and the Virgin River is occasionally graded and is presently void of vegetation. There are many Storm Drain systems which discharge storm runoff into this channel. Presently the irrigation facility which crosses under Abbott Wash is located under Old Mill Road. The current irrigation system, a siphon, was recently installed with the Old Mill

FIGURE 1

2



GENERAL LOCATION MAP

THE CITY OF MESQUITE

Road Improvements. The siphon is located well below the design grade of the proposed channel. Prior to the current irrigation system, the irrigation structure crossed over Abbott Wash through a 60 inch CMP pipe. This structure has been removed. The existing slope between I-15 and the Virgin River runs at approximately 1.0%.

Intent of Review:

The following is being submitted for review: 1) Hydrology for the design flow, and 2) Hydraulics for the proposed channel alignment and geometry. The hydrology to determine the design flow is based on the 2001 MPU completed for CCRFCD by Pentacore. The methodology presented in this study has been discussed with the Flood District in the recent past. This report provides a hard copy of the items discussed with the Flood District. The proposed channel is rectangular in shape with a 28.5 foot bottom and 10 foot walls. The Army Corps of Engineers computer program HEC-RAS, version 3.0.1, was used to model the design flows in the proposed channel. Criteria regarding channel hydraulics such as freeboard, super-elevation, roll waves, etc... are included in this report. The drawings included with this report present the overall channel alignment and geometry used for the hydraulic analysis presented in the HEC-RAS model. The final construction drawings and report will include the construction details, and calculations regarding the channel lining, joints, required steel, scour, retaining walls, safety issues, and other related items required by the Flood District. The intent of this report is to obtain approval of the Hydrology and Channel Hydraulics for the proposed channel. Any modifications required through the review process, or minor revisions made in the final construction drawing will be addressed in the final report and Improvement Plans.

Drainage Basin Description, Design Flow for Channel Improvements:

When referring to the 2001 MPU or 1995 MPU, this is in reference to "*The City of Mesquite Flood Control Master Plan Update*". The 2001 MPU was completed by Pentacore, while the 1995 MPU was completed by CH2M-Hill. Both MPU's were prepared for the ***Clark County Regional Flood Control District*** (CCRFCD). These MPU's identify the Master Planning Information with respect to storm runoff drainage for the City of Mesquite. As discussed above, Abbott Wash is the regional flood control facility for the Abbott Wash Watershed. The Abbott Wash Watershed is identified in both the 1995 and 2001 MPU's. Characteristics for this watershed are discussed in the 1995 and 2001 MPU's. Reference material from these MPU's which identify this watershed and include a discussion of the watershed characteristics are included in Appendix A. Local storm drain facilities from the various developments adjacent to Abbott Wash are discharged into this wash. These facilities will be extended into the proposed channel. Abbott Wash discharges runoff directly into the Virgin River. The current FIRM, 32003C0387 D, identifies the portions of Abbott Wash and surrounding area between Pioneer Blvd. and the Virgin River which are presently identified as Zone A. A copy of this map is included in Appendix C, page C1, of this report. The proposed improvements will allow Abbott Wash to convey a 100 year storm without overtopping I-15 or Mesquite Blvd. Therefore, upon the completion of the proposed improvements a LOMR will likely be completed to remove the

portions of Abbott Wash and surrounding area between Pioneer Blvd. and the Virgin River out of the floodplain. The LOMR is not included with this project.

The Abbott Wash watershed was analyzed previously in the MPU's identified above. In both MPU's the southmost sub-basin, Basin A10, limited the basin area contributing runoff to this wash according to the following description: The extent of the contributing area east of Abbott Wash was limited to approximately 200 feet past the east bank. On the other hand the contributing area west of Abbott Wash extended several hundred feet past the west bank. As development occurs east of Abbott Wash, it is possible that future improvements from this area could direct more runoff to Abbott Wash. We believe additional runoff from the area east of Abbott Wash should be included in the design flows for this facility. Figure A-1 included in Appendix A identifies the original sub-basin A10. This figure also identifies the area added to this sub-basin with these revisions. We are instructed by Clark County Regional Flood Control District that adding additional area to sub-basin A10 requires a revised Hec-1 model. The following describes revisions we have added to the Hec-1 Analysis completed for Abbott Wash in the 2001 MPU, and presents our recommended design flow.

Base Hec-1 model: The 2001 MPU includes two Hec-1 models for Abbott Wash. The model included in Volume 2, Appendix C of the 2001 MPU does not included the Unnamed Wash flows. The model included in Volume 2, Appendix G, Alternative 3 includes the Unnamed Wash flows. NDOT has requested that the proposed channel for Abbott Wash be designed with enough capacity to convey the Unnamed Wash flows. This would provide a way to drain the Unnamed Wash basin if required in the future. Therefore, the Hec-1 analysis included in the 2001 MPU, Volume 2, Appendix G, Abbott Wash Alternative 3 is the base model we began with. The total area included in this analysis is 7.75 square miles. Additional revisions we have added to this base model are describe below.

Revisions to Base Hec-1 model:

Increase overall watershed size, justify utilizing SDN3 storm distribution: As mentioned in the first paragraph on this page, some additional property east of Abbott Wash (within Basin A10) was added. This area was added as the current storm drain systems for this area are not capable of conveying the future runoff. We added a total of 226 acres (0.35 mi^2) to Basin A10. This area is identified on Figure A-1, page A1, in Appendix A. The total area for the Abbott Wash watershed was increased to 8.10 mi^2. According to the current hydrologic criteria for CCRFCD, the SDN4 Storm Distribution is required for an area equal to or greater than 8 mi^2. The 2001 MPU used a SDN3 Storm Distribution for the Abbott Wash watershed as the overall basin for Abbott Wash in this MPU was 7.75 mi^2.

Volume 1 of the 2001 MPU, page 28, see page A2 in Appendix A, shows that the overall area for the Abbott Wash watershed analyzed in the 2001 MPU was 3.2% larger than the 1995 MPU. We believe this demonstrates some subjectivity between the master plans. Further, as development occurs it is very likely that the sub-basins within the Abbott Wash watershed will

be modified somewhat. There are portions of the Abbott Wash & Unnamed watersheds that border the Town Wash or Pulsipher Wash watersheds. These portions could be graded such that the overall watershed for Abbott Wash or the Unnamed Wash could be reduced or increased. In an effort to maintain a conservative approach, we have revised the base model referenced above to include the additional area in Basin A10. However, we have adjusted the revised overall area for the Abbott Wash and Unnamed Wash watersheds, to include 7.99 mi^2 rather than the 8.1 mi^2 for reasons discussed above. Accordingly, the sub-basins adjacent to the other watersheds were adjusted to account for future grading, therefore, Sub-basins A1, A2, A3, A5, A6, A7, A8, A9, A9a, UN, and revised A10 were reduced by 0.01 mi^2. In an effort to maintain conservancy the revised Hec-1 analysis utilizes the SDN3 Storm Distribution. In addition a Depth Area Reduction Factor (DARF) of 0.88 was added to the revised model. This DARF is representative of an overall basin size of approximately eight square miles. Refer to *"Revised Basin Areas for Abbott Wash Watershed"* page A2 in Appendix A.

Verify Rainfall: Volume 1 of the 2001 MPU, page 25 references the NOAA map and discusses how the rainfall isohyets were used to determine design rainfall values. The rainfall information included in the NOAA, Atlas 2, Volume VII, Nevada, 1973 is the best published information available for the Mesquite area. Use of the NOAA information to determine rainfall depths is common in Clark County. Currently this information is the only published source available for use in Clark County, with the exception of the Las Vegas area. Therefore, this information can be justified when determining rainfall values to be use for publicly funded projects. Appendix A of this report includes a copy of Figure 506 which is included in the CCRFCD Hydrologic Criteria and Drainage Design Manual (August 1999). We have placed the Abbott Wash watershed on this Figure according to how we interpret where it should be. Please see Figure A-3, pageA3, in Appendix A. A comparison between our placement of the Abbott Wash watershed on this figure with respect to where the 2001 MPU places this watershed is essentially the same. While the *"Rainfall Map"* included in Volume 2 of the 2001 MPU shows the 2.2 isohyet along the east boundary of the upper portion of the Abbott Wash watershed, we believe the isohyet would run closer to the west boundary of this watershed. Please note that the *"Rainfall Map"* identifies the 2.2 isohyet as 3.15. This accounts for the 1.43 adjustment ratio applied to a 100 year 6 hour storm as required by the current criteria. Our placement of the Abbott Wash watershed with respect to the isohyets shown on Figure 506 can be described as follows: Figure 506 shows the isohyets with respect to the Townships in Clark County. The 2.2 isohyet appears to intersect the 12S/13S Township line and the 70E/71E Range line. This intersection is located in the southwest corner of Sub-basin A6 which is close to the overall west boundary of Abbott Wash. See Figure D-2 included in the 1995 MPU. While it is difficult to determine the accuracy of our placement with respect to the location shown on the Rainfall Map in the 2001 MPU due to the scale of Figure 506, we believe the design rainfall value of 3.15 inches specified in the 2001 MPU is adequate. The adjustment ratio of 1.43 applied to a 100 year 6 hour storm is in essence a safety factor of 43% and therefore inherently conservative. Based on the available information provided by NOAA, and the adjustment ratio which is applied per Clark County criteria, we concur with the design rainfall of 3.15 inches for the Abbott Wash watershed.

Green-Ampt Parameters for Sub-basin A10: In addition to revising the size of sub-basin A10, we reviewed the Green-Ampt parameters and Lag Time used in the referenced Hec-1 model. To verify some of the Green-Ampt parameters, we used the current Zoning Map for the City of Mesquite to determine the percent impervious for the future developed condition and compared it to the value used in the base model. Our calculations show that the percent impervious = 62% for the future developed condition which is higher than the value used in the 2001 MPU. We also utilized the Soil Survey of Virgin River Area, Nevada - Arizona completed by the Soil Conservation Service in 1980. We compared the composite soil type for the overall revised sub-basin A10 with the composite soil type used in the previous MPU's and found little variation. The 1995 MPU utilized the Green-Ampt method rather that using the SCS method. According to CH2M-Hill the Green-Ampt method was warranted in part due to "*unique soils and watershed conditions*" (see pg. 11, 1995 MPU). At the time the soil investigation north of I-15 was incomplete. CH2M-Hill did some infiltrometer tests, sieve analysis, and geomorphic investigation to classify the soil and determine site specific Green-Ampt parameters. The 2001 MPU states "*These previous Hec-1 models using Green-Ampt loss rate procedures have been reviewed and approved by FEMA, CCRFCD, and the City of Mesquite. In an effort to be consistent with these previous studies, the Green-Ampt was utilized for this Update as well*" (See pg. 32, Volume 1, 2001 MPU). The 2001 MPU used the same Green-Ampt parameters as the 1995 MPU. For the same reasons we have left the Green-Ampt parameters the same with the exception of the RTIMP field or percent impervious for Basin A10.

Lag Time: The lag time used for Basin A10 in the Base Hec-1 model was revised from 0.46 hr. to 0.41 hr. The revised size for sub-basin A10 is 0.84 square miles so the Travel Time Method was used to determine the Lag Time. These calculations account for some initial overland flow time, some travel time via street flow, some travel time in future storm drains we anticipate as the area develops, and some travel time in the proposed concrete channel. Lag Time calculations are included in Appendix A. Typically for larger basins, the Urbanized Equation controls. However, in this case the Travel Time Method provided a shorter time due to the high velocities expected in future storm drains and the proposed concrete channel. According to the CCRFCD Manual, the method that provides the shorter time for the most remote location governs. The lag time used in the 2001 MPU for sub-basin A10 (0.46) was based on a length of 6,500 feet. Although based on the size of the original basin, one could scale a longer distance from the most remote area of this basin to the downstream end of this basin. According to the Manual, there are many things to consider when calculating Lag Times such as grade breaks or swales that may not follow the natural grade and increase the time of concentration. The Lag Time used in the original Hec-1 model was based on their engineering judgement. Similarly, the Lag Time presented in our revised Hec-1 model is based on our engineering judgement. The approximate Time of Concentration route is shown on Figure A-1 in Appendix A.

Routing Modifications: The Base Hec-1 analysis utilized the Muskingum Routing method between points 40 and 50, and the Kinematic Wave method between points 50 and 60. Prior to any channel improvement north of I-15 this type of routing was appropriate. As the channel north of I-15 between Pioneer Blvd. and Hardy Way is now improved and well defined, we

modified the routing method used between points 40 and 50. Appendix A includes a discussion with an accompanying figure that depicts the modified routing used between those points. The revised model includes two routing cards between points 40 and 50, the routing reach labeled *40-40b* utilizes the Muskingum method while the reach labeled *40b-50* uses the Kinematic Wave method. In addition, the original Kinematic Wave routing used between points 50 and 60 used a manning's *n* coefficient of 0.035 which is representative of an earthen channel. The proposed channel lining for this project is concrete. Therefore, the Kinematic Wave routing parameters between points 50 and 60 were revised to match the proposed channel.

Combination Point Modifications: Combination Point 50 as defined in the Base Hec-1 model was revised accordingly. Combination Point 50 was split into two combination points, *Combination Point 50a*, and *Combination Point 50b*. Combination Point 50a represents the peak flow north of I-15 prior to the Unnamed Wash flows while Combination Point 50b defines the peak flow north of I-15 including the Unnamed Wash flows. This was necessary to determine the quantity of flows being added north of I-15 due to the Unnamed Wash flows. The HEC-RAS analysis for the developed condition models flow from the Unnamed Wash being added between Pioneer Blvd. and I-15. NDOT requires a proposed channel size to convey the Unnamed Wash flows to Abbott Wash. A feasible channel design to route Unnamed Wash flows to Abbott Wash is included in Appendix B. The proposed channel for this condition is not intended for use as a final design; rather the intent is to show NDOT that such a channel is feasible.

Summary of Revised Hec-1 Results: The revised Hec-1 model computes peak flows of *2,790 cfs* at Point *50a*, and *3,334 cfs* at Point *50b* located north of I-15. These flows are associated with a 0.89 DARF which is consistent with the overall basin size minus sub-basin A10. We have used a design flow of **2,790 cfs** under Pioneer Blvd., and a design flow **of 3,334 cfs** for the proposed channel south of Pioneer Blvd. to the proposed channel south of Old Mill Road. At design point 60 located at the Virgin River, the revised Hec-1 model computed a peak flow of *3,999 cfs*. This peak flow is associated with a 0.88 DARF and represents an overall basin area of approximately eight square miles. South of Old Mill Road to the Virgin River we used a design flow of **4000 cfs** for the proposed channel.

Discussion of Hydraulic Analysis for Channel Improvements:

Existing Condition: Hec-2 was utilized to provide an existing condition model of Abbott Wash. Hec-2 was utilized as we have analyzed several portions of Abbott Wash in previous drainage studies completed for various clients. The existing condition model indicates overtopping will occur at I-15 and at Mesquite Blvd. These overtopping flows are widely accepted as both the 1995 and 2001 MPU's require these structures to be replaced or up-sized due to overtopping. Although portions of the existing condition model has not been revised to reflect some of the recent modifications, we believe it is sufficient as the real intent of this project is to provide a channel design for Abbott Wash to convey a 100 year storm according to CCRFC criteria. A beginning flow of 2,970 cfs was used which matches our previous models and the 1995 MPU for the existing condition. The output file for the existing Hec-2 analysis is included in Appendix B.

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Developed Condition:

Proposed Channel Alignment & Geometry: Due to property restrictions in some parts of Abbott Wash a concrete channel was chosen. In some areas it was necessary to use a rectangular channel due to the depth of the wash and the existing easement provided. Although there are some sections of the proposed channel with an easement wide enough to maintain a trapezoidal channel shape, the proposed design utilizes a rectangular channel 28.5 feet in width and approximately 10 feet in height. A rectangular channel was chosen for the following three reasons: 1.) The City of Mesquite did not want the liability of injuries due to skateboarders using a trapezoidal channel. 2.) The proposed channel crosses under I-15, Mesquite Blvd., the future 2nd South Street, Hafen Lane, and the proposed sewer access crossing. A dual 14 foot wide by 9 foot tall culvert is used for all of the crossings with the exception of Hafen Lane where the existing 4 barrel 10' wide by 8' tall culvert is used. Due to the transition required at these crossings, and the areas which require a rectangular channel because of property restrictions, many of the trapezoidal channel sections were only 800 to 900 feet long. The CCRFCD recommends a consistent channel type to limit the turbulence due to transitions in the channel geometry. Rather than altering the channel geometry between rectangular and trapezoidal, a consistent channel section was used. 3.) The HEC-RAS analysis indicates Super-Critical Flow for the proposed channel geometry and slopes. A rectangular channel is recommended for Super-Critical flow to limit turbulence losses due to transitions.

The proposed alignment, slopes and channel geometry, including the transitions to a wider rectangular channel at Hafen Lane and north of I-15, were checked against CCRFCD criteria for super-critical flow. Per CCRFCD criteria, Sections 702.2 and 706.2, the Froude Number must be greater than 1.13 to maintain Super-Critical flow, and a Froude Number of 1.7 is required at the downstream side of each transition. The channel was designed to maintain Super-Critical flow rather than alternate between the two flow regimes. A minimum radius of 500 feet was used to limit the super-elevation of the water surface to 2 feet as it travels around the curves. See CCRFCD Manual Section 706.2. Freeboard and Slug Flow were also checked to ensure they would meet CCRFCD criteria, Section 706.2. Appendix B includes output for the HEC-RAS analysis including summary tables which provide Froude Numbers for each cross-section. Appendix B also includes supporting calculations to show that the proposed channel meets CCRFCD criteria for Freeboard, Slug Flow, minimum curve radius, and transition length.

The proposed channel begins approximately 200 feet south of Pioneer Boulevard. The existing culvert under Pioneer Blvd. is a triple barrel 14 foot wide by 10 foot tall culvert. Currently the City of Mesquite is working with the Nevada Department of Transportation (NDOT) to provide an overpass over I-15. This project is named "*I-15, Mesquite Midtown Overpass (Grapevine Road) EA 72642*". This overpass is located adjacent to Abbott Wash and will tie into Pioneer Blvd. at the Redd Hills Parkway/Pioneer Blvd. intersection. The name of Redd Hills Parkway will be changed to Grapevine Rd. as the overpass connects Grapevine Road, located south of I-15, to Pioneer Blvd. which is located north of I-15. The Grapevine Road alignment is located directly south of the current Pioneer Blvd. and Redd Hills Parkway intersection. In order to

complete the Grapevine Overpass, the existing culvert under Pioneer Blvd. will need to be extended 200 feet. NDOT is planning to construct the culvert extension with the Grapevine Overpass project. Correlation between the NDOT overpass project and this channel improvement project is ongoing. We have worked together to provide a design which will work for both projects. This project begins at the end of the extended culvert under Pioneer Blvd. Between the end of this culvert and I-15 the rectangular channel is necked down from 44 feet in width to 28.5 feet in width. This channel width, 28.5 feet, is maintained to station 3+00 where the concrete channel ends. From Station 3+00 to Station 1+00 (Virgin River tie) there is a 10' wide concrete low flow channel with gabions installed at an approximate transverse slope of 2.5:1 on each side of the 10' wide concrete channel. Gabions were used to tie the channel to the Virgin River as they are more likely to match the Virgin River's Geomorphic changes over time. Further discussion regarding the Virgin River Geomorphic process will be included in the final report. At the I-15, Mesquite Blvd., 2nd South, and sewer crossings a dual 14' wide by 9 foot tall box culvert is used to convey the flow. The culvert has a 6 inch interior wall between the two barrels. Therefore, the culverts match the channel width of 28.5 feet.

HEC-RAS Analysis Discussion: The Army Corps of Engineers HEC-RAS computer program, version 3.0.1, was utilized to analyze the proposed channel. The Mixed Flow Regime, Steady Flow Analysis was utilized. *Roughness Coefficient*: A mannings n value of 0.015 was used in this model. This is the value recommended in the CCRFCD Manual for a concrete channel with a Float Finnish (CCRFCD Manual 705.7.1.10). *Contraction and Expansion coefficients*: The contraction and expansion coefficients recommended for Super-Critical flow are referenced from the "*US Army Corps of Engineers - Hydraulic Reference Manual for HEC-RAS, Version 3.0, January 2001, Chapter 3, pages 3-19 and 3-20*". The contraction and expansion coefficients referenced in the CCRFCD Manual appear to be representative of a Sub-Critical Flow condition. A letter dated January 3, 2002 from our office to Clark County Regional Flood Control District regarding Contraction and Expansion coefficients has been included in Appendix B. The proposed transitions are gradual so the contraction and expansion coefficients used in the Hec-Ras model are 0.05 and 0.10 respectively. The proposed culverts which pass under I-15, Mesquite Blvd., 2nd South, and the sewer crossing are dual 14' wide by 9' tall culverts with a 6 inch interior wall. There is really no transition at these crossings as the culverts match the width of the rectangular channel. However, a contraction and expansion coefficient of 0.05 and 0.10 respectively have been used at these crossings to account for the 6" interior wall between the culverts. The culverts were modeled using the bridge method in HEC-RAS. *Channel Geometry*: The HEC-RAS analysis utilized geometry consistent with a rectangular channel. The bottom of the channel is sloped at 2% from each side of the channel to the center. The cross sections are labeled, and the transitions and culvert crossings are identified in the HEC-RAS model consistent with the stations, transitions, and culvert crossings identified on the Plan and Profile drawing included with this submittal.

Steady Flow Parameters: For the downstream boundary condition a known water surface elevation of 1557.4 was used. This represents a worst case scenario of the 100 year water surface elevation of the Virgin River Floodway. The Floodway was used in lieu of the

Floodplain to account for future development which may occur adjacent to the Virgin River. The Floodway elevation is referenced from the "*Technical Drainage Study completed for The City of Mesquite Including Portions of the Virgin River, Town Wash, Abbott Wash, and Pulsipher Wash within the Incorporated Limits of the City*". This study was completed by Bulloch Brothers Engineering, Inc. in August of 1994. The current FIRM map reflects the Floodplain and Floodway determined for the Virgin River by this study. The current FIRM, Map No. 32003C0387 D, Revised to reflect LOMR dated September 27, 1996, is included in Appendix C, page C1. This FIRM identifies the Virgin River Floodplain and Floodway at the confluence of Abbott Wash with the Virgin River. Appendix B includes references from the LOMR study submitted to FEMA.

The upstream boundary condition utilized the Normal Depth method using an existing slope of 0.95%. As discussed on page 8 under "*Summary of Revised Hec-1 Results*", a beginning flow of 2,790 cfs was used from north of Pioneer Blvd. to the NDOT Right-of-Way for I-15 south of Pioneer Blvd. The flow was then increased to 3,334 cfs to account for peak flows entering Abbott Wash from the Unnamed Wash. The flow was then increased to 4,000 cfs south of the I-15/Old Mill Road culvert. As the increase in flow from 3,334 cfs to 4,000 cfs is not expected to occur at one location, the increase was completed in two locations. The balance of the channel was design for a design flow of 4,000 cfs. As the design flow of 4,000 cfs represents the peak flow at the bottom of Basin A10 located south of I-15, a design flow of 4,000 cfs at Mesquite Blvd. and south is considered to be conservative.

HEC-RAS Results: The HEC-RAS output file and summary tables are included in Appendix B. The model indicates that the Super-Critical Flow regime is maintained throughout the length of the proposed channel until the backwater from the Virgin River causes a Hydraulic Jump. The Hydraulic Jump occurs south of the proposed sewer crossing in the vicinity of the existing Virgin River Floodplain. The proposed sewer crossing is required as the existing structure caused a hydraulic jump. There was some concern that a hydraulic jump would damage or wash out the existing ductile iron sewer pipe which presently crosses over the wash. The existing sewer pipe spans approximately 25 feet. Each side of the pipe is supported by a concrete wall. The existing sewer crossing structure is a 25 foot wide by 8 foot tall concrete box. This box is approximately 30 feet in length. The bottom of the existing 24 inch sewer is approximately 5.5 feet above the existing invert of the 25 foot wide structure in Abbott Wash. The existing sewer structure was sized under a different criteria and may not have accounted for backwater effects from the Virgin River.

The existing culvert under Hafen Lane ~~was~~ is adequate for conveying the design flow. Therefore, this culvert was utilized in the design. A transition on each side of this culvert was utilized to tie into the typical 28.5' wide channel. Both the Mesquite Blvd. and I-15 culverts were replaced with the two 14' wide by 9' tall box culverts. The model shows that this channel is capable of conveying the required flow and meets the current criteria for CCRFCD at major street crossings. This criteria requires a 2 foot freeboard between the water surface elevation and the low chord of the culvert. The velocity in the proposed channel conveying the design flow of

4000 cfs is less than 30 feet per second.

Proposed use of Existing Culverts under I-15 and Mesquite Blvd. for Pedestrian access: The existing culvert under I-15 has been preserved for use as a possible pedestrian access under I-15. Likewise, One barrel of the existing triple barrel culvert under Mesquite Blvd. has been preserved for possible pedestrian access. Pedestrian access under Mesquite Blvd. is preferable to an at-grade crossing where the flow of traffic would be interrupted. The pedestrian access under I-15 would tie the trail systems south of I-15 to the trail systems located north of I-15.

Maintenance Access Road & Vehicular Access at Bottom of Channel: According to the CCRFCD Manual, an access road is required at the top of the channel on both sides when the channel width is greater than 30 feet. Alternatively "*vehicular operation access at the bottom of the channel and at the top of one bank*" (CCRFCD 707.2) is sufficient. Although the proposed concrete channel is approximately 30 feet wide, the channel will exceed 30 feet to match the existing grades on each side of the channel. In addition, the City of Mesquite wanted access to the bottom of the channel for maintenance purposes. The Abbott Wash Trail which runs adjacent to Abbott Wash will be used for a maintenance access road on one side of the wash. Additionally vehicular accesses to the bottom of the wash will be provided at the major street crossings. Approximate locations for channel access into Abbott Wash are shown on the "*Channel Alignment & Geometry*" drawings. These accesses will include more detail on the final construction drawings. They will be detailed and constructed as shown in Figure 710, Section 700, in the CCRFCD Manual. According to the Flood District it is difficult accurately model this type of access. We are informed by CCRFCD that the access geometry shown in Figure 710 is intended to minimize energy losses due to friction, and channel geometry. Therefore the access locations were not included in the HEC-RAS model.

Safety Requirement & Miscellaneous: Safety requirements which include fences and access ladder steps will be detailed on the final improvement plans and discussed further in the final drainage study. Likewise further detail and calculations regarding outlet protection, scour, channel lining, steel requirements, joints, etc... shall be included in the final design. As discussed in the introduction, the intent of this review is for the Hydrology, Hydraulics, and related hydraulic calculations for the proposed channel. The proposed channel is designed to covey 100 year flows from Pioneer Blvd. to the Virgin River. The Plan and Profile sheets included with this report do not include construction details. Construction details shall be included on the final improvement plans.

Conclusions:

The proposed channel is capable of conveying the design flow from Pioneer Blvd. to the Virgin River. The Hydrology and Hydraulics for the proposed channel meet the current CCRFCD Criteria. Sections 500, 600, and 700 of the current CCRFCD Manual was utilized as a guide for determining the design flow and design channel. This project is not located on an alluvial fan. We believe the proposed improvements comply with the current Flood Control Master Plan

Update - 2001 for the City of Mesquite. Maintenance of the proposed channel is expected to be minimal. Occasional cleaning may be required due to sedimentation which may occur over time. Phasing and construction issues for the proposed improvements will be discussed in the final report. We believe the information referenced from the 2001 - MPU, 1995 - MPU, and other referenced sources are based on sound engineering principles and accept the results. Revisions to some of the referenced material, including a discussion on why and how the revisions were made, are noted in this report.

References:

1. Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual August 1999.

2. Civil Engineering Reference Manual Michael R. Lindeburge, P.E.

3. Olympus Aerial Surveys, Inc./ Aerial Photography for Completed for Abbott Wash, Photo Date: September 26, 2000 / File: 00084L1.DWG,

4. US Army Corps of Engineers - HEC-1 Computer Program, Version 4.1. HEC-1 Reference Manual, CPD-1A, September 1990.

5. US Army Corps of Engineers - HEC-2 Computer Program, Version 4.6.2. HEC-2 Reference Manual, CPD-2A, September 1990.

6. U.S. Army Corps of Engineers - HEC-RAS Computer Program, Version 3.0.1, and "*Hydraulic Reference Manual for HEC-RAS, Version 3.0, January 2001*".

7. *City of Mesquite, Nevada Long Range Comprehensive Master Plan*. This Master Plan was completed by Robert A Fieldon, Incorporated. Architecture, Planning & Urban Design located in Las Vegas, Nevada.

8. *The City of Mesquite Flood Control Master Plan Update 2001.* Prepared for: Clark County Regional Flood Control District. Completed by PENTACORE in September 2001. Project No.: 0279.0010

9. *The City of Mesquite Flood Control Master Plan Update* Prepared for Clark County Regional Flood Control District. Completed by CH2MHILL in September 1995.

10. *Soil Survey of Virgin River Area, Nevada - Arizona* / United States Department of Agriculture, Soil Conservation Service

References Continued:

11. Improvement Plans for "Old Mill Road - Phase II". Prepared for: The City of Mesquite / Completed by: Bulloch Brothers Engineering, Inc., April 2002

12. "I-15 Mesquite Midtown Overpass (Grapevine Road) EA72642" Completed by NDOT, Design for this project is currently being completed.

13. "*Technical Drainage Study completed for The City of Mesquite Including Portion of the Virgin River, Town Wash, Abbott Wash, and Pulsipher Wash within the Incorporated Limits of the City*". Completed by Bulloch Brothers Engineering, Inc. in 1994

14. *"Master Drainage Study completed for Arroyo Heights"* (now Falcon Ridge P.U.D.), Prepared for Mesquite 643 in June of 2000 by Bulloch Brothers Engineering, Inc.

15. *"Mesquite Master Sewer As-built"* / Prepared for: City of Mesquite Public Works / Prepared by: Bulloch Brothers Engineering, Inc. September 2001.

16. "*Bore Route under I-15*" / Prepared for: The City of Mesquite & Falcon Ridge P.U.D. / Completed by: Bulloch Brothers Engineering, Inc. / NDOT Permit No. 97-2001.

17. Grading Plan completed for the *"Pioneer Commercial Subdivision"* located within the Mesquite Vistas P.U.D. adjacent to Abbott Wash north of I-15. Grading Plan prepared by: G.C. Wallace, Inc. Engineers/Planners/Surveyors located in Las Vegas, Nevada.

18. "*Villa La Paz Off-Site Improvements*" Prepared for Mesquite Vistas, located in Mesquite Nevada, Completed by: G.C. Wallace, Inc. Engineers/Planners/Surveyors located in Las Vegas, Nevada.

APPENDIX A

Hydrologic Calculations and Material From Referenced Drainage Studies

Increase Overall Abbott Wash Watershed Size:
Figure A-1, Revised Basin A10, Additional area added to Basin A10 ..... A1
Revised Basin Areas for Abbott Wash Watershed A2
Verify Rainfall:
Figure A-3, BBE placement of Abbott Wash watershed on Fig. 506 ..... A3
Figure A-4, Watershed placement on Fig. 506 (Referenced from 2001 MPU) ... A4
Isohyet placement for watersheds (Ref. from 2001 MPU) A5
BBE interpretation of where 2.2 Isohyet is located per Fig. 506 ..... A6
Check Green Ampt Parameters:
Portion of current Zoning Map for City of Mesquite A7
Impervious Area Calculations A8
Curve Number Calculations for Revised Basin A-10 ..... A9
Portion of Soil Survey of Virgin River Area, NV-AZ by SCS A11
Check Green Ampt Parameters for Revised Basin A10 ..... A12
Revised Lag Time for Basin A10:
Standard Form 4 for Revised Lag Time Calculation, Revised Basin A10 ..... A15
Routing Modifications 40-50, 50-60:
Revised Routing discussion A16
Muskingum Parameter for routing between 40 to 40b A17
Average Velocity for Upstream Channel A18
Revised routing shown on portion of Figure D-2 , Ref. From 1995 MPU A19
Muskingum Routing Parameters Ref. From 1995 MPU A20
Combination Point Modifications:
Discussion in report only, see page 8
Revised Hec-1 Model:
Output file for Revised Hec-1 model A22
Base Hec-1 Model:
Copy of Base Hec-1 Output file Referenced from 2001 MPU A29

APPENDICES FOR

TECHNICAL DRAINAGE STUDY
Completed For
The Abbott Wash Conveyance Project

A Regional Flood Control Facility
From North of I-15 To The Virgin River
Located in Mesquite, Nevada

APPENDIX A
Design Flow Hydrology

JUNE 2002

PIONEER BOULEVARD

HORIZON BOULEVARD

INTERSTATE 15

OVERLAND FLOW AREA

OASIS RESORT HOTEL & CASINO

CASABLANCA RESORT HOTEL & CASINO

FUTURE STORM DRAIN

ABBOTT WASH

WEST PARK

MESQUITE MEDICAL CENTER

VIRGIN VALLEY WATER DISTRICT

CITY SEDIMENTATION PONDS NO. 1

VIRGIN RIVER

ADDITIONAL AREA
(226 AC.+/-)

EL RANCHO MARKET

US POST OFFICE

STATELINE CASINO

LDS CHURCHES

MESQUITE STAR HOTEL & CASINO

MESQUITE RECREATION CENTER

VIRGIN VALLEY ELEMENTARY SCHOOL

LIBRARY PARK

PUBLIC LIBRARY

SENIOR CENTER

CITY HALL

SMITH'S

OLD MILL ROAD

WEST MESQUITE BLVD

EAST MESQUITE BLVD

WEST FIRST SOUTH ST

EAST FIRST SOUTH ST

SECOND SOUTH STREET

HAFEN LANE

GRAPHIC SCALE

800 0 400 800

(IN FEET)
1 inch = 800 ft.

=BASIN A10-WEST (ORIGINAL)
=BASIN A10-EAST (ADDED AREA)
=TIME OF CONCENTRATION ROUTE
=ORIGINAL SUB-BASIN A10
=ADDED AREA TO SUB-BASIN A10

CITY LAYOUT REFERENCED FROM:
CITY OF MESQUITE ADDRESS MAP
PRODUCED BY: CITY OF MESQUITE - GIS DEPT.

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-
LAND PLANNERS

P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586-9592

91 WEST 1470 SOUTH, STE 102
ST. GEORGE, UTAH 84770
(435) 628-4700

561 W MESQUITE BLVD, STE 4
MESQUITE, NEVADA 89027
(702) 346-5101

FIGURE A-1

A1

REVISED BASIN AREAS FOR ABBOTT WASH WATERSHED

(Reference: 2001 MPU, Volume 1, Pg. 2B) The City of Mesquite

TABLE 2 DRAINAGE BASINS AREA AND DARF					
Basins	MPU1995 (sq. mi.)	MPU2000 (sq. mi.)	DARFs in MPU2000	BBE (Sq. mi)	Adjusted BBE (Sq. mi.)
Town Wash	21.25	21.21	0.78		
T1	4.60	4.56	0.90		
T2	3.13	3.12	0.92		
T3	1.64	1.73	0.95		
T4	0.66	0.68	0.98		
T5	3.38	3.17	0.92		
T6	3.41	3.38	0.91		
T7	1.12	1.04	0.97		
T8	1.00	1.01	0.97		
T9	1.65	1.96	0.93		
T10	0.50	0.38	0.99		
T11	0.16	0.06	1.00		
Abbott Wash	6.90	7.13	0.89	7.48	7.38
A1	1.18	~~1.21~~ 1.12	0.95	1.12	1.11
A2	0.74	0.80	0.97	0.80	0.79
A3	0.54	0.55	0.98	0.55	0.54
A4	0.33	0.29	0.99	0.29	0.29
A5	0.49	0.51	0.98	0.51	0.50
A6	0.68	0.92	0.97	0.92	0.91
A7	0.30	0.29	0.99	0.29	0.28
A8	0.47	0.48	0.98	0.48	0.47
A9	1.28	1.40	0.95	1.40	1.39
A9a	0.38	0.28	0.99	0.28	0.27
A10	0.51	0.49	0.98	0.84	0.83
Pulsipher Wash	4.85	4.80	0.91		
P1	0.85	0.80	0.97		
P2	0.50	0.54	0.98		
P3	0.71	0.73	0.97		
P4	1.07	1.02	0.97		
P6	0.66	0.72	0.97		
P7	0.57	0.53	0.98		
P8	0.34	0.34	0.98		
P9	0.15	0.12	1.00		
Unnamed Wash	0.60	0.62	0.98	0.62	0.61
West Washes		5.11	0.91		
			TOTAL-	8.10	7.99

DARF = 0.88

RAINFALL DEPTH-DURATION-FREQUENCY
100-YEAR, 6-HOUR
(DEPTHS IN TENTHS OF INCHES)

Placement of Watershed - BBE

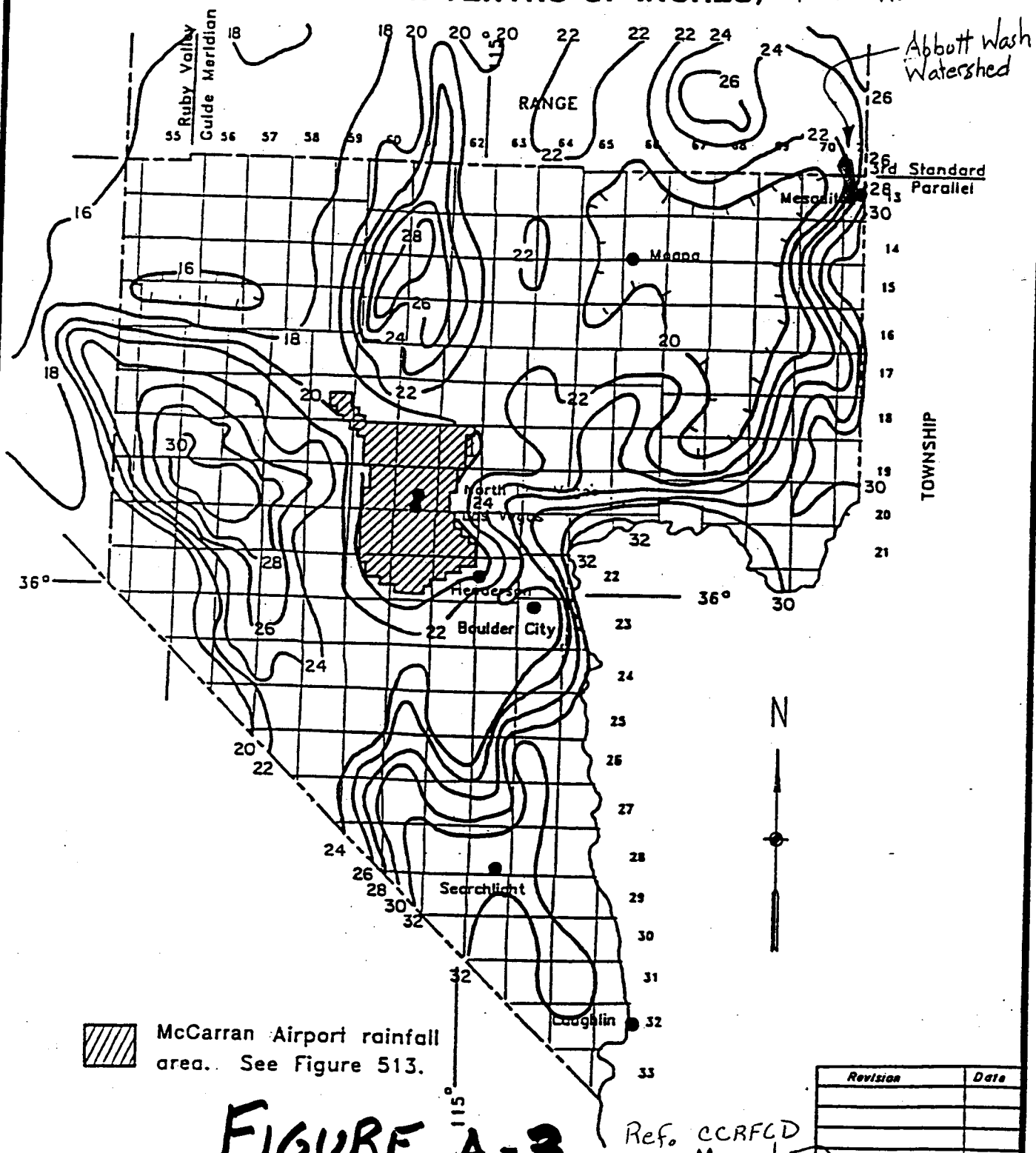


FIGURE A-3

Ref. CCRFCD Manual

Revision	Date

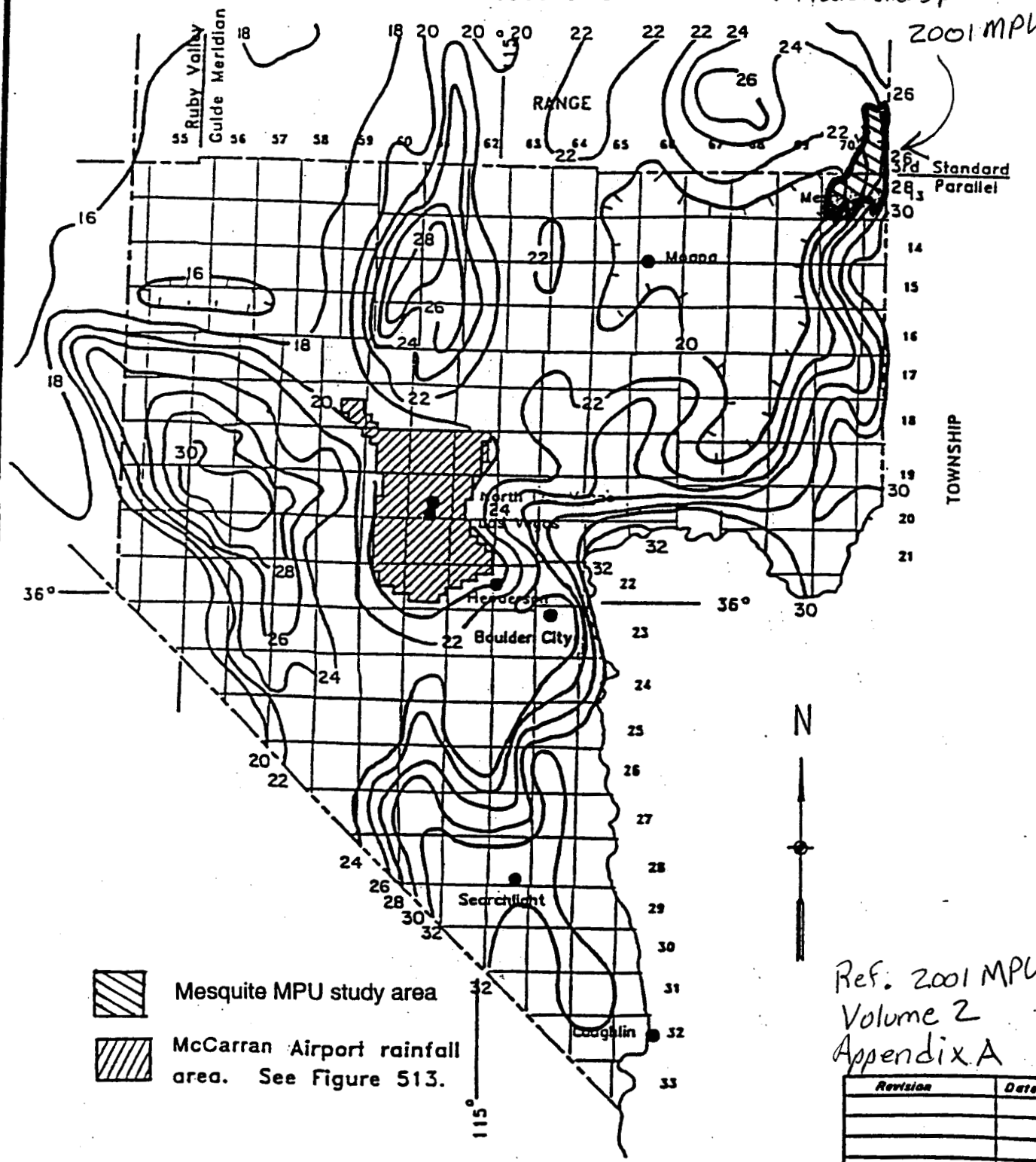
WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 506

RAINFALL DEPTH-DURATION-FREQUENCY
100-YEAR, 6-HOUR
(DEPTHS IN TENTHS OF INCHES)

Placement of Watersheds per 2001 MPU



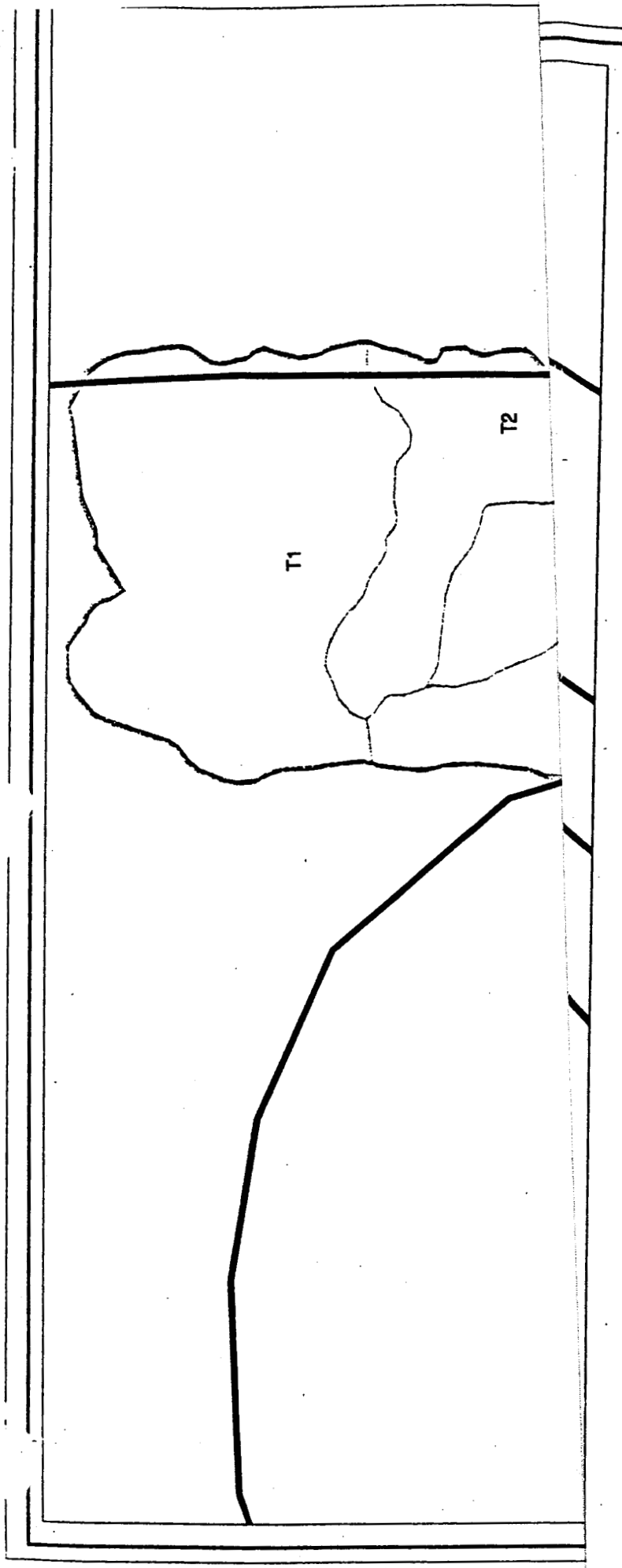
Ref. 2001 MPU Volume 2 Appendix A

Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 506



CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

Ref. 7

City of Mesquite MPU 2001 Rainfall Map

(Data Derived from NOAA using adjustment factor 1.43)

Rainfall in Inches 100-Year, 6-Hour

- 4.00 inches
- 3.72 inches
- 3.43 inches
- 3.15 inches
- 2.86 inches

- Watershed Boundaries

5000 2500 0 5000
(IN FEET)

REF.

September 07, 2001

Scale: 1 inch = 5000 feet

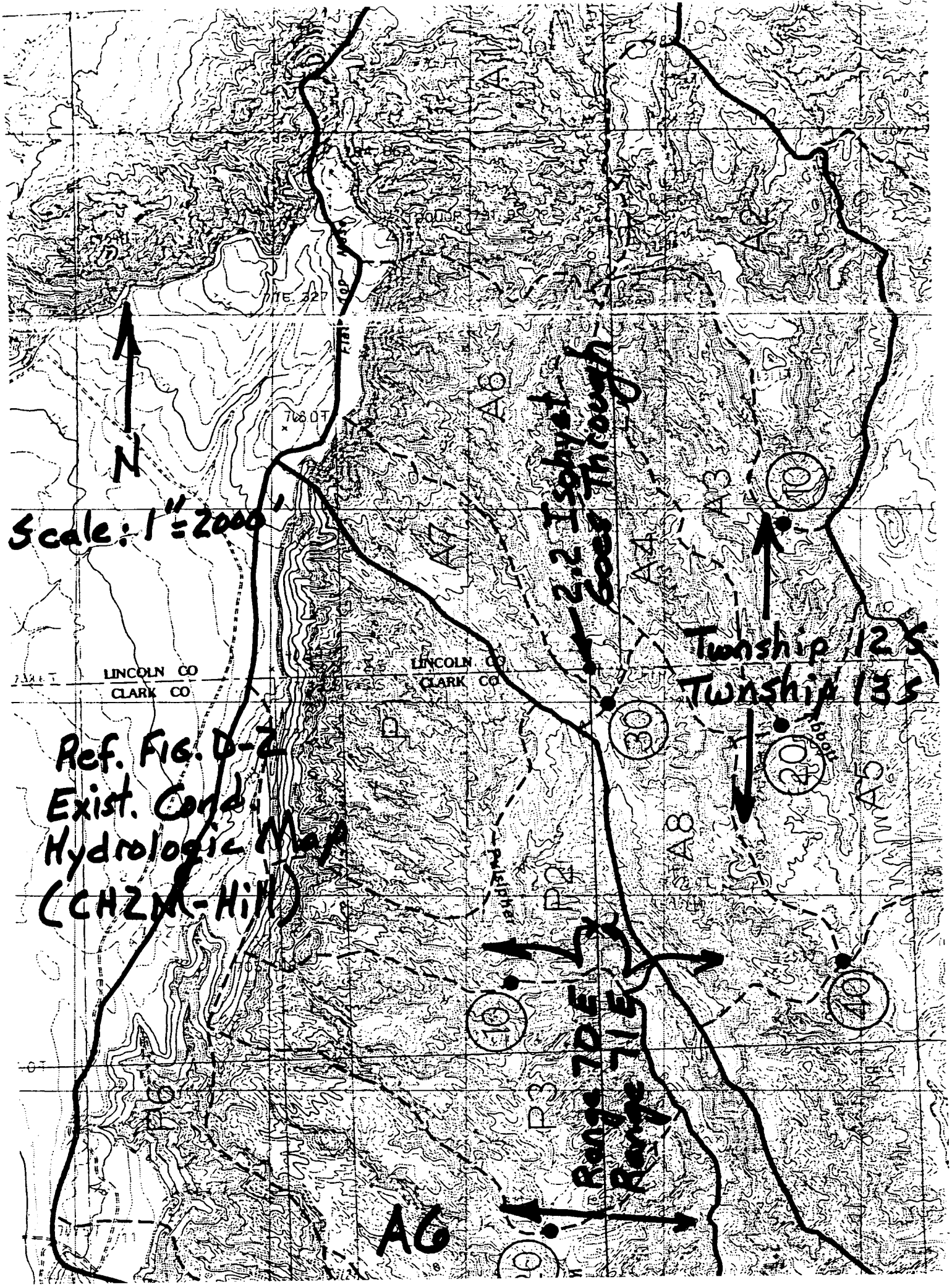
PENTACORE
Geographic Information Systems

6763 West Charleston Blvd.
Las Vegas, Nevada 89146

For Reference only. Pentacore assumes no liability for the accuracy of the data delineated hereon.

D.N.G.

A5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Scale: 1" = 2000'
LINCOLN CO
CLARK CO
LINCOLN CO
CLARK CO
Ref. Fig. D-2
Exist. Cond.
Hydrologic Map
(CH2M-Hill)
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Township 13S
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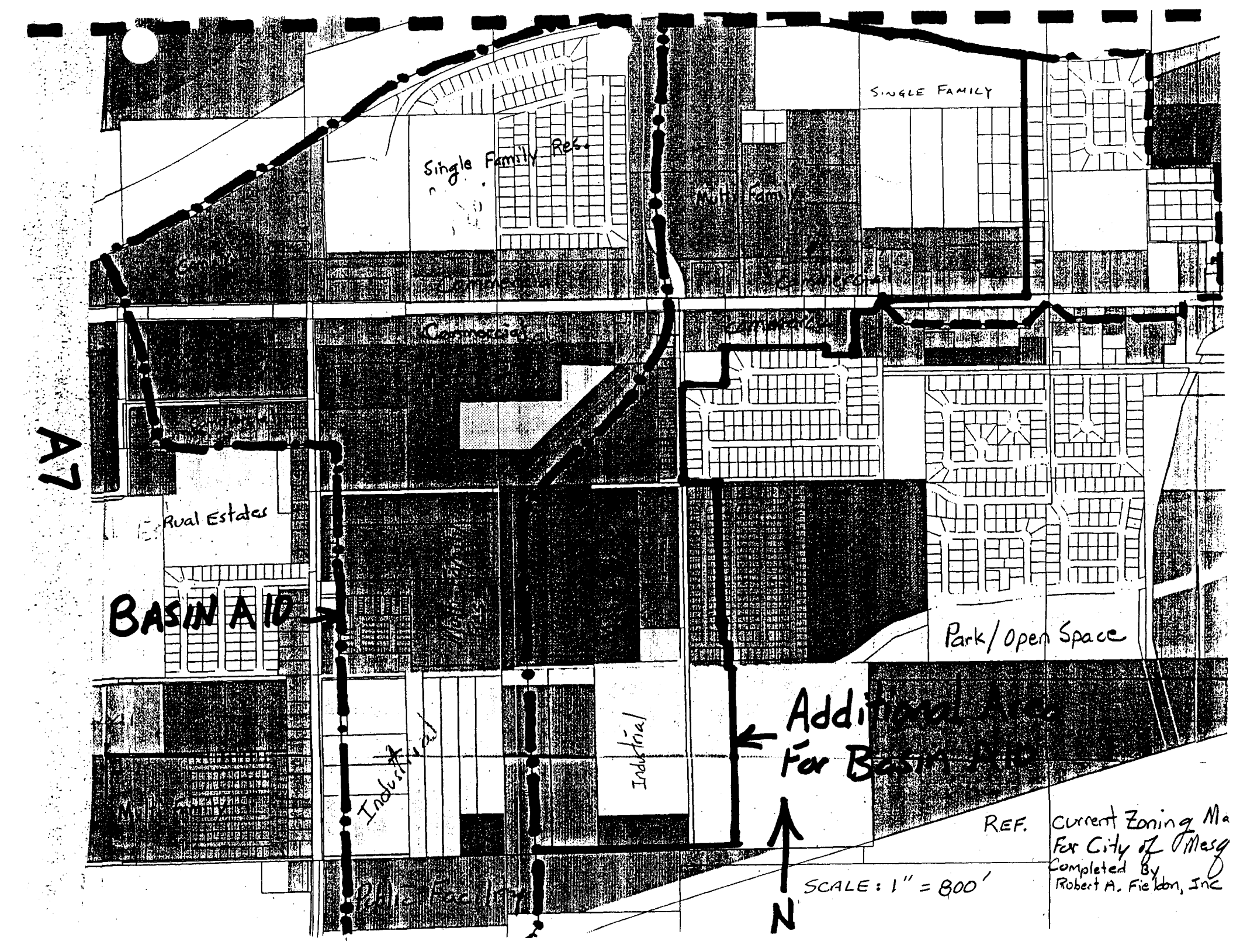
A7
Single Family Res.
SINGLE FAMILY
Commercial
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Rural Estates
BASIN A10
Park/Open Space
Industrial
Industrial
Addi
For B
REF. Current Zoning Ma
For City of Mesq
Completed By
Robert A. Fielden, Inc
SCALE: 1" = 800'
N

1) DETERMINE PERCENT IMPERVIOUS AREA OF BASIN A10 FOR GREEN-AMPT METHOD

A-10 WEST

PER MASTER PLAN	AREA	% IMPERVIOUS (PER CCRFCDM)
SINGLE FAMILY	55 AC ±	38
MULTI-FAMILY	65 AC ±	68
COMMERCIAL	105 AC ±	85
PUBLIC FACILITY	15 AC ±	85
INDUSTRIAL	35 AC ±	72
PARK/OPEN SPACE	10 AC ±	–
DESERT/Ag.	29 AC ±	–
	314 AC ±	

AVG. % IMPERVIOUS

$$= \frac{(55\text{AC.})(.38) + 65\text{AC}(.68) + 105\text{AC.}(.85) + 15\text{AC.}(.85) + 35\text{AC.}(.72)}{314\text{AC.}}$$

= .61 = 61% IMPERVIOUS A-10 WEST ← A10 WEST

A-10 EAST

	AREA	% IMPERVIOUS (PER CCRFCDM)
SINGLE FAMILY	40.5 AC.	38
MULTI-FAMILY	100.2 AC.	68
COMMERCIAL	22.4 AC.	85
IMPERVIOUS (ZOA05)	11.5 AC.	100
INDUSTRIAL	38.6 AC.	72
PARK/OPEN SPACE	6.8 AC.	–
	220.0 AC.	

AVG. % IMPERVIOUS

$$= \frac{40.5\text{AC}(.38) + 100.2\text{AC}(.68) + 22.4\text{AC.}(.85) + 11.5\text{AC.}(1) + 38.6\text{AC.}(.72)}{220.0\text{AC}}$$

= .64 = 64% IMPERVIOUS A-10 EAST ← A10 EAST

A-10

	AREA	% IMPERVIOUS
A-10 WEST	314 AC	61
A-10 EAST	225 AC	64

AVG % IMPERVIOUS

$$= \frac{314\text{AC}(.61) + 225\text{AC.}(.64)}{539\text{AC}} = .62 = 62\% \text{ IMPERVIOUS A-10}$$ ← A10

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

BASIN A10-WEST (Original Sub-basin A10)

AREA = 314 AC.

30% TYPE A SOIL
70% TYPE B SOIL

LAND TYPE	ACRE	WT. CN
SINGLE FAMILY	55 AC.	71
MULTI-FAMILY	65 AC.	84
COMMERCIAL	105 AC.	91
INDUSTRIAL	35 AC	86
PUBLIC FACILITY	15 AC.	91
PARK	10 AC	63
DESERT/Ag.	29 AC.	76

A-10 WEST

$$\text{Wt. CN} = \frac{55_{AC}(71) + 65(84) + 105(91) + 35(86) + 15(91) + 10(63) + 29(76)}{314 \text{ AC.}}$$

A-10 WEST = 83 ← CN A-10 WEST

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

BASIN A10 | CN CALCULATIONS

A-10 EAST (Added Area To Sub-basin A10)

AREA = 220 AC.

55% TYPE B SOIL
45% TYPE A SOIL

LAND TYPE	AREA	WT. CN
COMMERCIAL	24 AC.	91
SINGLE FAMILY	45 AC.	69
MOBILE HOME	21 AC.	84
PUBLIC FACILITY	18 AC.	91
INDUSTRIAL	24 AC.	85
MULTI-FAMILY	78 AC.	82
PARK	10 AC.	60

$$\text{WT. CN} = \frac{24\text{AC}(91) + 45(69) + 21(84) + 18(91) + 24(85) + 78(82) + 10(60)}{220\text{ AC.}}$$

A-10 EAST = 80 ← A-10 WEST CN

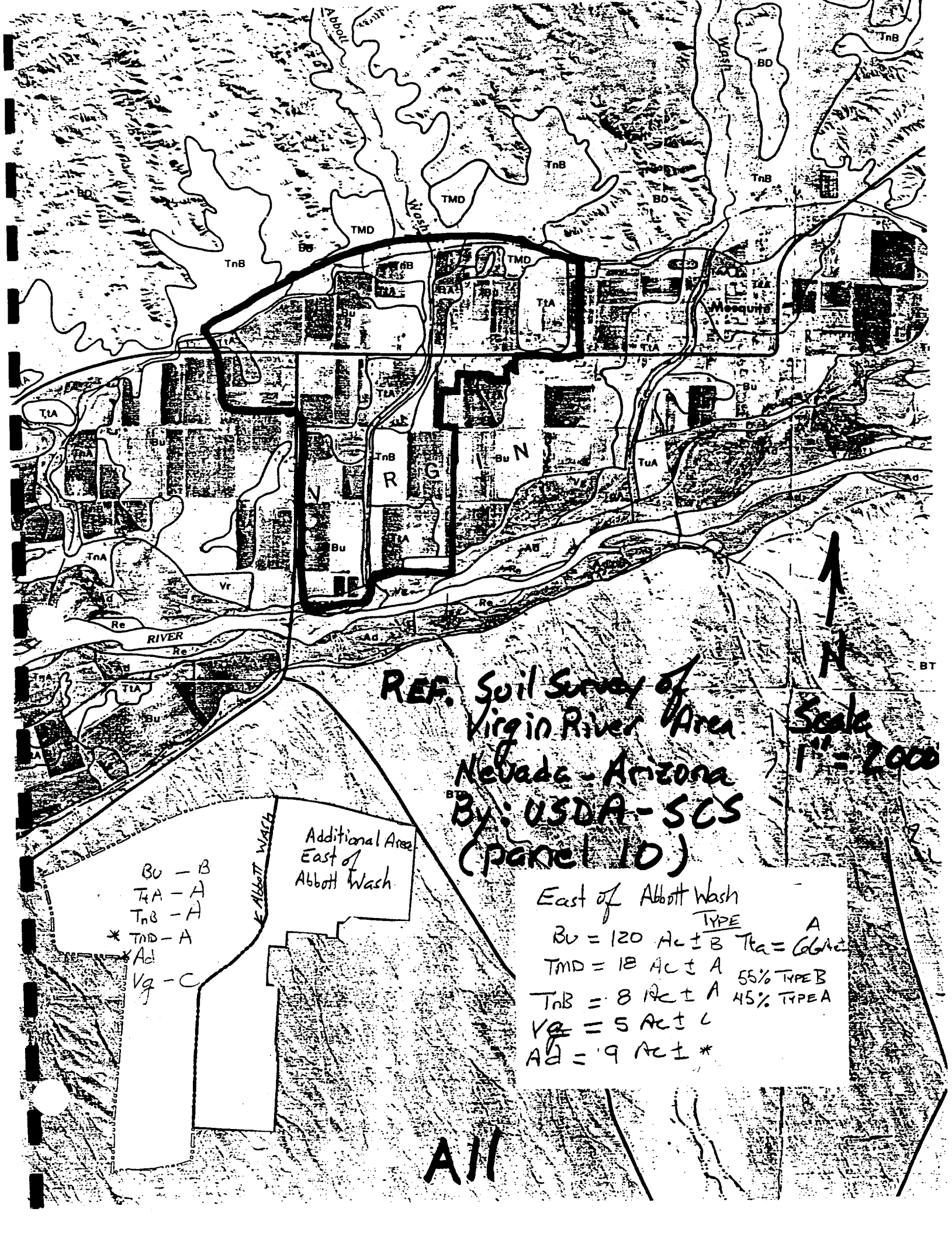
OVERALL A10

A-10 WEST CN = 80
AREA = 220 AC.

A-10 EAST CN = 83
AREA = 314 AC.

$$\text{OVERALL A-10} = \frac{80(220\text{ AC}) + 83(214\text{ AC})}{534\text{ AC}} = 82 \leftarrow \text{CN A-10}$$

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD



Abbott
Wash
TnB
BD
TMD
TtA
Bu
TuA
TnA
Vr
Re
RIVER
Ad
BT
Mesquite
N
Scale
1" = 2000
REF. Soil Survey of
Virgin River Area
Nevada - Arizona
By: USDA-SCS
(panel 10)
Additional Area
East of
Abbott Wash
Abbott Wash
Bu - B
TtA - A
TnB - A
* TMD - A
* Ad
Vg - C
East of Abbott Wash
TYPE
Bu = 120 Ac ± B
Tta = 66 Ac ± A
TMD = 18 Ac ± A
55% TYPE B
TnB = 8 Ac ± A
45% TYPE A
Vg = 5 Ac ± C
Ad = 9 Ac ± *
All

CHECK GREEN-AMPT PARAMETERS

A-10 EAST AREA = 226 AC ±

SOIL TYPE / %	DESCRIPTION	XKSAT	(REFERENCE XKSAT PARAMETERS: 1995 MPU CH2M-HILL. APPENDIX D, PAGE 83.)
Bu / 55%	TYPE B SILT LOAM	0.15	
TmD / 10%	TYPE A SANDY LOAM	0.40	
T+A / 30%	TYPE A SANDY LOAM	0.40	
TnB / 5%	TYPE A LOAMY SAND	1.2	

A-10 EAST WT. XKSAT

$$\text{WT. XKSAT} = 0.55(0.15) + 0.10(0.40) + 0.30(0.40) + 0.05(1.2) = \underline{0.3}$$

A-10 WEST

XKSAT = 0.42 PER 1995 & 2001 MPU
AREA = 314 AC.

OVERALL WT. XKSAT

$$\text{A-10 XKSAT} = \frac{226\,\text{Ac.}(0.3) + 314\,\text{Ac.}(0.42)}{540\,\text{Ac.}} = \underline{0.37}\ \text{USE}\ 0.42$$

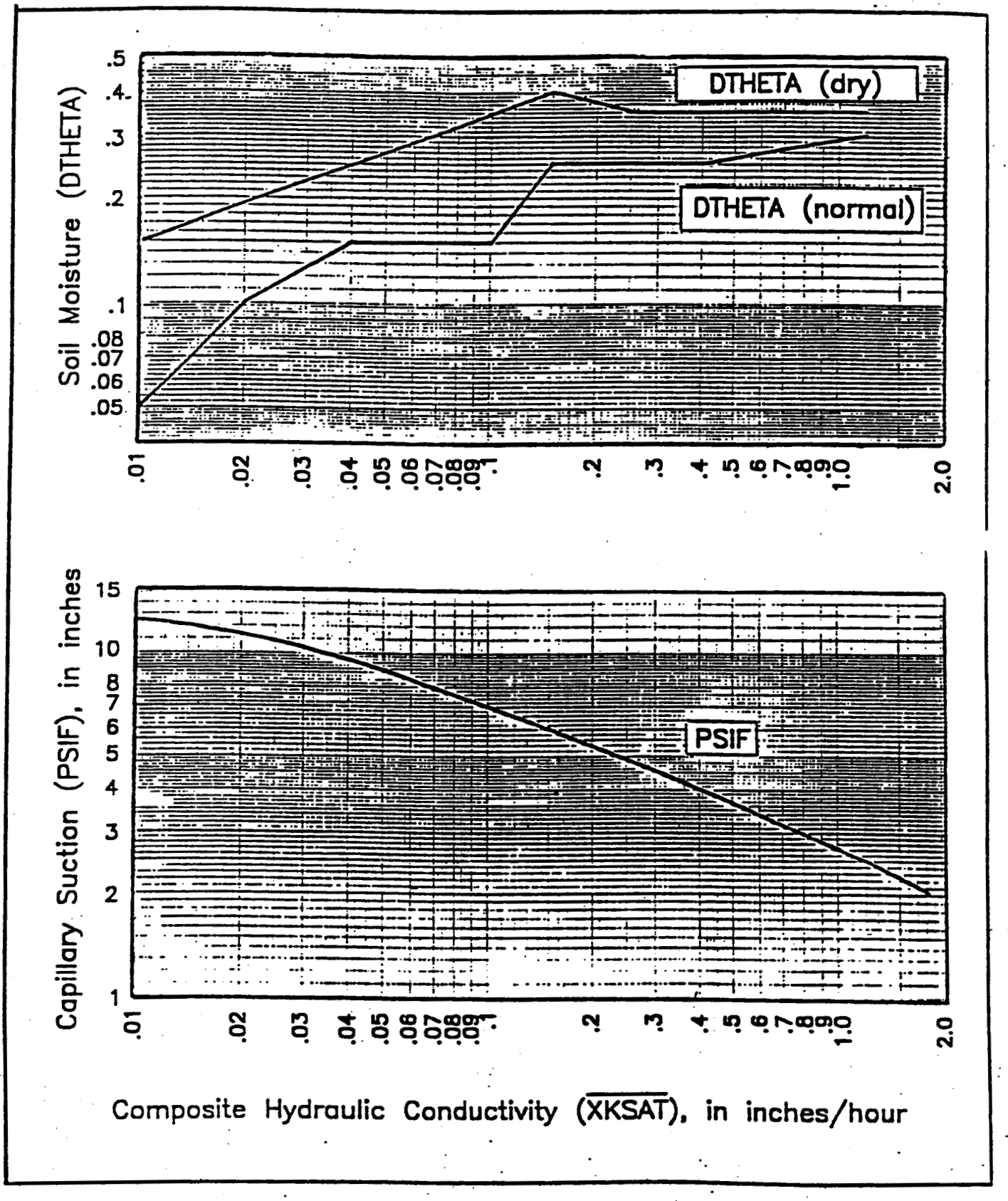
DTHETA & PSIF CARDS ARE ESTIMATED USING FIG. 3-3 (1995 MPU BY CH2M-HILL) W/ XKSAT = 0.42
DTHETA (NORMAL) = 0.25

PSIF = 3.9

FIGURE 3-3

COMPOSITE VALUES OF PSIF AND DTHETA AS A FUNCTION OF $\overline{XKSAT}$

(To be used for Area Weighted Averaging of Green and Ampt Parameter Values)



TIME OF CONCENTRATION AND HEC-1 INPUT

Development ABBOTT WASH - BASIN A10

Calculated by MK Date March 11, 2002

Sub-Basin Data				Initial / Overland Time (t_i)			Travel Time (t_t)				t_c Check (Urbanized Basins)		Final t_c			Remarks
KK			BA											UD	LS	HEC-1 Card
Desig:	K	Area Ac	Area sq mi	Length ft	Slope %	t_i Min.	Length ft	Slope %	Vel. fps	t_t Min.	Total Length ft	t_c=(L/180)+10 Min.	Min.	Lag Time (hr)	CN	
A10	0.7848	534	0.8344	150	4	4.37741	1340	0.61	1.58	14.1559	8360	56.44	40.69	0.4069	89	C=20.2
				200	1	8.02368	850	0.68	2.52	5.62169						
							560	0.7	3.79	2.46262						30"CMP
							1280	0.7	9.56	2.23152						48"RCP
							700	0.5	8.08	1.44389						48"RCP
							3280	0.85	23	2.37681						Avg. wash
																velocity Q100

$t_i = 1.8 * (1.1 - K) * L^{1.2} / S^{1/3}$

$t_c = t_i + t_t$

REFERENCE:

A15

STANDARD FORM 4

Revision	Date

— REVISED ROUTING DISCUSSION — (SEE FIGURE, NEXT PAGE)

Revised Routing From Point 40 To Point 50, Abbott Wash.

* Original Routing used by CHZM-Hill & Pentacore = Muskingum
  - Scaled length between 40 & 50 ≃ 8000 ft.
  - Length used in model between 40 & 50 = 9,400 ft. (Existing channel Meanders)

* Due To Completed Improvents between Pioneer Blvd. & Hardy Way, Abbott Wash Channel improved To Unifarm Channel with a Concrete Low Flow & Reinforced Turf Sides. Abbott Wash Channel between Pioneer Blvd. & I-15 To be improved With Abbott Wash Conveyance Project. Per G.C. Wallace Imp. Plans For Abbott Wash between Hardy Way & Pioneer Blvd., Length = 3,400 ft. Distance Between Pioneer Blvd. & I-15 is Approximately 600 ft. Therefore, Improved Channel Length = 4,000 ft ±. (Scaled distance ~ 4,000 ft.)
Measured length of Meandering Channel between Point 40 and Hardy Way ≃ 4,540 ft. Scaled Distance between Point 40 and Hardy Way along a straight line ≃ 3,800 ft.

Routing Between Point 40 & 50 Through Sub-basin A9 Broke into Two Routing methods.

- 40 - 40b = routing of Existing channel From Point 40 To Hardy Way. Method = Muskingum, Revised Parameters included on following Pages

- 40b - 50 = routing of Improved channel From Hardy Way To I-15, Method = Kinematic Wave (RK) ← Hec-1 Calculates Time.

MUSKINGUM PARAMETERS FOR ROUTING CP 40 TO 40b **Abbott Wash**

June 20, 2002

Note:

Basin A9 was revised in order to account for the improvements to the channel in the south 1/2 of the basin. CP 40 to CP 50 routes flows through Basin A9. The developed portion of the channel was modeled using the Kinematic Wave method. The undeveloped portion was modeled using the Muskingum method.

The original routing method was the Muskingum method from points 40 to 50. The original HEC-1 model was modified to account for both methods. The Muskingum method for the undeveloped portion of the channel was modified from the original to include only the undeveloped channel.

The original length was modified from 9400' to 4540' to account for the undeveloped portion only.

The original slope was modified from 0.7% to 1.1%.(topography indicates upper reach is steeper than the lower reach. Slope based on elevation at point 40 (1690 ft.) to Hardy Way (1640 ft.) L=4540 ft.

Slope of the developed channel was referenced from the avg. design slope per G.C. Wallace Abbott Wash plans.

Referenced channel geometry and manning's n for existing upstream channel from 1995 MPU by CH2M-Hill, pg. 64.

Channel: bottom width=30', side slopes=4:1, n=0.055

Avg. flow velocity is assumed to occur at 1/3 peak discharge Per methodology used in 1995 MPU by CH2M-Hill.

MUSKINGUM ROUTING

X per CCRFCDM, Section 608.1

K = L/(3,600*Vw) (Eq. 621, CCRFCDM)

L = reach length (ft) = 4540 ft (undeveloped channel length, CP 40 to 40b)

V = Average flow velocity

Vw (celerity) = 1.5*Average flow velocity

delta t = 5 minutes = 0.083 hrs.

Note:

Channnel parameters: Routing reach- 40-40b

Q=2709 cfs approx. 2700 cfs, 1/3Q=900 cfs+/-, alluvial channel n=0.055, bw=30', ss=4:1, delta elev.=50', L=4540', slope=0.011, avg. velocity=5.51 fps.

Refer to Haestad Flowmaster output for typical cross-section geometry and parameters-next page.

Storage Constant, K**

Basin	Begin Routing	End Routing	X	L (ft)	Avg. flow velocity V (fps)	Floodwave Celerity Vw (fps)	K (hrs)
Abbott	A1	10	0.15	10250	4.5	6.8	0.422
	10	20	0.15	5600	4.3	6.5	0.241
	20	40	0.15	5600	3.8	5.7	0.273
	30	40	0.15	10200	3.8	5.7	0.497
Original	40	50	0.15	9400	*4.1/5.8	*6.2/8.7	*0.425/0.30
Revised	**40**	**40b**	**0.15**	**4540**	**5.51**	**8.27**	**0.152**

round to 0.15

(*existing/developed)

NSTPS**				HEC-1**		
2(1-X)K/delta t >= NSTPS >=2XK/delta t				NSTPS	K	X
8.6	5.0	1.5		5	0.422	0.15
4.9	3.0	0.9		3	0.241	0.15
5.6	3.0	1		3	0.273	0.15
10.1	6.0	1.8		6	0.497	0.15
*8.7/6.1	*5.0/4	*1.5/1.1	ORIGINAL	*5/4	*0.425/0.30	0.15
3.11	**2.0**	**0.55**	**REVISED**	**2**	**0.15**	**0.15**

(*existing condition/future developed)

**tables referenced from:
1995 MPU by CH2M-Hill
Appendix G, page 4.

Note:

Muskingum parameters identified in 2001 MPU are almost identical for reach 40-50. 2001 MPU uses an x weighting factor of 0.30 while the 1995 MPU uses 0.15. Section 608.1 of the CCRFCD Manual indicates an x value of 0.15 for the Clark County area.

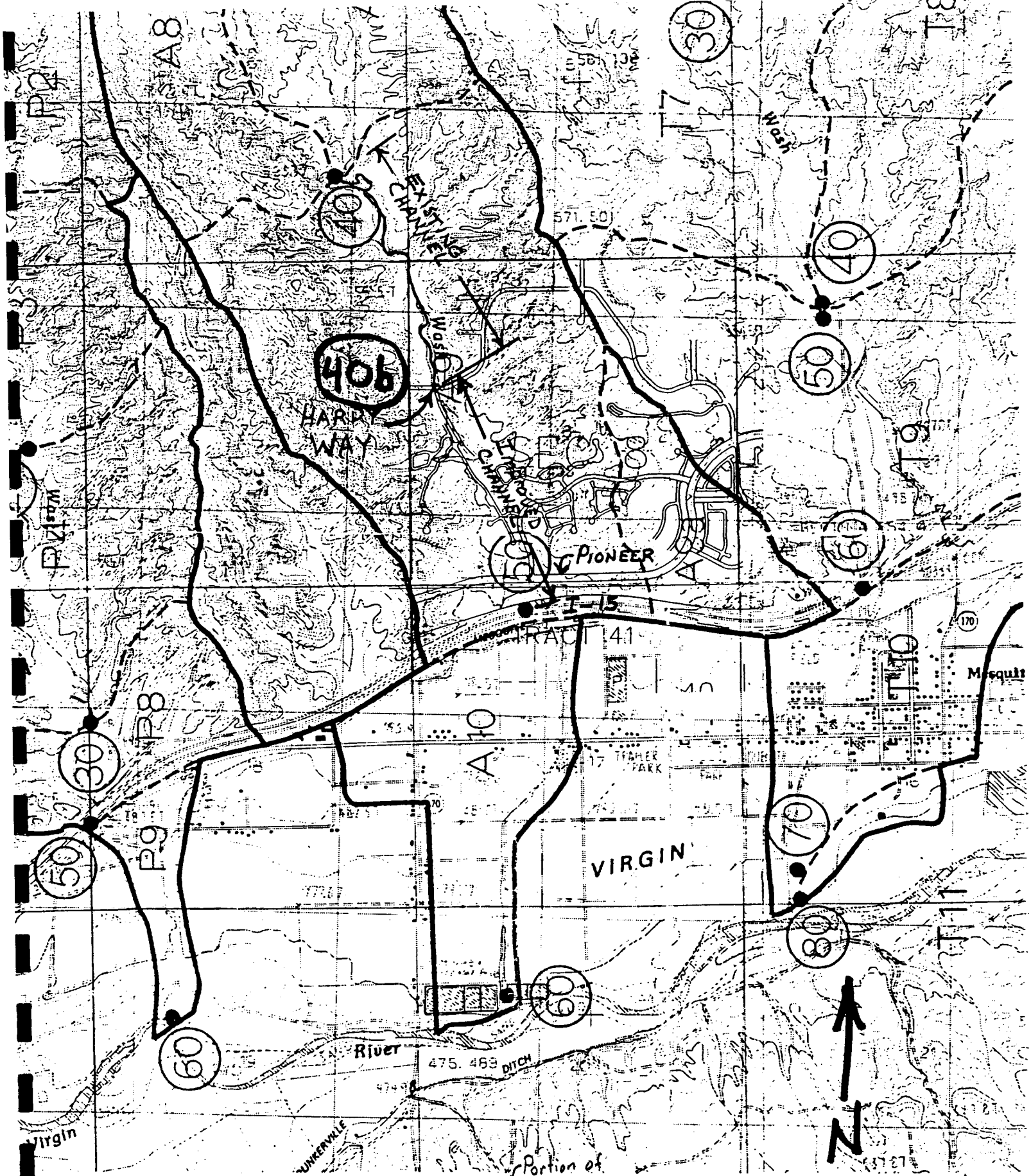
Existing Upstream Channel, Reach 40 -40b
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\abbottwa.fm2
Worksheet	Existing Upstream Trap. Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.055	
Channel Slope	0.011000	ft/ft
Left Side Slope	4.000000	H : V
Right Side Slope	4.000000	H : V
Bottom Width	30.00	ft
Discharge	900.00	cfs

1/3 peak Flow @ Point 40
See revised Hec-1 Model, page A27, Depth-Area Reduction Factor = 0.90
Q_{100} @ Pt. 40 = 2,707 cfs

Results		
Depth	3.66	ft
Flow Area	163.26	ft²
Wetted Perimeter	60.16	ft
Top Width	59.26	ft
Critical Depth	2.68	ft
Critical Slope	0.034903	ft/ft
Velocity	5.51	ft/s
Velocity Head	0.47	ft
Specific Energy	4.13	ft
Froude Number	0.59	
Flow is subcritical.		



REFERENCE : FIGURE D-2
EXISTING CONDITION
HYDROLOGIC MAP
(CHZM-HILL.)

SCALE 1" = 2000'

- A19 -

5/22/95

CH2M HILL

Subject: MESQUITE MASTERPLAN UPDATE
Abbott Wash: Estimating parameters for Muskingum routing of channels S. of County line
Existing Conditions

By: H. Allen
Project No: SWW39645.A1.02

Notes:
Routing parameter, K, is assumed to be based on the celerity (Vw) of the "elementary discharge wave" (see Flood Hydrology Manual (FHM), BuRec, 1989)
Vw is assumed to equal 1.5 times the mean velocity of the flood flow (per FHM).
The mean velocity is assumed to occur at a discharge that is 1/3 the peak discharge.
Velocities estimated using the Manning Equation in typical channel cross-sections
Reach lengths are from 1991 Masterplan Update.
Following values for the discharge and Muskingum Routing parameters are the results of several iterations with HEC-1.

Typical Channel Characteristics:

	Manning's n (after Chow, 1959)														
	Material, n0		Irreg., n1		Var. of x-sec, n2		Obstructions, n3		Vegetation, n4		Meandering, m5		Manning's	Bottom Width, bw,	Channel Side
Channel Location	Desc.	Value	Desc.	Value	Desc.	Value	Desc.	Value	Desc.	Value	Desc.	Value	n	ft	Slopes
Upper Badlands	earth	0.02	severe	0.02	occasional	0.005	minor	0.01	low	0.01	Apprec.	1.25	0.081	15	2:1
Lower Badlands	earth	0.02	severe	0.02	occasional	0.005	minor	0.01	low	0.01	Apprec.	1.20	0.078	30	2:1
Alluvial	earth	0.02	moderate	0.01	occasional	0.005	minor	0.005	low	0.01	Apprec.	1.10	0.055	varies	4:1

Routing Reach								Channel Slope				Ave
Begin	End	Q, cfs	1/3 Q, cfs	Channel Location	n	bw	SS	Δ El., meters	Δ El., ft.	L, ft.	Slope, ft/ft	Velocity ft/s
A1	10	1163	388	Upper Badlands	0.081	15	2:1	50	164.0	10250	0.0160	4.5
10	20	1525	508	Upper Badlands	0.081	15	2:1	20	65.6	5600	0.0117	4.3
20	40	1671	557	Lower Badlands	0.078	30	2:1	15	49.2	5600	0.0088	3.8
30	40	1273	424	Lower Badlands	0.078	30	2:1	35	114.8	10200	0.0113	3.8
40	50	3009	1003	Alluvial	0.055	80	4:1	20	65.6	9400	0.0070	4.1

MUSKINGUM ROUTING

X per CCRFCD Hydrology Design Manual, Section 608.1
K = L/(3600Vw) (equ. 621), L = reach length, Vw = floodwave velocity
Floodwave velocity, Vw, (celerity) = 1.5 times average flow velocity.
Δt = 5 minutes = 0.083 hours

			Storage Constant, K					NSTPS			HEC-1		
Basin	Begin Routing	End Routing	X	L, ft.	Ave. flow Velocity, ft/s V	Floodwave Celerity, ft/s Vw	K, hrs.	2(1-X)K/Δt	>= NSTPS >=	2XK/Δt	NSTPS	K	X
Abbott	A1	10	0.15	10250	4.5	6.8	0.422	8.6	5.0	1.5	5	0.422	0.15
	10	20	0.15	5600	4.3	6.5	0.241	4.9	3.0	0.9	3	0.241	0.15
	20	40	0.15	5600	3.8	5.7	0.273	5.6	3.0	1.0	3	0.273	0.15
	30	40	0.15	10200	3.8	5.7	0.497	10.1	6.0	1.8	6	0.497	0.15
	40	50	0.15	9400	4.1	6.2	0.425	8.7	5.0	1.5	5	0.425	0.15

A20

Ref: 1995 MPU

CH2M HILL

Subject: MESQUITE MASTERPLAN UPDATE
Abbott Wash: Estimating parameters for Muskingum routing of channels S. of County line
Future Conditions

By: H. Allen
Project No: SWW39645.A1.02

Notes:
Routing parameter, K, is assumed to be based on the celerity (Vw) of the "elementary discharge wave" (see Flood Hydrology Manual (FHM), BuRec, 1989)
Vw is assumed to equal 1.5 times the mean velocity of the flood flow (per FHM).
The mean velocity is assumed to occur at a discharge that is 1/3 the peak discharge.
Velocities estimated using the Manning Equation in typical channel cross-sections
Reach lengths are from 1991 Masterplan Update.
Following values for the discharge and Muskingum Routing parameters are the results of several iterations with HEC-1.
For future conditions, assume upper-badland channels aren't modified, lower-badland channels are slightly regraded and alluvial channels are highly "improved".
Also assume that channel lengths and slopes are the same as existing conditions.

Typical Channel Characteristics:

	Manning's n (after Chow, 1959)													Bottom	Channel
	Material, n0		Irreg., n1		Var. of x-sec, n2		Obstructions, n3		Vegetation, n4		Meandering, m5		Manning's	Width, bw,	Side
Channel Location	Desc.	Value	Desc.	Value	Desc.	Value	Desc.	Value	Desc	Value	Desc	Value	n	ft	Slopes
Upper Badlands	earth	0.02	severe	0.020	occasional	0.005	minor	0.01	low	0.01	Apprec.	1.25	0.081	15	2:1
Lower Badlands	earth	0.02	moderate	0.015	occasional	0.005	minor	0.01	low	0.01	Apprec.	1.15	0.069	30	2:1
Alluvial	earth	0.02	moderate	0.010	gradual	0.000	negligible	0.002	low	0.005	minor	1.05	0.039	varies	4:1

Routing Reach								Channel Slope				Ave
Begin	End	Q, cfs	1/3 Q, cfs	Channel Location	n	bw	SS	Δ El., meters	Δ El., ft.	L, ft.	Slope, ft/ft	Velocity ft/s
A1	10	1163	388	Upper Badlands	0.081	15	2:1	50	164.0	10250	0.0160	4.5
10	20	1525	508	Upper Badlands	0.081	15	2:1	20	65.6	5600	0.0117	4.3
20	40	1679	560	Lower Badlands	0.069	30	2:1	15	49.2	5600	0.0088	4.1
30	40	1310	437	Lower Badlands	0.069	30	2:1	35	114.8	10200	0.0113	4.2
40	50	3126	1042	Alluvial	0.039	50	4:1	20	65.6	9400	0.0070	5.8

Note: Routing P6 to 30 is 1/2 Lower Badlands and 1/2 Alluvial so average values were used

MUSKINGUM ROUTING

X per CCRFCD Hydrology Design Manual, Section 608.1
K = L/(3600Vw) (equ 621), L = reach length, Vw = floodwave velocity
Floodwave velocity, Vw, (celerity) = 1.5 times average flow velocity.
Δt = 5 minutes = 0.083 hours

			Storage Constant, K					NSTPS			HEC-1		
Basin	Begin Routing	End Routing	X	L, ft	Ave. flow Velocity, ft/s V	Floodwave Celerity, ft/s Vw	K, hrs.	2(1-X)K/Δt	>= NSTPS >=	2XK/Δt	NSTPS	K	X
Abbott	A1	10	0.15	10250	4.5	6.8	0.422	8.6	5.0	1.5	5	0.422	0.15
	10	20	0.15	5600	4.3	6.5	0.241	4.9	3.0	0.9	3	0.241	0.15
	20	40	0.15	5600	4.1	6.2	0.253	5.2	3.0	0.9	3	0.253	0.15
	30	40	0.15	10200	4.2	6.3	0.450	9.2	5.0	1.6	5	0.450	0.15
	40	50	0.15	9400	5.8	8.7	0.300	6.1	4.0	1.1	4	0.300	0.15

A21
E-5

REF.: 1995 MPU

```
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998             *
*           VERSION 4.1             *
*                                   *
*  RUN DATE   20JUN02  TIME  09:31:37   *
*                                   *
*************************************
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*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*         609 SECOND STREET         *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
              *
              *DIAGRAM
    1         ID     CITY OF MESQUITE MASTER PLAN UPDATE 2000
    2         ID     PENTACORE ENGINEERING  :  John J. Lee
    3         ID     ABBOTT WASH HYDROLOGIC ANALYSIS - 100 YEAR FUTURE DEVELOPED COND.
    4         ID     GREEN AMPT LOSS RATE PARAMETERS
    5         ID     THIS MODEL INCLUDES UNNAMED WASH
    6         ID     unnamed wash diverted to and combined with Abbott Wash
    7         ID     BASE MODEL FROM MESQUITE MPU 1995
    8         ID     May 2000
    9         ID     Revised:  5 DARFs Used
   10         ID                 0.89 @ Virgin River
   11         ID                 0.90 @ I-15
   12         ID                 0.91 @ Concentration Point 40
   13         ID               Drainage areas recalculated
   14         ID               Routing recalculated
   15         ID               Lag time recalculated
   16         ID               Removed the ponding area upstream of I-15 from 1995 MPU HEC-1
   17         ID     Revised:  March 1, 2002 by: Weston L. Nelson, BULLOCH BROTHERS ENG., INC.
   18         ID               Revised model included in 2001 MPU, Volume 2, Appendix G, Alt. 3
   19         ID               Increased Area of Sub-basin A10
   20         ID               Revised Lag Time in Sub-basin A10, UD = 0.41
   21         ID               Revised LG coefficients for Sub-basin A10: RTIMP=62%
   22         ID               Revised routing between 40 & 50 (40-50a RM K=0.15) (40-50b RK)
   23         ID               Revised RK routing between 50-60, n=0.015
   24         ID               Reduced Sub-basins A1 A2 A3 A5 A6 A7 A8 A9 A9a UN & Rev. A10
   25         ID                 by 0.01 sq. mi. for overall area = 7.99 sq. mi.
   26         ID               6 DARFs USed
   27         ID                 0.88 @ Virgin River
   28         ID                 0.89 @ I-15
   29         ID               Added Combination Point:
   30         ID                 Point 50a = peak flow @ I-15 prior to Unnamed Wash flows
   31         ID                 Point 50b = peak flow @ I-15 including  Unnamed Wash flows
   32         ID               File Name:  MPUAWBB2.dat
   33         IT       2       0        0     300
   34         IO       5
   35         IN       5       0        0
   36         JR    PREC     .88      .89     .90     .91     .92     .98
              *

   37         KK      A1
   38         BA    1.11
   39         PB   3.150
   40         PC       0    0.02    0.057    0.07   0.087   0.108   0.124    0.13    0.13    0.13
   41         PC    0.13    0.13     0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
   42         PC    0.19   0.197    0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
   43         PC   0.251   0.256     0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
   44         PC   0.499    0.59     0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
   45         PC    0.86   0.868    0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
   46         PC   0.982   0.985    0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
   47         PC   0.998   0.999        1
   48         LG    0.15     .35      4.4     .32       0
   49         UD     .40
              *
```



```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
```

```
 50          KK   A1-10   CNAME
 51          RM      5    .422      .15
             *

 52          KK      A2
 53          BA    0.79
 54          LG    0.15     .39      5.7      .17        0
 55          UD     .54
             *

 56          KK      10   CNAME       20
 57          HC       2
             *

 58          KK   10-20
 59          RM       3    .241      .15
             *

 60          KK      A3
 61          BA    0.54
 62          LG    0.15     .38      5.9      .16        0
 63          UD     .41
             *

 64          KK      A4
 65          BA    0.29
 66          LG    0.15     .31      7.3      .09        0
 67          UD     .29
             *

 68          KK      20   CNAME       40
 69          HC       3
             *

 70          KK   20-40
 71          RM       3    .273      .15
             *

 72          KK      A5
 73          BA    0.50
 74          LG    0.15     .34      4.9      .25       25
 75          UD     .37
             *

 76          KK    40A5
 77          HC       2
             *

 78          KK      A6
 79          BA    0.91
 80          LG    0.15      .4        6      .15        0
 81          UD     .35
             *
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 82          KK      A7
 83          BA    0.28
 84          LG    0.15     .35      6.8      .11        0
 85          UD     .24
             *

 86          KK      30   CNAME       40
 87          HC       2
             *

 88          KK   30-40
 89          RM       6    .497      .15
             *

 90          KK      A8
 91          BA    0.47
 92          LG    0.14     .20      6.6      .12       25
 93          UD     .35
             *

 94          KK      40   CNAME       50
 95          HC       3
             *

 96          KK  40-40b
 97          KM   Used Muskingum method to route from point 40 to Hardy Way
 98          KM   Hardy Way marks the beginning of channel improvements.
 99          RM       2    .150      .15

100          KK  40b-50
101          KM   Used Kinematic wave channel routing for improved channel
102          KM   from Hardy Way to I15.
103          RK    4000   0.009   0.025            TRAP       30        3
             *

104          KK      A9
```

```
 105          BA    1.39
 106          LG    0.15     .25     3.9     .42      30
 107          UD     .16
              *

 108          KK     A9a
 109          BA    0.27
 110          LG    0.15     .27     3.4     .58      30
 111          UD     .13
              *

 112          KK     50a   CNAME
 113          HC       3
              *
              * BEGIN UNNAMED WASH - SINGLE SUBWATERSHED, NO EXISTING OUTLET
              *
1                                          HEC-1 INPUT                                          PAGE  4

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 114          KK      UN
 115          KM              UNNAMED WASH
 116          BA    0.61
 117          LG     .16     .26     3.7     .49    25.8
 118          UD     .31
              *
              * END UNNAMED WASH WATERSHED
              *

 119          KK     50b   CNAME
 120          HC       2
              *

 121          KK   50-60
 122          RK    7350   .0082    .015            TRAP      20       2
              *

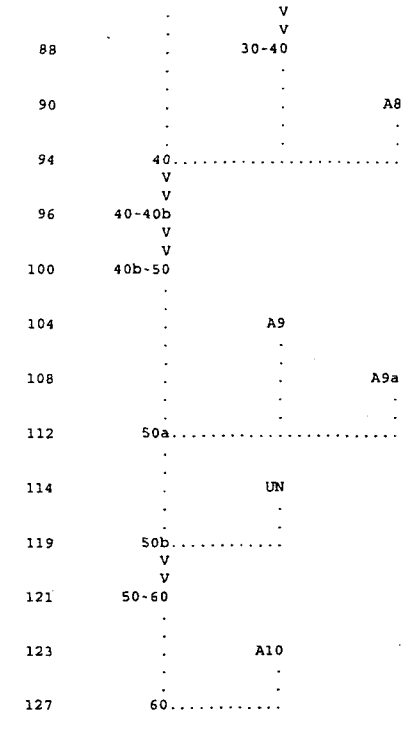
 123          KK     A10
 124          BA    0.83
 125          LG      .1     .25     3.9     .42      62
 126          UD     .41
              *

 127          KK      60
 128          HC       2
              *
 129          ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   37         A1
               V
               V
   50      A1-10
               .
               .
   52          .          A2
               .           .
               .           .
   56         10............
               V
               V
   58      10-20
               .
               .
   60          .          A3
               .           .
               .           .
   64          .           .          A4
               .           .           .
               .           .           .
   68         20........................
               V
               V
   70      20-40
               .
               .
   72          .          A5
               .           .
               .           .
   76       40A5............
               .
               .
   78          .          A6
               .           .
               .           .
   82          .           .          A7
               .           .           .
               .           .           .
   86          .          30............
```

A24



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*           VERSION 4.1                 *
*                                       *
* RUN DATE   20JUN02  TIME  09:31:37    *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*        609 SECOND STREET              *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
```

```
CITY OF MESQUITE MASTER PLAN UPDATE 2000
PENTACORE ENGINEERING  :  John J. Lee
ABBOTT WASH HYDROLOGIC ANALYSIS - 100 YEAR FUTURE DEVELOPED COND.
GREEN AMPT LOSS RATE PARAMETERS
THIS MODEL INCLUDES UNNAMED WASH
unnamed wash diverted to and combined with Abbott Wash
BASE MODEL FROM MESQUITE MPU 1995
May 2000
Revised:  5 DARFs Used
            0.89 @ Virgin River
            0.90 @ I-15
            0.91 @ Concentration Point 40
          Drainage areas recalculated
          Routing recalculated
          Lag time recalculated
          Removed the ponding area upstream of I-15 from 1995 MPU HEC-1
Revised:  March 1, 2002 by: Weston L. Nelson, BULLOCH BROTHERS ENG., INC.
          Revised model included in 2001 MPU, Volume 2, Appendix G, Alt. 3
          Increased Area of Sub-basin A10
          Revised Lag Time in Sub-basin A10, UD = 0.41
          Revised LG coefficients for Sub-basin A10: RTIMP=62%
          Revised routing between 40 & 50 (40-50a RM K=0.15) (40-50b RK)
          Revised RK routing between 50-60, n=0.015
          Reduced Sub-basins A1 A2 A3 A5 A6 A7 A8 A9 A9a UN & Rev. A10
            by 0.01 sq. mi. for overall area = 7.99 sq. mi.
          6 DARFs USed
            0.88 @ Virgin River
            0.89 @ I-15
          Added Combination Point:
            Point 50a = peak flow @ I-15 prior to Unnamed Wash flows
            Point 50b = peak flow @ I-15 including  Unnamed Wash flows
          File Name:  MPUAWBB2.dat

34 IO          OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                   NMIN           2  MINUTES IN COMPUTATION INTERVAL
```

```
                    IDATE      1    0  STARTING DATE
                    ITIME           0000  STARTING TIME
                      NQ             300  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      1    0  ENDING DATE
                   NDTIME           0958  ENDING TIME
                   ICENT              19  CENTURY MARK

                COMPUTATION INTERVAL      .03 HOURS
                    TOTAL TIME BASE     9.97 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

     JP        MULTI-PLAN OPTION
                    NPLAN             1  NUMBER OF PLANS

     JR        MULTI-RATIO OPTION
                  RATIOS OF PRECIPITATION
                   .88      .89      .90      .91      .92      .98
        WARNING EXCESS AT PONDING LESS THAN ZERO FOR PERIOD. EXCESS SET TO ZERO
1

          PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                          FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                   TIME TO PEAK IN HOURS
```

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .88	RATIO 2 .89	RATIO 3 .90	RATIO 4 .91	RATIO 5 .92	RATIO 6 .98
HYDROGRAPH AT										
+	A1	1.11	1	FLOW	907.	925.	943.	961.	979.	1088.
				TIME	3.80	3.80	3.80	3.80	3.80	3.80
ROUTED TO										
+	A1-10	1.11	1	FLOW	758.	773.	789.	805.	821.	916.
				TIME	4.23	4.23	4.23	4.23	4.23	4.23
HYDROGRAPH AT										
+	A2	.79	1	FLOW	600.	611.	622.	633.	644.	709.
				TIME	3.93	3.93	3.93	3.93	3.93	3.93
2 COMBINED AT										
+	10	1.90	1	FLOW	1228.	1252.	1277.	1302.	1326.	1476.
				TIME	4.13	4.13	4.13	4.13	4.13	4.13
ROUTED TO										
+	10-20	1.90	1	FLOW	1159.	1182.	1206.	1229.	1253.	1395.
				TIME	4.37	4.37	4.37	4.37	4.37	4.37
HYDROGRAPH AT										
+	A3	.54	1	FLOW	508.	517.	525.	534.	543.	595.
				TIME	3.80	3.80	3.80	3.80	3.80	3.80
HYDROGRAPH AT										
+	A4	.29	1	FLOW	376.	382.	387.	392.	398.	430.
				TIME	3.70	3.70	3.70	3.70	3.70	3.70
3 COMBINED AT										
+	20	2.73	1	FLOW	1344.	1372.	1399.	1427.	1455.	1623.
				TIME	4.30	4.30	4.30	4.30	4.30	4.30
ROUTED TO										
+	20-40	2.73	1	FLOW	1308.	1334.	1361.	1388.	1414.	1577.
				TIME	4.53	4.53	4.53	4.53	4.53	4.53
HYDROGRAPH AT										
+	A5	.50	1	FLOW	518.	527.	535.	543.	552.	602.
				TIME	3.77	3.77	3.77	3.77	3.77	3.77
2 COMBINED AT										
+	40A5	3.23	1	FLOW	1379.	1406.	1434.	1461.	1489.	1659.
				TIME	4.47	4.47	4.47	4.47	4.47	4.47
HYDROGRAPH AT										
+	A6	.91	1	FLOW	953.	969.	985.	1001.	1017.	1112.
				TIME	3.77	3.77	3.77	3.77	3.77	3.77
HYDROGRAPH AT										
+	A7	.28	1	FLOW	384.	390.	396.	402.	407.	441.
				TIME	3.63	3.63	3.63	3.63	3.63	3.63
2 COMBINED AT										
+	30	1.19	1	FLOW	1295.	1317.	1338.	1359.	1380.	1507.
				TIME	3.73	3.73	3.73	3.73	3.73	3.73
ROUTED TO										
+	30-40	1.19	1	FLOW	1047.	1065.	1083.	1101.	1119.	1225.

				TIME	4.23	4.23	4.23	4.23	4.23	4.23
HYDROGRAPH AT										
+	A8	.47	1	FLOW	581.	588.	596.	604.	612.	658.
				TIME	3.77	3.77	3.77	3.77	3.77	3.77
3 COMBINED AT										
+	40	4.89	1	FLOW	2614.	2661.	2707.	2753.	2800.	3080.
				TIME	4.17	4.17	4.17	4.17	4.17	4.17
ROUTED TO										
+	40-40b	4.89	1	FLOW	2571.	2617.	2663.	2709.	2755.	3032.
				TIME	4.33	4.33	4.33	4.33	4.33	4.33
ROUTED TO										
+	40b-50	4.89	1	FLOW	2570.	2616.	2661.	2707.	2753.	3031.
				TIME	4.37	4.37	4.37	4.37	4.37	4.37
HYDROGRAPH AT										
+	A9	1.39	1	FLOW	2112.	2144.	2176.	2208.	2240.	2431.
				TIME	3.57	3.57	3.57	3.57	3.57	3.57
HYDROGRAPH AT										
+	A9a	.27	1	FLOW	410.	417.	423.	430.	437.	476.
				TIME	3.57	3.57	3.57	3.57	3.57	3.57
3 COMBINED AT										
+	50a	6.55	1	FLOW	2744.	2790.	2835.	2881.	2925.	3194.
				TIME	3.60	3.60	3.60	3.60	3.60	3.60
HYDROGRAPH AT										
+	UN	.61	1	FLOW	637.	648.	659.	670.	680.	745.
				TIME	3.70	3.70	3.70	3.70	3.70	3.70
2 COMBINED AT										
+	50b	7.16	1	FLOW	3280.	3334.	3389.	3444.	3497.	3823.
				TIME	3.60	3.60	3.60	3.60	3.60	3.60
ROUTED TO										
+	50-60	7.16	1	FLOW	3251.	3304.	3357.	3415.	3467.	3796.
				TIME	3.63	3.63	3.63	3.63	3.63	3.63
HYDROGRAPH AT										
+	A10	.83	1	FLOW	910.	922.	935.	947.	959.	1034.
				TIME	3.80	3.80	3.80	3.80	3.80	3.80
2 COMBINED AT										
+	60	7.99	1	FLOW	3999.	4067.	4130.	4196.	4263.	4646.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .88									
40b-50	MANE	1.30	2570.61	260.78	1.13	2.00	2570.15	262.00	1.13

CONTINUITY SUMMARY (AC-FT) - *INFLOW*= .2947E+03 EXCESS= .0000E+00 OUTFLOW= .2948E+03 BASIN STORAGE= .5350E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .89									
40b-50	MANE	1.31	2616.20	260.78	1.15	2.00	2615.77	262.00	1.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3006E+03 EXCESS= .0000E+00 OUTFLOW= .3008E+03 BASIN STORAGE= .5732E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .90									
40b-50	MANE	1.29	2661.94	261.58	1.18	2.00	2661.24	262.00	1.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3066E+03 EXCESS= .0000E+00 OUTFLOW= .3067E+03 BASIN STORAGE= .5036E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .91									
40b-50	MANE	1.28	2707.82	261.17	1.20	2.00	2707.47	262.00	1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3125E+03 EXCESS= .0000E+00 OUTFLOW= .3127E+03 BASIN STORAGE= .7060E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .92									
40b-50	MANE	1.20	2753.79	261.79	1.22	2.00	2753.30	262.00	1.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3185E+03 EXCESS= .0000E+00 OUTFLOW= .3187E+03 BASIN STORAGE= .6174E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .98

```
          40b-50  MANE         1.11   3031.57    262.05      1.36      2.00   3031.48    262.00        1.36

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3546E+03 EXCESS= .0000E+00 OUTFLOW= .3548E+03 BASIN STORAGE= .5505E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .88
             50-60  MANE         1.37   3261.97    218.33      1.20      2.00   3251.26    218.00        1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4578E+03 EXCESS= .0000E+00 OUTFLOW= .4579E+03 BASIN STORAGE= .2513E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .89
             50-60  MANE         1.38   3311.65    219.30      1.22      2.00   3304.29    218.00        1.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4664E+03 EXCESS= .0000E+00 OUTFLOW= .4665E+03 BASIN STORAGE= .2601E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .90
             50-60  MANE         1.38   3377.21    218.92      1.24      2.00   3357.03    218.00        1.24

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4750E+03 EXCESS= .0000E+00 OUTFLOW= .4751E+03 BASIN STORAGE= .2453E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .91
             50-60  MANE         1.35   3418.80    219.34      1.27      2.00   3415.15    218.00        1.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4836E+03 EXCESS= .0000E+00 OUTFLOW= .4837E+03 BASIN STORAGE= .2284E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .92
             50-60  MANE         1.31   3478.85    219.12      1.29      2.00   3467.12    218.00        1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4922E+03 EXCESS= .0000E+00 OUTFLOW= .4923E+03 BASIN STORAGE= .2487E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .98
             50-60  MANE         1.29   3804.99    218.23      1.43      2.00   3795.90    218.00        1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5446E+03 EXCESS= .0000E+00 OUTFLOW= .5447E+03 BASIN STORAGE= .2738E-01 PERCENT ERROR=    .0


*** NORMAL END OF HEC-1 ***
```

Abbott Wash
Alternative 3
(Diversion from Unnamed Wash)
(No Detention Basin)

```
1*************************************                    *************************************
*                                   *                    *                                   *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS    *
*              JAN   1997            *                    *   HYDROLOGIC ENGINEERING CENTER   *
*           VERSION 4.1              *                    *        609 SECOND STREET          *
*                                   *                    *      DAVIS, CALIFORNIA 95616      *
*  RUN DATE   03APR01  TIME  10:35:39 *                    *          (916) 756-1104           *
*                                   *                    *                                   *
*************************************                    *************************************
```

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                    HEC-1 INPUT                                    PAGE  1

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

              *
              *DIAGRAM
  1           ID     CITY OF MESQUITE MASTER PLAN UPDATE 2000
  2           ID     PENTACORE ENGINEERING  :  John J. Lee
  3           ID     ABBOTT WASH HYDROLOGIC ANALYSIS - 100 YEAR FUTURE DEVELOPED COND.
  4           ID     GREEN AMPT LOSS RATE PARAMETERS
  5           ID     THIS MODEL INCLUDES UNNAMED WASH
  6           ID     unnamed wash diverted to and combined with Abbott Wash
  7           ID     BASE MODEL FROM MESQUITE MPU 1995
  8           ID     May 2000
  9           ID    Revised  : 5 DARFs Used
 10           ID               0.89 @ Virgin River
 11           ID               0.90 @ I-15
 12           ID               0.91 @ Concentration Point 40
 13           ID    Revised :  Drainage areas recalculated
 14           ID    Revised :  Routing recalculated
 15           ID    Revised :  Lag time recalculated
 16           ID    Revised :  Removed the ponding area, upstream of I-15 from 1995 MPU HEC-1
 17           IT       2       0       0     300
```

A30

```
 18          IO        5
 19          IN        5         0         0
 20          JR     PREC      .89       .90       .91       .92       .98
             *

 21          KK       A1
 22          BA     1.12
 23          PB     3.15
 24          PC        0      0.02     0.057      0.07     0.087     0.108     0.124      0.13      0.13      0.13
 25          PC     0.13      0.13      0.13     0.133      0.14     0.142     0.148     0.158     0.172     0.181
 26          PC     0.19     0.197     0.199       0.2     0.201     0.204     0.214     0.229     0.241     0.249
 27          PC    0.251     0.256      0.27     0.278     0.281     0.283     0.295     0.322     0.352     0.409
 28          PC    0.499      0.59      0.71     0.744     0.781     0.812     0.819     0.835     0.851     0.856
 29          PC     0.86     0.868     0.876     0.888      0.91     0.926     0.937      0.95      0.97     0.976
 30          PC    0.982     0.985     0.987     0.989      0.99     0.993     0.993     0.994     0.995     0.998
 31          PC    0.998     0.999         1
 32          LG     0.15       .35       4.4       .32         0
 33          UD      .40
             *

 34          KK    A1-10     CNAME
 35          RM        5      .422       .15
             *

 36          KK       A2
 37          BA     0.80
 38          LG     0.15       .39       5.7       .17         0
 39          UD      .54
             *

 40          KK       10     CNAME        20
 41          HC        2
             *
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 42          KK    10-20
 43          RM        3      .241       .15
             *

 44          KK       A3
 45          BA     0.55
 46          LG     0.15       .38       5.9       .16         0
 47          UD      .41
             *

 48          KK       A4
 49          BA     0.29
 50          LG     0.15       .31       7.3       .09         0
 51          UD      .29
             *

 52          KK       20     CNAME        40
 53          HC        3
             *
```

```
 54          KK   20-40
 55          RM       3    .273      .15
             *

 56          KK       A5
 57          BA     0.51
 58          LG     0.15      .34      4.9      .25       25
 59          UD      .37
             *

 60          KK     40A5
 61          HC        2
             *

 62          KK       A6
 63          BA     0.92
 64          LG     0.15       .4        6      .15
 65          UD      .35
             *

 66          KK       A7
 67          BA     0.29
 68          LG     0.15      .35      6.8      .11
 69          UD      .24
             *

 70          KK       30   CNAME       40
 71          HC        2
             *
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 72          KK   30-40
 73          RM       6    .497      .15
             *

 74          KK       A8
 75          BA     0.48
 76          LG     0.14      .20      6.6      .12       25
 77          UD      .35
             *

 78          KK       40   CNAME       50
 79          HC        3
             *

 80          KK   40-50
 81          RM       5    .425      .15
             *

 82          KK       A9
 83          BA     1.40
 84          LG     0.15      .25      3.9      .42       30
 85          UD      .16
```

```
                    *

  86                KK     A9a
  87                BA    0.28
  88                LG    0.15      .27      3.4      .58      30
  89                UD     .13
                    *
                    * BEGIN UNNAMED WASH - SINGLE SUBWATERSHED, NO EXISTING OUTLET
                    *

  90                KK      UN
  91                KM              UNNAMED WASH
  92                BA    0.62
  93                LG     .16      .26      3.7      .49     25.8
  94                UD     .31
                    *
                    * END UNNAMED WASH WATERSHED
                    *

  95                KK      50   CNAME
  96                HC       4
                    *

  97                KK   50-60
  98                RK    7800   .0088    .035            TRAP      20       2
                    *
1                                                HEC-1 INPUT                                                PAGE  4

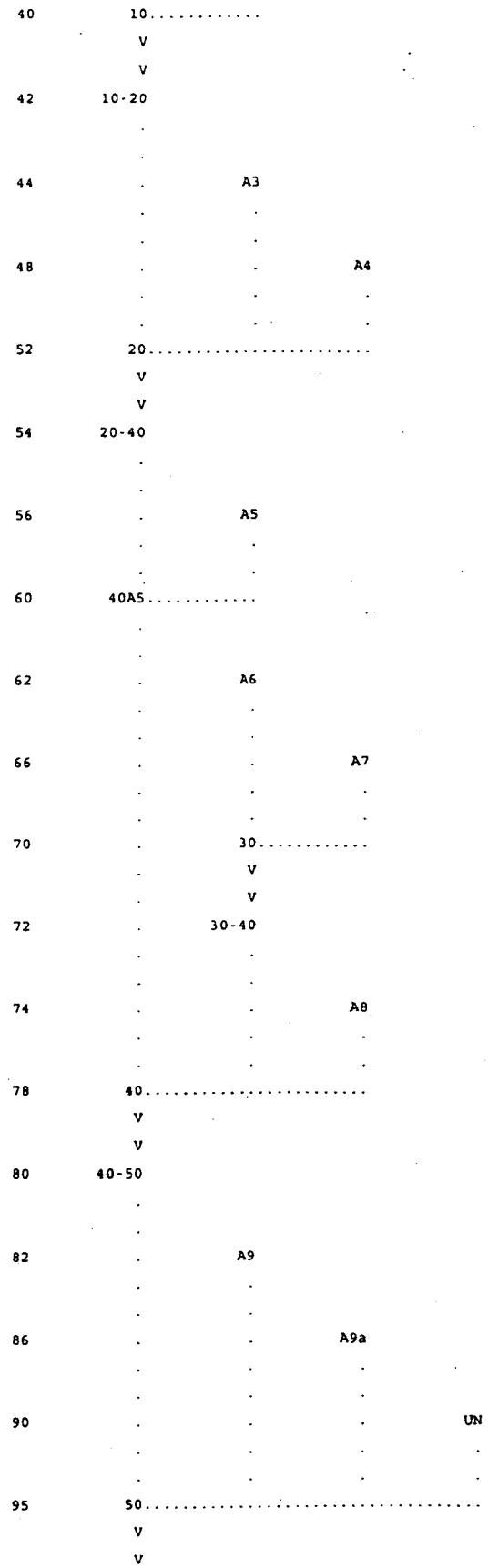
         LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  99                KK     A10
 100                BA    0.49
 101                LG      .1      .25      3.9      .42      38
 102                UD     .46
                    *

 103                KK      60
 104                HC       2
                    *
 105                ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   21          A1
                V
                V
   34       A1-10
                .
                .
   36           .          A2
                .           .
                .           .
```


40
10
42
10-20
44
A3
48
A4
52
20
54
20-40
56
A5
60
40A5
62
A6
66
A7
70
30
72
30-40
74
A8
78
40
80
40-50
82
A9
86
A9a
90
UN
95
50

```
 97        50-60
                .
                .
 99             .          A10
                .           .
                .           .
103           60............

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                    ***************************************
*                                       *                    *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS      *
*              JAN   1997               *                    *   HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1                 *                    *         609 SECOND STREET           *
*                                       *                    *      DAVIS, CALIFORNIA 95616        *
*  RUN DATE   03APR01  TIME  10:35:39   *                    *          (916) 756-1104             *
*                                       *                    *                                     *
*****************************************                    ***************************************
```

CITY OF MESQUITE MASTER PLAN UPDATE 2000
PENTACORE ENGINEERING : John J. Lee
ABBOTT WASH HYDROLOGIC ANALYSIS - 100 YEAR FUTURE DEVELOPED COND.
GREEN AMPT LOSS RATE PARAMETERS
THIS MODEL INCLUDES UNNAMED WASH
unnamed wash diverted to and combined with Abbott Wash
BASE MODEL FROM MESQUITE MPU 1995
May 2000
Revised : 5 DARFs Used
0.89 @ Virgin River
0.90 @ I-15
0.91 @ Concentration Point 40
Revised : Drainage areas recalculated
Revised : Routing recalculated
Revised : Lag time recalculated
Revised : Removed the ponding area upstream of I-15 from 1995 MPU HEC-1

```
18 IO          OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                     NMIN          2  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1    0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     1    0  ENDING DATE
                   NDTIME       0958  ENDING TIME
                   ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL     .03 HOURS
                     TOTAL TIME BASE    9.97 HOURS
```

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION

NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION

RATIOS OF PRECIPITATION

.89 .90 .91 .92 .98

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES

TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .89	RATIO 2 .90	RATIO 3 .91	RATIO 4 .92	RATIO 5 .98
HYDROGRAPH AT									
+	A1	1.12	1	FLOW	933.	951.	970.	988.	1098.
				TIME	3.80	3.80	3.80	3.80	3.80
ROUTED TO									
+	A1-10	1.12	1	FLOW	780.	796.	812.	828.	924.
				TIME	4.23	4.23	4.23	4.23	4.23
HYDROGRAPH AT									
+	A2	.80	1	FLOW	619.	630.	641.	652.	718.
				TIME	3.93	3.93	3.93	3.93	3.93
2 COMBINED AT									
+	10	1.92	1	FLOW	1265.	1290.	1315.	1340.	1491.
				TIME	4.13	4.13	4.13	4.13	4.13
ROUTED TO									
+	10-20	1.92	1	FLOW	1195.	1219.	1242.	1266.	1410.
				TIME	4.37	4.37	4.37	4.37	4.37
HYDROGRAPH AT									
+	A3	.55	1	FLOW	526.	535.	544.	553.	606.
				TIME	3.80	3.80	3.80	3.80	3.80
HYDROGRAPH AT									
+	A4	.29	1	FLOW	382.	387.	392.	398.	430.
				TIME	3.70	3.70	3.70	3.70	3.70
3 COMBINED AT									
+	20	2.76	1	FLOW	1387.	1415.	1443.	1471.	1641.
				TIME	4.30	4.30	4.30	4.30	4.30

ROUTED TO									
+	20-40	2.76	1	FLOW	1349.	1376.	1403.	1431.	1595.
				TIME	4.53	4.53	4.53	4.53	4.53
HYDROGRAPH AT									
+	A5	.51	1	FLOW	537.	546.	554.	563.	614.
				TIME	3.77	3.77	3.77	3.77	3.77
2 COMBINED AT									
+	40A5	3.27	1	FLOW	1423.	1451.	1479.	1507.	1679.
				TIME	4.47	4.47	4.47	4.47	4.47
HYDROGRAPH AT									
+	A6	.92	1	FLOW	979.	996.	1012.	1028.	1124.
				TIME	3.77	3.77	3.77	3.77	3.77
HYDROGRAPH AT									
+	A7	.29	1	FLOW	404.	410.	416.	422.	457.
				TIME	3.63	3.63	3.63	3.63	3.63
2 COMBINED AT									
+	30	1.21	1	FLOW	1340.	1362.	1383.	1405.	1533.
				TIME	3.73	3.73	3.73	3.73	3.73
ROUTED TO									
+	30-40	1.21	1	FLOW	1083.	1102.	1120.	1138.	1247.
				TIME	4.23	4.23	4.23	4.23	4.23
HYDROGRAPH AT									
+	A8	.48	1	FLOW	601.	609.	617.	625.	672.
				TIME	3.77	3.77	3.77	3.77	3.77
3 COMBINED AT									
+	40	4.96	1	FLOW	2703.	2750.	2797.	2844.	3128.
				TIME	4.17	4.17	4.17	4.17	4.17
ROUTED TO									
+	40-50	4.96	1	FLOW	2572.	2617.	2662.	2707.	2981.
				TIME	4.60	4.60	4.60	4.60	4.60
HYDROGRAPH AT									
+	A9	1.40	1	FLOW	2160.	2192.	2224.	2256.	2448.
				TIME	3.57	3.57	3.57	3.57	3.57
HYDROGRAPH AT									
+	A9a	.28	1	FLOW	432.	439.	446.	453.	494.
				TIME	3.57	3.57	3.57	3.57	3.57
HYDROGRAPH AT									
+	UN	.62	1	FLOW	659.	670.	681.	691.	758.
				TIME	3.70	3.70	3.70	3.70	3.70
4 COMBINED AT									
+	50	7.26	1	FLOW	3191.	3241.	3290.	3340.	3641.
				TIME	3.60	3.60	3.60	3.60	3.60

ROUTED TO

	50-60	7.26	1	FLOW	3162.	3201.	3280.	3323.	3630.
				TIME	3.67	3.67	3.67	3.67	3.67

HYDROGRAPH AT

	A10	.49	1	FLOW	454.	461.	468.	475.	517.
				TIME	3.87	3.87	3.87	3.87	3.87

2 COMBINED AT

	60	7.75	1	FLOW	3505.	3552.	3631.	3680.	4020.
				TIME	3.70	3.70	3.67	3.67	3.67

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .89									
50-60	MANE	1.86	3172.06	221.28	1.22	2.00	3162.35	220.00	1.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4729E+03 EXCESS= .0000E+00 OUTFLOW= .4740E+03 BASIN STORAGE= .5596E-01 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .90									
50-60	MANE	1.87	3220.46	220.99	1.25	2.00	3200.71	220.00	1.25

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4816E+03 EXCESS= .0000E+00 OUTFLOW= .4827E+03 BASIN STORAGE= .5102E-01 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .91									
50-60	MANE	2.35	3282.50	220.06	1.27	2.00	3279.56	220.00	1.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4903E+03 EXCESS= .0000E+00 OUTFLOW= .4911E+03 BASIN STORAGE= .6166E-01 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .92									
50-60	MANE	2.41	3325.32	220.06	1.29	2.00	3322.56	220.00	1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4991E+03 EXCESS= .0000E+00 OUTFLOW= .4998E+03 BASIN STORAGE= .5057E-01 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .98									
50-60	MANE	2.27	3636.36	220.18	1.43	2.00	3629.51	220.00	1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5522E+03 EXCESS= .0000E+00 OUTFLOW= .5529E+03 BASIN STORAGE= .4447E-01 PERCENT ERROR= -.1

*** NORMAL END OF HEC-1 ***

Design Flow Calculations
for
The Abbott Wash Conveyance Project
from I-15 to the Virgin River

RFCD
2001 DEC 14 AM 11:55

Rec'd 2-14-2002

Completed for:
Clark County Regional Flood Control District
600 S. Grand Central Pky, Ste 300
Las Vegas, Nevada 89106-4511

Completed by:
Bulloch Brothers Engineering, Inc.
561 W. Mesquite Blvd.
Mesquite, Nevada 89027
Phone: (702) 346-5101

Please note that the cover letter provides a detailed description of the following Methods and procedures used to determine design flows for Abbott Wash south of I-15

TABLE OF CONTENTS:

Design Flow Calculations 1

Figure 1 2

Figure 2 7

Referenced information from MPU 2001, Hec-1 model, App. C 9

Figure A 10

Referenced information from MPU 2001, Hec-1 model, App. G 20

Referenced information from MPU 2001, keyed in Hec-1 Model 31

DESIGN FLOW SOUTH OF I-15 FOR ABBOTT WASH.

BASIN A10 → AREA ≃ 0.50 sq. mi. = 324 Ac. ±

ADDITIONAL AREA EAST OF ABBOTT WASH

BASIN AEast → Area = 0.35 sq. mi or 226 Ac ±

CONTRIBUTING AREA: Used For Methods 1 & 2.

SEE FIGURE 1 NEXT PAGE ↓	AREA WITHIN BASIN A10 (Ac.)	ADDITIONAL AREA EAST OF A10 (Ac.)	TOTAL
AREA 1	33.46	22.18	55.64
AREA 2	46.70	101.72	148.42
AREA 3	44.16	16.20	60.36
AREA 4	135.16	43.20	178.36
AREA 5	64.52	42.70	107.22
TOTAL:	324.00	+ 226.00	= 550.00

* Please Refer To FIGURE 1 For a Pictorial View of The Contributing Areas Noted Above. The Additional Area East of Basin A10 is an Approximation of What Could possibly be directed TO Abbott Wash in the Future.

– DETERMINE FLOW/ACRE FOR ADDITIONAL AREA.

As A Rough Estimate, Use Flow/Acre per Basin A10 From Master Plan Update 2001

BASIN A10 → AREA = 324 Ac. ±

Q_{100} (@ DARF = 0.89) = 454 cfs

Q_{100} (@ DARF = 0.98) = 517 cfs

∴ 454 cfs / 324 Ac = 1.401 cfs/Ac.

517 cfs / 324 Ac = 1.596 cfs/Ac.

(1.401 + 1.596)/2 = 1.498 cfs/Ac.

1.498 cfs/Ac. should Represent An Interpolated Peak Flow between the DARF's 0.89 + 0.98.

Flow/Acre → Use 1.498 cfs/Ac.

METHOD 1

DESIGN FLOW FOR ABBOTT WASH SOUTH OF I-15

— BEGINNING FLOW NORTH OF I-15
(Match G.C. Wallace Design Flow) — — — — 3,156 cfs

— ADD Peak Flow From Unnamed Wash
For Conservative Estimate Add peak From Unnamed Wash To Design Flow per G.C. Wallace
*Note: Peak Flow UN = 758 cfs Per Appendix G of 2001 Update. As shown in the Ref. Information, Pages 46 , 83% of the UN Peak Flows Arrive @ Point 50, shown on FIGURE A in the Ref. Info., During The overall Peak Flow.

0.89 0.98 ← DARF's
↓ ↓
(659+758)/2 = 708.50
708.50 × 0.83 = 588

+ 588 cfs

DESIGN FLOW FOR I-15 Crossing → 3,744 cfs

— DESIGN FLOW FOR SECTION 1, south of I-15
Add Flows From Area 1
(see Fig. 1 For Location of Section 1 & Area 1)
55.64 Ac. × 1.498 cfs/Ac. = 83.37 — — —

3744 cfs
+ 83 cfs
3827 cfs

(see Pg. For Flow/Ac. Calculation)

— DESIGN FLOW FOR SECTION 2, South of I-15
Add Flows From Area 2
∴ 148.42 Ac. × 1.498 cfs/Ac = 222.40 cfs →

3,827 cfs
+ 222 cfs
4,049 cfs

— DESIGN FLOW FOR SECTION 3, South of I-15
Add Flows From Area 3
∴ 60.36 Ac × 1.498 cfs/Ac = 90.44

4,049 cfs
+ 90 cfs
4,139 cfs.

— DESIGN FLOW FOR SECTION 4, South of I-15
Add Flows From AREA 4
∴ 178.36 Ac. × 1.498 cfs/Ac = 267.26 cfs →

4,139 cfs
+ 267 cfs
4,406 cfs

- DESIGN FLOW FOR SECTION 5, South of I-15
Add Flows From AREA 5
∴ 107.22 Ac × 1.498 cfs/Ac = 160.66

4406 cfs
+ 161 cfs
4,567 cfs

50 SHEETS 22-141
100 SHEETS 22-142
200 SHEETS 22-144
AMPAD

METHOD 2

DESIGN FLOW FOR ABBOTT WASH SOUTH OF I-15

- DETERMINE DESIGN FLOW FOR RUNOFF CROSSING UNDER I-15 by Interpolating between the peak Flows associated with the DARF's 0.89 & 0.98 at Combination Point 50. As shown in The Hec-1 Output Found in Appendix G of The MPU-2001. This Value should represent the Avg. between Peak Flows in the Overall Basin @ Point 50 using Two different DARF's (0.89 + 0.98) Includes Peak Flows From Unnamed Wash
Calculations are included in Ref. Info. of this Submittal, pg 18

— DESIGN FLOW UNDER I-15
$(3191 + 3641)/2 = 3,416 \pm$ — 3,416 cfs

— DESIGN FLOW FOR SECTION 1, South of I-15
Add Flows From AREA 1
(See FIG. 1, For Location of Sec. 1 + Area 1)
55.64 Ac. X 1.498 cfs/Ac = 83.37 →

3,416
+ 83
3,499 cfs

— DESIGN FLOW FOR SECTION 2, South of I-15
Add Flows From AREA 2
∴ 148.42 Ac X 1.498 cfs/Ac = 222.40 cfs

3499 cfs
+ 222 cfs
3,721 cfs

— DESIGN FLOW FOR SECTION 3, South of I-15
Add Flows From AREA 3
∴ 60.36 Ac X 1.498 cfs/Ac. = 90.44

3,721 cfs
+ 90 cfs
3,811 cfs

— DESIGN FLOW FOR SECTION 4, South of I-15
Add Flows From AREA 4
∴ 178.36 Ac X 1.498 cfs/Ac. = 267.26 cfs

3811 cfs
+ 267 cfs
4,078 cfs

- DESIGN FLOW FOR SECTION 5, South of I-15
Add Flows FROM AREA 5
∴ 107.22 Ac. X 1.498 cfs/Ac. = 160.66 cfs

4,078 cfs
+ 161 cfs
4,239 cfs

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

METHOD 3

DESIGN FLOW FOR ABBOTT WASH SOUTH OF I-15

METHOD 3 IDENTICAL TO METHOD 2 EXCEPT LESS AREA IS DIRECTED TO ABBOTT WASH FROM THE ADDITIONAL AREA EAST OF BASIN A1D. SEE FIGURE 2 ON FOLLOWING PAGE.

BASIN A1D ⟶ AREA ~ 0.50 sq. Mi. or 324 Ac.

ADDITIONAL AREA EAST OF ABBOTT WASH
BASIN A-EAST ⟶ AREA =

CONTRIBUTING AREA : USED FOR METHOD 3

SEE FIGURE 2 NEXT PAGE ↓	Area Within Basin A1D (Ac.)	ADDITIONAL AREA EAST OF A1D (Ac.)	TOTAL.
AREA 1	33.46	35.28	68.74
AREA 2	46.70	——	46.70
AREA 3	44.16	8.13	52.29
AREA 4	135.16	15.06	150.22
AREA 5	64.52	13.97	78.49
TOTAL.	324.00	+ 72.44	= 396.44

METHOD 3 - Continued.

DESIGN FLOW FOR ABBOTT WASH SOUTH OF I-15

- DESIGN FLOW UNDER I-15
  USE SAME METHOD AS DESCRIBED IN METHOD 2
  $(3191 + 3641)/2 = 3{,}416$ cfs.
  INCLUDES FLOWS FROM UNNAMED Wash.

  3,416 cfs

- DESIGN FLOW FOR SECTION 1, South of I-15
  Add Flows From Area 1
  (See Fig. 2, For Location of Section 1 & Area 1)
  ∴ 68.74 Ac × 1.498 cfs/Ac = 103.00 cfs

  3,416 cfs + 103 cfs = **3,519 cfs**

- DESIGN FLOW FOR SECTION 2, South of I-15
  Add Flows From Area 2
  ∴ 46.70 Ac. × 1.498 cfs/Ac = 69.97 cfs

  3,519 cfs + 70 cfs = **3,589 cfs**

- DESIGN FLOW FOR SECTION 3, South of I-15
  Add Flows From Area 3
  ∴ 52.29 Ac. × 1.498 cfs/Ac. = 78.35 cfs

  3,589 cfs + 78 cfs = **3,667 cfs**

- DESIGN FLOW FOR SECTION 4, South of I-15
  Add Flows From AREA 4
  ∴ 150.22 Ac. × 1.498 cfs/Ac. = 225.09 cfs

  3,667 cfs + 225 cfs = **3,892 cfs**

- DESIGN FLOW FOR SECTION 5, South of I-15
  ADD Flows From Area 5
  ∴ 78.49 Ac. × 1.498 cfs/Ac. = 117.61 cfs

  3,892 cfs + 118 cfs = **4,010 cfs**

Quick Manning's Solution
For
Proposed Channel

Table
Rating Table for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\abbottwa.fm2
Worksheet	Typ. Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Constant Data

Input Data

	Minimum	Maximum	Increment	
Channel Slope	0.008000	0.010000	0.002000	ft/ft
Discharge	4,000.00	5,000.00	250.00	cfs

Rating Table

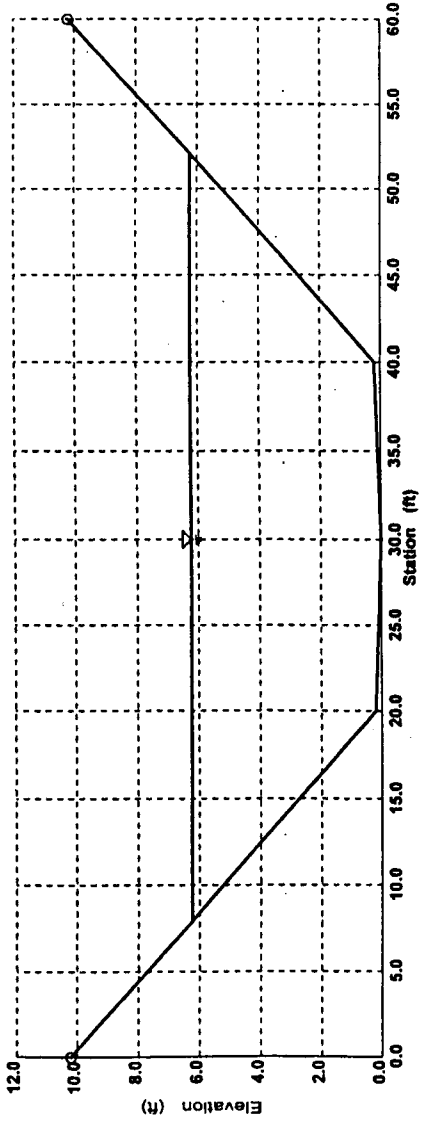
Discharge (cfs)	Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Water Surface Elevation (ft)	Velocity (ft/s)
4,000.00	0.008000	0.015	5.88	22.20
4,000.00	0.010000	0.015	5.55	24.06
4,250.00	0.008000	0.015	6.07	22.58
4,250.00	0.010000	0.015	5.73	24.47
4,500.00	0.008000	0.015	6.25	22.95
4,500.00	0.010000	0.015	5.90	24.87
4,750.00	0.008000	0.015	6.42	23.29
4,750.00	0.010000	0.015	6.07	25.25
5,000.00	0.008000	0.015	6.59	23.63
5,000.00	0.010000	0.015	6.23	25.61

86

Cross Section
Cross Section for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\abbottwa.fm2
Worksheet	Typ. Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

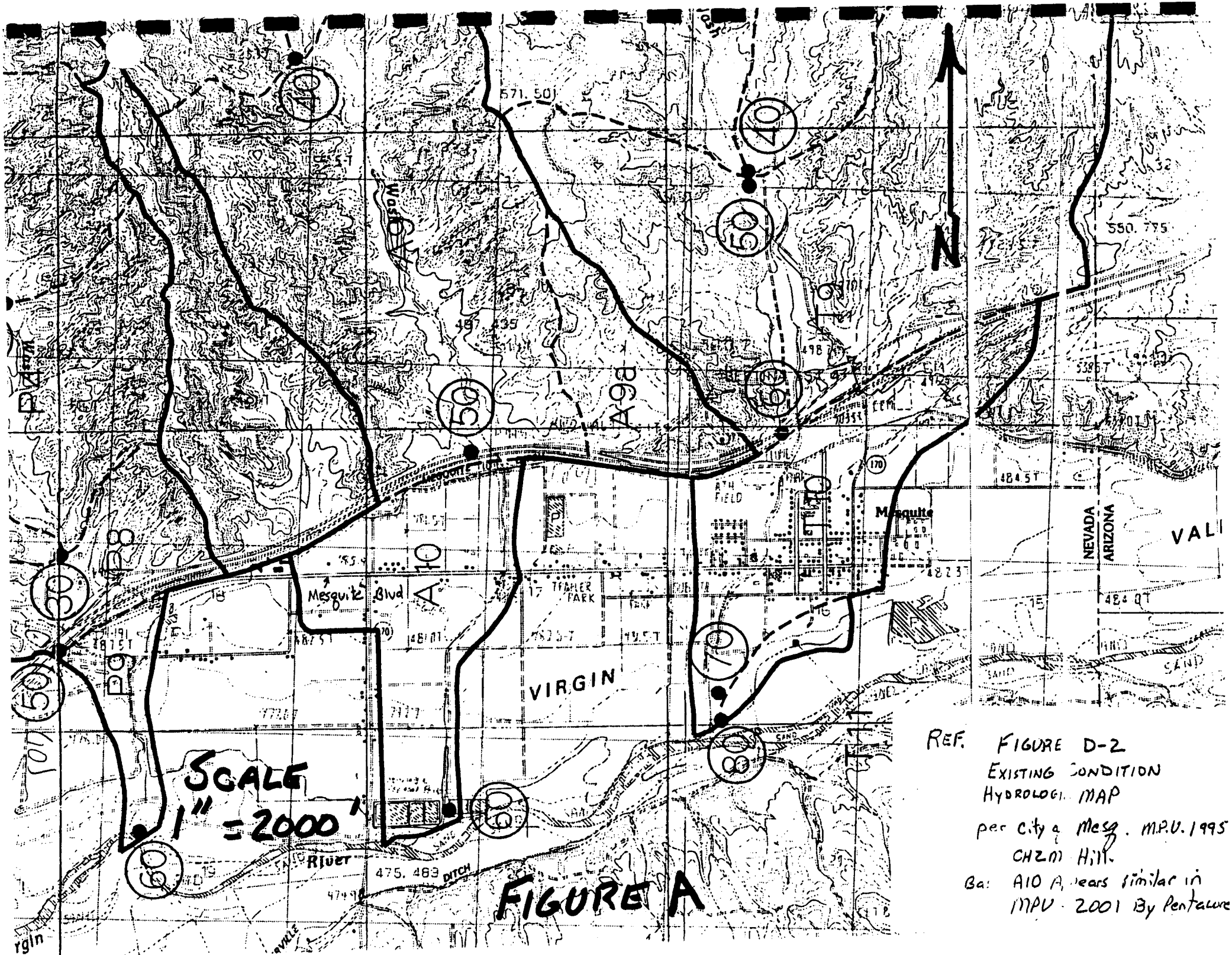
Section Data		
Wtd. Mannings Coefficient	0.015	
Channel Slope	0.008000	ft/ft
Water Surface Elevation	6.25	ft
Discharge	4,500.00	cfs



Referenced information from MPU 2001

Hec-1 Model, Appendix C, Volume 2

(No Unnamed Wash Flows Directed to Abbott Wash)



REF. FIGURE D-2
EXISTING CONDITION
HYDROLOGI. MAP
per City & Mesq. M.P.U. 1995
CHZM Hill.
Ba: AIO A, lears similar in
MPU · 2001 By Pentaure

The City of Mesquite Flood Control Master Plan Update 2001
Appendix C, Volume 2, Future Condition

```
1*************************************
*                                   *
*  FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*            JAN 1997               *
*          VERSION 4.1              *
*                                   *
* RUN DATE  20MAR01  TIME 08:18:59  *
*                                   *
*************************************
```

```
*************************************
*                                   *
*  U.S. ARMY CORPS OF ENGINEERS     *
*  HYDROLOGIC ENGINEERING CENTER    *
*       609 SECOND STREET           *
*     DAVIS, CALIFORNIA 95616       *
*       (916) 756-1104              *
*                                   *
*************************************
```

6 Hour, 100 Yr. ⟶ R = 2.2" X 1.43 = 3.15"

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
                *
                *DIAGRAM
   1            ID     CITY OF MESQUITE MASTER PLAN UPDATE 2000
   2            ID     PENTACORE ENGINEERING  :  John J. Lee
   3            ID     ABBOTT WASH HYDROLOGIC ANALYSIS - 100 YEAR FUTURE DEVELOPED COND.
   4            ID     GREEN AMPT LOSS RATE PARAMETERS
   5            ID     BASE MODEL FROM MESQUITE MPU 1995
   6            ID     May 2000
   7            ID     Revised  : 5 DARFs Used
   8            ID                0.89 @ Virgin River
   9            ID                0.90 @ I-15
  10            ID                0.91 @ Concentration Point 40
  11            ID     Revised :  Routing recalculated
  12            ID     Revised :  Lag time recalculated
  13            ID     Revised :  Removed the ponding area upstream of I-15 from 1995 MPU HEC-1
  14            IT       2       0       0     300
  15            IO       5
  16            IN       5       0       0
  17            JR     PREC     .89     .90     .91     .92     .98
```

```
                 *

   18            KK      A1
   19            BA    1.12
   20            PB    3.15
   21            PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13    0.13
   22            PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
   23            PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
   24            PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
   25            PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
   26            PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
   27            PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
   28            PC   0.998   0.999       1
   29            LG    0.15     .35     4.4     .32       0
   30            UD     .40
                 *

   31            KK   A1-10   CNAME
   32            RM       5    .422     .15
                 *

   33            KK      A2
   34            BA    0.80
   35            LG    0.15     .39     5.7     .17       0
   36            UD     .54
                 *

   37            KK      10   CNAME      20
   38            HC       2
                 *
```



```
LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   39            KK   10-20
   40            RM       3    .241     .15
                 *

   41            KK      A3
   42            BA    0.55
   43            LG    0.15     .38     5.9     .16       0
   44            UD     .41
                 *

   45            KK      A4
   46            BA    0.29
   47            LG    0.15     .31     7.3     .09       0
   48            UD     .29
                 *

   49            KK      20   CNAME      40
   50            HC       3
                 *

   51            KK   20-40
   52            RM       3    .273     .15
```

```
                 *

  53             KK      A5
  54             BA    0.51
  55             LG    0.15     .34     4.9     .25      25
  56             UD     .37
                 *

  57             KK    40A5
  58             HC       2
                 *

  59             KK      A6
  60             BA    0.92
  61             LG    0.15      .4       6     .15
  62             UD     .35
                 *

  63             KK      A7
  64             BA    0.29
  65             LG    0.15     .35     6.8     .11
  66             UD     .24
                 *

  67             KK      30   CNAME      40
  68             HC       2
                 *
```



```
LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  69             KK   30-40
  70             RM       6    .497     .15
                 *

  71             KK      A8
  72             BA    0.48
  73             LG    0.14     .20     6.6     .12      25
  74             UD     .35
                 *

  75             KK      40   CNAME      50
  76             HC       3
                 *

  77             KK   40-50
  78             RM       5    .425     .15
                 *

  79             KK      A9
  80             BA    1.40
  81             LG    0.15     .25     3.9     .42      30
  82             UD     .16
                 *

  83             KK     A9a
```

```
84          BA    0.28
85          LG    0.15    .27     3.4     .58     30
86          UD     .13
            *

87          KK      50   CNAME
88          HC       3
            *

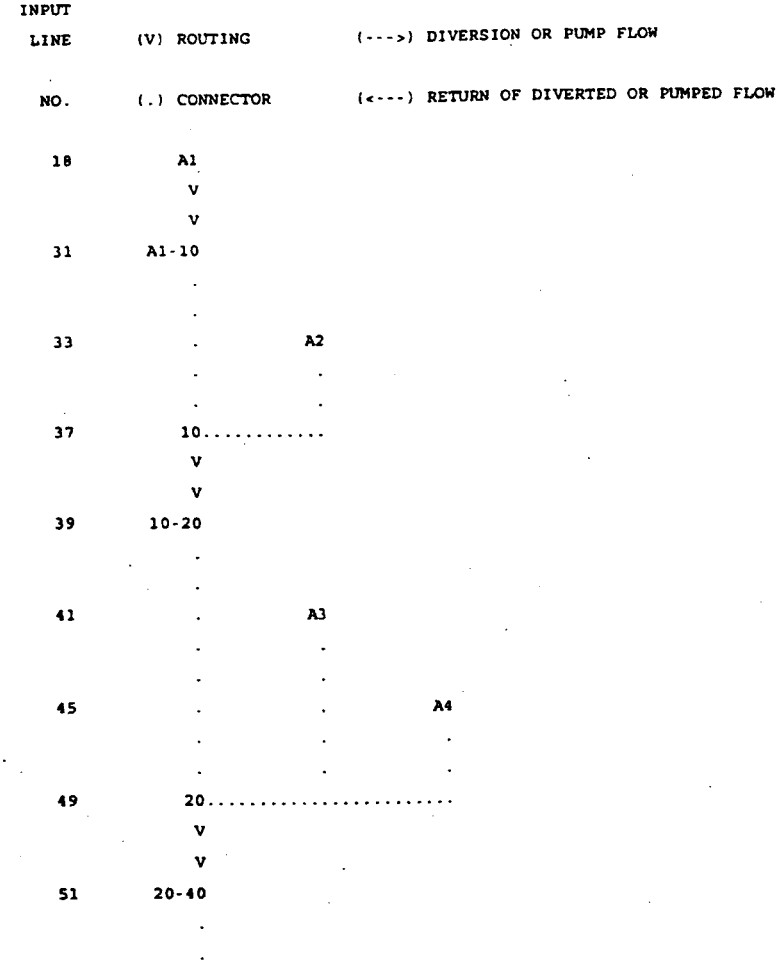
89          KK   50-60
90          RK    7800   .0088    .035             TRAP     20      2
            *

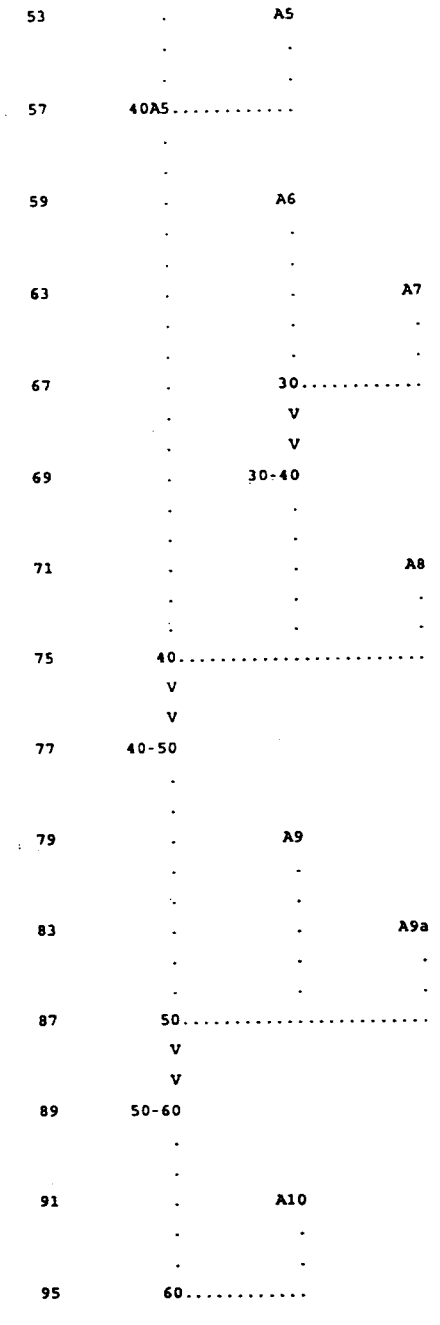
91          KK     A10
92          BA    0.49
93          LG      .1    .25     3.9     .42     38
94          UD     .46
            *

95          KK      60
96          HC       2
            *
97          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK





(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JAN  1997                *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE  20MAR01  TIME  08:18:59    *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*            (916) 756-1104             *
*                                       *
*****************************************
```

CITY OF MESQUITE MASTER PLAN UPDATE 2000
PENTACORE ENGINEERING : John J. Lee
ABBOTT WASH HYDROLOGIC ANALYSIS - 100 YEAR FUTURE DEVELOPED COND.
GREEN AMPT LOSS RATE PARAMETERS
BASE MODEL FROM MESQUITE MPU 1995
May 2000
Revised : 5 DARFs Used
0.89 @ Virgin River
0.90 @ I-15
0.91 @ Concentration Point 40
Revised : Routing recalculated
Revised : Lag time recalculated
Revised : Removed the ponding area upstream of I-15 from 1995 MPU HEC-1

15 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	2	MINUTES IN COMPUTATION INTERVAL
IDATE 1	0	STARTING DATE
ITIME	0000	STARTING TIME
NQ	300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE 1	0	ENDING DATE
NDTIME	0958	ENDING TIME
ICENT	19	CENTURY MARK

COMPUTATION INTERVAL .03 HOURS
TOTAL TIME BASE 9.97 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION

NPLAN	1	NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.89 .90 .91 .92 .98

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

				RATIOS APPLIED TO PRECIPITATION				
OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5

					.89	.90	.91	.92	.98
HYDROGRAPH AT									
+	A1	1.12	1	FLOW	933.	951.	970.	988.	1098.
				TIME	3.80	3.80	3.80	3.80	3.80
ROUTED TO									
+	A1-10	1.12	1	FLOW	780.	796.	812.	828.	924.
				TIME	4.23	4.23	4.23	4.23	4.23
HYDROGRAPH AT									
+	A2	.80	1	FLOW	619.	630.	641.	652.	718.
				TIME	3.93	3.93	3.93	3.93	3.93
2 COMBINED AT									
+	10	1.92	1	FLOW	1265.	1290.	1315.	1340.	1491.
				TIME	4.13	4.13	4.13	4.13	4.13
ROUTED TO									
+	10-20	1.92	1	FLOW	1195.	1219.	1242.	1266.	1410.
				TIME	4.37	4.37	4.37	4.37	4.37
HYDROGRAPH AT									
+	A3	.55	1	FLOW	526.	535.	544.	553.	606.
				TIME	3.80	3.80	3.80	3.80	3.80
HYDROGRAPH AT									
+	A4	.29	1	FLOW	382.	387.	392.	398.	430.
				TIME	3.70	3.70	3.70	3.70	3.70
3 COMBINED AT									
+	20	2.76	1	FLOW	1387.	1415.	1443.	1471.	1641.
				TIME	4.30	4.30	4.30	4.30	4.30
ROUTED TO									
+	20-40	2.76	1	FLOW	1349.	1376.	1403.	1431.	1595.
				TIME	4.53	4.53	4.53	4.53	4.53
HYDROGRAPH AT									
+	A5	.51	1	FLOW	537.	546.	554.	563.	614.
				TIME	3.77	3.77	3.77	3.77	3.77
2 COMBINED AT									
•	40A5	3.27	1	FLOW	1423.	1451.	1479.	1507.	1679.
				TIME	4.47	4.47	4.47	4.47	4.47
HYDROGRAPH AT									
+	A6	.92	1	FLOW	979.	996.	1012.	1028.	1124.
				TIME	3.77	3.77	3.77	3.77	3.77
HYDROGRAPH AT									
+	A7	.29	1	FLOW	404.	410.	416.	422.	457.
				TIME	3.63	3.63	3.63	3.63	3.63
2 COMBINED AT									
	30	1.21	1	FLOW	1340.	1362.	1383.	1405.	1533.
				TIME	3.73	3.73	3.73	3.73	3.73

DARF's

					0.89	0.90	0.91	0.92	0.98
ROUTED TO									
+	30-40	1.21	1	FLOW	1083.	1102.	1120.	1138.	1247.
				TIME	4.23	4.23	4.23	4.23	4.23
HYDROGRAPH AT									
+	A8	.48	1	FLOW	601.	609.	617.	625.	672.
				TIME	3.77	3.77	3.77	3.77	3.77
3 COMBINED AT									
+	40	4.96	1	FLOW	2703.	2750.	2797.	2844.	3128.
				TIME	4.17	4.17	4.17	4.17	4.17
ROUTED TO									
+	40-50	4.96	1	FLOW	2572.	2617.	2662.	2707.	2981.
				TIME	4.60	4.60	4.60	4.60	4.60
HYDROGRAPH AT									
+	A9	1.40	1	FLOW	2160.	2192.	2224.	2256.	2448.
				TIME	3.57	3.57	3.57	3.57	3.57
HYDROGRAPH AT									
+	A9a	.28	1	FLOW	432.	439.	446.	453.	494.
				TIME	3.57	3.57	3.57	3.57	3.57
3 COMBINED AT									
+	50	6.64	1	FLOW	2747.	2796.	2846.	2895.	3192.
				TIME	4.63	4.63	4.63	4.63	4.63
ROUTED TO									
+	50-60	6.64	1	FLOW	2742.	2794.	2841.	2892.	3187.
				TIME	4.70	4.70	4.70	4.70	4.70
HYDROGRAPH AT									
+	A10	.49	1	FLOW	454.	461.	468.	475.	517.
				TIME	3.87	3.87	3.87	3.87	3.87
2 COMBINED AT									
+	60	7.13	1	FLOW	2975.	3056.	3096.	3124.	3394.
				TIME	3.67	3.67	3.67	3.67	3.67

Basins A1-A8 → Area = 5.05
DARF = 0.91

← DARF = 0.98

← DARF = 0.98

Basin A1-A9 → Area = 6.73
DARF = 0.90

← Basin A9 + A9a
Area = 1.66 mi²
Use DARF = 0.98

Interpolate
(2796 + 3192)/2 = 2994

Please Note That Approved Plans For Abbott Wash North of I-15 Through Mesq. Vistas Used a design Flow = 3156

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .89									
	50-60 MANE	1.97	2744.99	283.23	1.22	2.00	2742.03	282.00	1.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4306E+03 EXCESS= .0000E+00 OUTFLOW= .4318E+03 BASIN STORAGE= .5269E-01 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .90

50-60	MANE	1.94	2794.38	282.08	1.24	2.00	2793.76	282.00	1.24

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4387E+03 EXCESS= .0000E+00 OUTFLOW= .4399E+03 BASIN STORAGE= .5234E-01 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .91

50-60	MANE	1.93	2843.24	283.32	1.27	2.00	2840.64	282.00	1.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4467E+03 EXCESS= .0000E+00 OUTFLOW= .4480E+03 BASIN STORAGE= .4564E-01 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .92

50-60	MANE	1.83	2892.71	282.09	1.29	2.00	2892.00	282.00	1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4548E+03 EXCESS= .0000E+00 OUTFLOW= .4560E+03 BASIN STORAGE= .6135E-01 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .98

50-60	MANE	1.85	3187.78	282.11	1.43	2.00	3186.81	282.00	1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5036E+03 EXCESS= .0000E+00 OUTFLOW= .5049E+03 BASIN STORAGE= .4860E-01 PERCENT ERROR= -.3

*** NORMAL END OF HEC-1 ***

Referenced information from MPU 2001

Hec-1 Model, Appendix G, Volume 2, Alternative 3

(Unnamed Wash Flows Directed to Abbott Wash)

The City of Mesquite Flood Control Master Plan Update 2001
Appedix G, Alternative 3, Volume 2

```
1*************************************
*                                   *
*  FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*            JAN  1997              *
*         VERSION 4.1               *
*                                   *
* RUN DATE  03APR01  TIME  10:35:39 *
*                                   *
*************************************
```

```
*************************************
*                                   *
*  U.S. ARMY CORPS OF ENGINEERS     *
*  HYDROLOGIC ENGINEERING CENTER    *
*       609 SECOND STREET           *
*     DAVIS, CALIFORNIA 95616       *
*         (916) 756-1104            *
*                                   *
*************************************
```

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
                .
                *DIAGRAM
    1           ID     CITY OF MESQUITE MASTER PLAN UPDATE 2000
    2           ID     PENTACORE ENGINEERING  :  John J. Lee
    3           ID     ABBOTT WASH HYDROLOGIC ANALYSIS - 100 YEAR FUTURE DEVELOPED COND.
    4           ID     GREEN AMPT LOSS RATE PARAMETERS
    5           ID     THIS MODEL INCLUDES UNNAMED WASH
    6           ID     unnamed wash diverted to and combined with Abbott Wash
    7           ID     BASE MODEL FROM MESQUITE MPU 1995
    8           ID     May 2000
    9           ID    Revised  : 5 DARFs Used
   10           ID               0.89 @ Virgin River
   11           ID               0.90 @ I-15
   12           ID               0.91 @ Concentration Point 40
   13           ID    Revised :  Drainage areas recalculated
   14           ID    Revised :  Routing recalculated
   15           ID    Revised :  Lag time recalculated
   16           ID    Revised :  Removed the ponding area, upstream of I-15 from 1995 MPU HEC-1
   17           IT       2       0       0     300
```

```
 18          IO        5
 19          IN        5       0       0
 20          JR     PREC     .89     .90     .91     .92     .98
             *

 21          KK       A1
 22          BA     1.12
 23          PB     3.15
 24          PC        0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13    0.13
 25          PC     0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
 26          PC     0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
 27          PC    0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
 28          PC    0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
 29          PC     0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
 30          PC    0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
 31          PC    0.998   0.999       1
 32          LG     0.15     .35     4.4     .32       0
 33          UD      .40
             *

 34          KK    A1-10   CNAME
 35          RM        5    .422     .15
             *

 36          KK       A2
 37          BA     0.80
 38          LG     0.15     .39     5.7     .17       0
 39          UD      .54
             *

 40          KK       10   CNAME      20
 41          HC        2
             *
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 42          KK    10-20
 43          RM        3    .241     .15
             *

 44          KK       A3
 45          BA     0.55
 46          LG     0.15     .38     5.9     .16       0
 47          UD      .41
             *

 48          KK       A4
 49          BA     0.29
 50          LG     0.15     .31     7.3     .09       0
 51          UD      .29
             *

 52          KK       20   CNAME      40
 53          HC        3                       *
             *
```

```
     54          KK   20-40
     55          RM      3    .273     .15
                 *

     56          KK      A5
     57          BA    0.51
     58          LG    0.15     .34     4.9     .25      25
     59          UD     .37
                 *

     60          KK    40A5
     61          HC       2
                 *

     62          KK      A6
     63          BA    0.92
     64          LG    0.15      .4       6     .15
     65          UD     .35
                 *

     66          KK      A7
     67          BA    0.29
     68          LG    0.15     .35     6.8     .11
     69          UD     .24
                 *

     70          KK      30   CNAME      40
     71          HC       2
                 *
```



```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

     72          KK   30-40
     73          RM       6    .497     .15
                 *

     74          KK      A8
     75          BA    0.48
     76          LG    0.14     .20     6.6     .12      25
     77          UD     .35
                 *

     78          KK      40   CNAME      50
     79          HC       3
                 *

     80          KK   40-50
     81          RM       5    .425     .15
                 *

     82          KK      A9
     83          BA    1.40
     84          LG    0.15     .25     3.9     .42      30
     85          UD     .16
```

```
                    *

 86                 KK     A9a
 87                 BA    0.28
 88                 LG    0.15     .27     3.4     .58      30
 89                 UD     .13
                    *
                    * BEGIN UNNAMED WASH - SINGLE SUBWATERSHED, NO EXISTING OUTLET
                    *

 90                 KK      UN
 91                 KM            UNNAMED WASH
 92                 BA    0.62
 93                 LG     .16     .26     3.7     .49    25.8
 94                 UD     .31
                    *
                    * END UNNAMED WASH WATERSHED
                    *

 95                 KK      50   CNAME
 96                 HC       4
                    *

 97                 KK   50-60
 98                 RK    7800   .0088    .035            TRAP      20       2
                    *
1                                                  HEC-1 INPUT                                                  PAGE  4

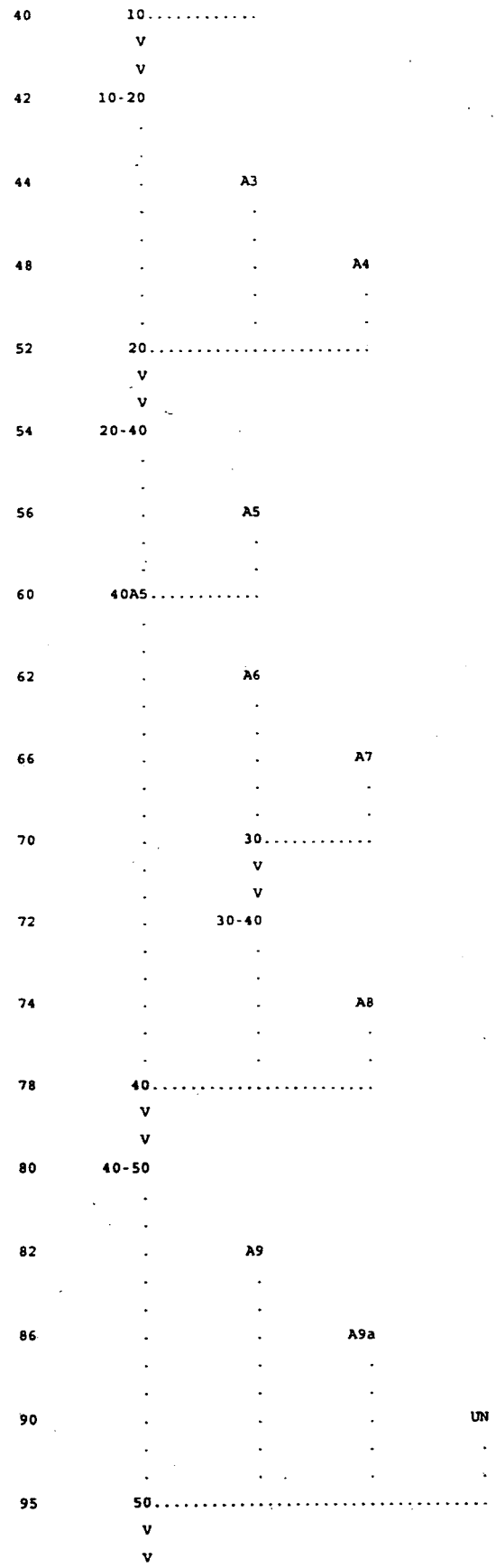
          LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 99                 KK     A10
100                 BA    0.49
101                 LG      .1     .25     3.9     .42      38
102                 UD     .46
                    *

103                 KK      60
104                 HC       2
                    *
105                 ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   21          A1
                V
                V
   34       A1-10
                .
                .
   36           .          A2
                .           .
                .           .
```


40
10
42
10-20
44
A3
48
A4
52
20
54
20-40
56
A5
60
40A5
62
A6
66
A7
70
30
72
30-40
74
A8
78
40
80
40-50
82
A9
86
A9a
90
UN
95
50

```
   97       50-60
                .
                .
   99           .          A10
                .            .
                .            .
  103          60.............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JAN  1997               *
*             VERSION 4.1               *
*                                       *
*  RUN DATE   03APR01  TIME  10:35:39   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*        DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104              *
*                                       *
*****************************************
```

CITY OF MESQUITE MASTER PLAN UPDATE 2000
PENTACORE ENGINEERING : John J. Lee
ABBOTT WASH HYDROLOGIC ANALYSIS - 100 YEAR FUTURE DEVELOPED COND.
GREEN AMPT LOSS RATE PARAMETERS
THIS MODEL INCLUDES UNNAMED WASH
unnamed wash diverted to and combined with Abbott Wash
BASE MODEL FROM MESQUITE MPU 1995
May 2000
Revised : 5 *DARFs Used*
0.89 @ Virgin River
0.90 @ I-15
0.91 @ Concentration Point 40
Revised : Drainage areas recalculated
Revised : Routing recalculated
Revised : Lag time recalculated
Revised : *Removed the ponding area upstream of I-15 from 1995 MPU HEC-1*

```
 18 IO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT         HYDROGRAPH TIME DATA
                    NMIN          2  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1   0  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      1   0  ENDING DATE
                  NDTIME       0958  ENDING TIME
                   ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL      .03 HOURS
                    TOTAL TIME BASE     9.97 HOURS
```

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION

NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION

RATIOS OF PRECIPITATION

.89 .90 .91 .92 .98

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES

TIME TO PEAK IN HOURS

					RATIOS APPLIED TO PRECIPITATION				
OPERATION	STATION	AREA	PLAN		RATIO 1 .89	RATIO 2 .90	RATIO 3 .91	RATIO 4 .92	RATIO 5 .98
HYDROGRAPH AT									
+	A1	1.12	1	FLOW	933.	951.	970.	988.	1098.
				TIME	3.80	3.80	3.80	3.80	3.80
ROUTED TO									
+	A1-10	1.12	1	FLOW	780.	796.	812.	828.	924.
				TIME	4.23	4.23	4.23	4.23	4.23
HYDROGRAPH AT									
+	A2	.80	1	FLOW	619.	630.	641.	652.	718.
				TIME	3.93	3.93	3.93	3.93	3.93
2 COMBINED AT									
+	10	1.92	1	FLOW	1265.	1290.	1315.	1340.	1491.
				TIME	4.13	4.13	4.13	4.13	4.13
ROUTED TO									
+	10-20	1.92	1	FLOW	1195.	1219.	1242.	1266.	1410.
				TIME	4.37	4.37	4.37	4.37	4.37
HYDROGRAPH AT									
+	A3	.55	1	FLOW	526.	535.	544.	553.	606.
				TIME	3.80	3.80	3.80	3.80	3.80
HYDROGRAPH AT									
+	A4	.29	1	FLOW	382.	387.	392.	398.	430.
				TIME	3.70	3.70	3.70	3.70	3.70
3 COMBINED AT									
+	20	2.76	1	FLOW	1387.	1415.	1443.	1471.	1641.
				TIME	4.30	4.30	4.30	4.30	4.30

DARF's

					0.89	0.90	0.91	0.92	0.98
ROUTED TO									
+	20-40	2.76	1	FLOW	1349.	1376.	1403.	1431.	1595.
				TIME	4.53	4.53	4.53	4.53	4.53
HYDROGRAPH AT									
+	A5	.51	1	FLOW	537.	546.	554.	563.	614.
				TIME	3.77	3.77	3.77	3.77	3.77
2 COMBINED AT									
+	40A5	3.27	1	FLOW	1423.	1451.	1479.	1507.	1679.
				TIME	4.47	4.47	4.47	4.47	4.47
HYDROGRAPH AT									
+	A6	.92	1	FLOW	979.	996.	1012.	1028.	1124.
				TIME	3.77	3.77	3.77	3.77	3.77
HYDROGRAPH AT									
+	A7	.29	1	FLOW	404.	410.	416.	422.	457.
				TIME	3.63	3.63	3.63	3.63	3.63
2 COMBINED AT									
+	30	1.21	1	FLOW	1340.	1362.	1383.	1405.	1533.
				TIME	3.73	3.73	3.73	3.73	3.73
ROUTED TO									
+	30-40	1.21	1	FLOW	1083.	1102.	1120.	1138.	1247.
				TIME	4.23	4.23	4.23	4.23	4.23
HYDROGRAPH AT									
+	A8	.48	1	FLOW	601.	609.	617.	625.	672.
				TIME	3.77	3.77	3.77	3.77	3.77
3 COMBINED AT									
+	40	4.96	1	FLOW	2703.	2750.	2797.	2844.	3128.
				TIME	4.17	4.17	4.17	4.17	4.17
ROUTED TO									
+	40-50	4.96	1	FLOW	2572.	2617.	2662.	2707.	2981.
				TIME	4.60	4.60	4.60	4.60	4.60
HYDROGRAPH AT									
+	A9	1.40	1	FLOW	2160.	2192.	2224.	2256.	2448.
				TIME	3.57	3.57	3.57	3.57	3.57
HYDROGRAPH AT									
+	A9a	.28	1	FLOW	432.	439.	446.	453.	494.
				TIME	3.57	3.57	3.57	3.57	3.57
HYDROGRAPH AT									
+	UN	.62	1	FLOW	659.	670.	681.	691.	758.
				TIME	3.70	3.70	3.70	3.70	3.70
4 COMBINED AT									
+	50	7.26	1	FLOW	3191.	3241.	3290.	3340.	3641.
				TIME	3.60	3.60	3.60	3.60	3.60

Basins A1→A9 + UN → Area = 7.35 mi²
DARF = 0.89±

Basins A9, A9a, UN
DARF = 0.98

Interpolate
(3191 + 3641)/2 = 3416 ±

3416 > 2975 ← Design Flow

ROUTED TO

+	50-60	7.26	1	FLOW	3162.	3201.	3280.	3323.	3630.
				TIME	3.67	3.67	3.67	3.67	3.67

HYDROGRAPH AT

+	A10	.49	1	FLOW	454.	461.	468.	475.	517.
				TIME	3.87	3.87	3.87	3.87	3.87

2 COMBINED AT

+	60	7.75	1	FLOW	3505.	3552.	3631.	3680.	4020.
				TIME	3.70	3.70	3.67	3.67	3.67

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .89									
50-60	MANE	1.86	3172.06	221.28	1.22	2.00	3162.35	220.00	1.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4729E+03 EXCESS= .0000E+00 OUTFLOW= .4740E+03 BASIN STORAGE= .5596E-01 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .90									
50-60	MANE	1.87	3220.46	220.99	1.25	2.00	3200.71	220.00	1.25

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4816E+03 EXCESS= .0000E+00 OUTFLOW= .4827E+03 BASIN STORAGE= .5102E-01 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .91									
50-60	MANE	2.35	3282.50	220.06	1.27	2.00	3279.56	220.00	1.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4903E+03 EXCESS= .0000E+00 OUTFLOW= .4911E+03 BASIN STORAGE= .6166E-01 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .92									
50-60	MANE	2.41	3325.32	220.06	1.29	2.00	3322.56	220.00	1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4991E+03 EXCESS= .0000E+00 OUTFLOW= .4998E+03 BASIN STORAGE= .5057E-01 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .98									
50-60	MANE	2.27	3636.36	220.18	1.43	2.00	3629.51	220.00	1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5522E+03 EXCESS= .0000E+00 OUTFLOW= .5529E+03 BASIN STORAGE= .4447E-01 PERCENT ERROR= -.1

*** NORMAL END OF HEC-1 ***

Referenced information from MPU 2001

Hec-1 Model, Appendix G, Volume 2, Alternative 3

(We keyed in model & modified to print Hydrographs)

```
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*         JUN  1998                 *
*       VERSION 4.1                 *
*                                   *
*  RUN DATE   12OCT01  TIME  16:43:24   *
*                                   *
*************************************
```

```
*************************************
*                                   *
*   U.S. ARMY CORPS OF ENGINEERS    *
*   HYDROLOGIC ENGINEERING CENTER   *
*        609 SECOND STREET          *
*     DAVIS, CALIFORNIA 95616       *
*        (916) 756-1104             *
*                                   *
*************************************
```

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
          LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*** FREE ***
                    *DIAGRAM
               1    ID   CITY OF MESQUITE MASTER PLAN UPDATE 2000
               2    ID   PENTACORE ENGINEERING : John J. Lee
               3    ID   ABBOTT WASH HYDROLOGIC ANALYSIS - 100 YEAR FUTURE DEVELOPED COND.
               4    ID   GREEN AMPT LOSS RATE PARAMETERS
               5    ID   THIS MODEL INCLUDES UNNAMED WASH
               6    ID   Unnamed Wash diverted to and combined with Abbott Wash
               7    ID   MASE MODEL FROM MESQUITE MPU 1995
               8    ID   MAY 2000
               9    ID   Revised : 5 DARFs Used
              10    ID             0.89 @ Virgin River
              11    ID             0.90 @ I-15
              12    ID             0.91 @ Concentration Point 40
              13    ID   Revised : Drainage areas recalculated
              14    ID   Revised : Routing recalculated.
              15    ID   Revised : Lag time recalculated
              16    ID   Revised : Removed the ponding area upstream of I-15 from 1995 MPU HEC-1
                    *
              17    ID   Please note the following:
              18    ID   This model was keyed in by Bulloch Brothers Engineering, Inc. as it appears in the
              19    ID   City of Mesquite MPU - 2001, completed by Pentacore Engineering, With the following Exceptions:
              20    ID   KO cards were added in order to determine how the hydrographs were added at the following
              21    ID   locations: where the hydrograph is routed from 40-50, @ A5, @ A9a, @ UN, and @ 50 cname.
              22    ID   In addition, the the JR card was modified to analyze only the DARFs of 0.89
                    *
              23    IT       2       0       0     300
              24    IO       5
              25    IN       5       0       0
              26    JR    PREC    0.89
                    *
              27    KK      A1
              28    BA    1.12
              29    PB    3.15
              30    PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13    0.13
              31    PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
              32    PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
              33    PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
              34    PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
              35    PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
              36    PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
              37    PC   0.998   0.999       1
              38    LG    0.15    0.35     4.4    0.32       0
              39    UD    0.40
                    *
              40    KK   A1-10CNAME
              41    RM       5   0.422    0.15
```



```
          LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
              42    KK      A2
              43    BA    0.80
              44    LG    0.15    0.39     5.7    0.17       0
              45    UD    0.54
                    *
              46    KK      10CNAME 20
              47    HC       2
                    *
              48    KK   10-20
              49    RM       3   0.241    0.15
              50    KK      A3
              51    BA    0.55
              52    LG    0.15    0.38     5.9    0.16       0
              53    UD    0.41
                    *
              54    KK      A4
              55    BA    0.29
              56    LG    0.15    0.31     7.3    0.09       0
              57    UD    0.29
                    *
              58    KK      20CNAME 40
              59    HC       3
                    *
```

```
 60          KK   20-40
 61          RM       3   0.273    0.15
             *

 62          KK      A5
 63          BA    0.51
 64          LG    0.15    0.34     4.9    0.25      25
 65          UD    0.37
             *

 66          KK    40A5
 67          HC       2
             *

 68          KK      A6
 69          BA    0.92
 70          LG    0.15     0.4       6    0.15
 71          UD    0.35
             *
1                                          HEC-1 INPUT                                          PAGE  3

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 72          KK      A7
 73          BA    0.29
 74          LG    0.15    0.35     6.8    0.11
 75          UD    0.24
             *

 76          KK      30CNAME 40
 77          HC       2
             *

 78          KK   30-40
 79          RM       6   0.497    0.15
             *

 80          KK      A8
 81          BA    0.48
 82          LG    0.14    0.20     6.6    0.12      25
 83          UD    0.35
             *

 84          KK      40CNAME 50
 85          HC       3
             *

 86          KK   40-50
 87          KO       0       2
 88          RM       5   0.425    0.15
             *

 89          KK      A9
 90          KO       0       2
 91          BA    1.40
 92          LG    0.15    0.25     3.9    0.42      30
 93          UD    0.16
             *

 94          KK     A9a
 95          KO       0       2
 96          BA    0.28
 97          LG    0.15    0.27     3.4    0.58      30
 98          UD    0.13
             *
             * BEGIN UNNAMED WASH - SINGLE SUBWATERSHED, NO EXISTING OUTLET
             *

 99          KK      UN
100          KO       0       2
101          KM   UNNAMED WASH
102          BA    0.62
103          LG    0.16    0.26     3.7    0.49    25.8
104          UD    0.31
             *
             * END UNNAMED WASH WATERSHED
             *
1                                          HEC-1 INPUT                                          PAGE  4

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

105          KK      50CNAME
106          KO       0       2
107          HC       4
             *

108          KK   50-60
109          RK    7800  0.0088   0.035            TRAP      20       2
             *

110          KK     A10
111          BA    0.49
112          LG     0.1    0.25     3.9    0.42      38
113          UD    0.46
             *

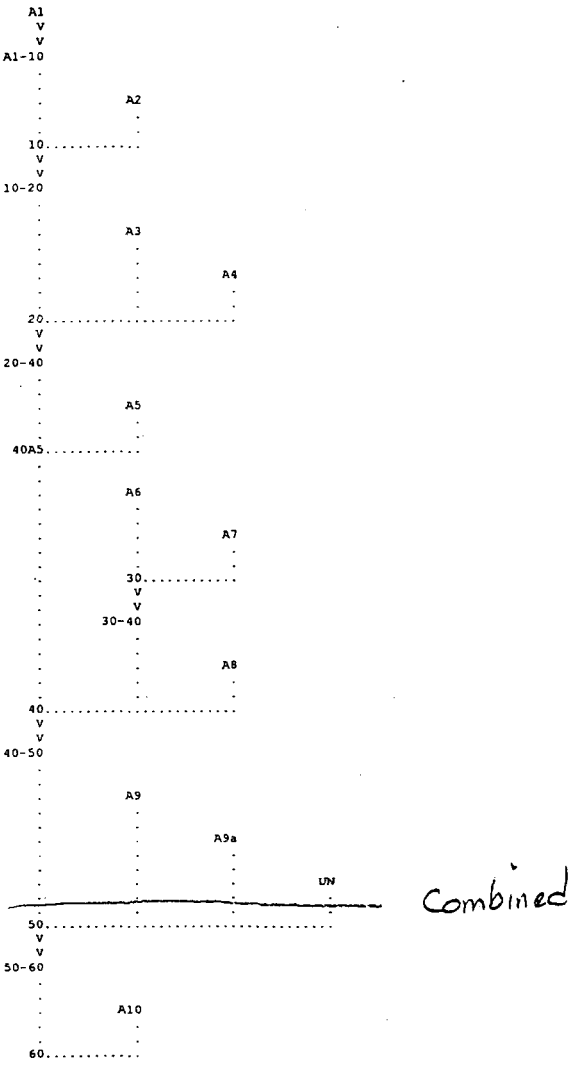
114          KK      60
115          HC       2
116          ZZ
1
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW



Combined

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*          VERSION 4.1                  *
*                                       *
*  RUN DATE   12OCT01  TIME  16:43:24   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*             (916) 756-1104            *
*                                       *
*****************************************
```

CITY OF MESQUITE MASTER PLAN UPDATE 2000
PENTACORE ENGINEERING : John J. Lee
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GREEN AMPT LOSS RATE PARAMETERS
THIS MODEL INCLUDES UNNAMED WASH
Unnamed Wash diverted to and combined with Abbott Wash
MASE MODEL FROM MESQUITE MPU 1995
MAY 2000
Revised : 5 DARFs Used
0.89 @ Virgin River
0.90 @ I-15
0.91 @ Concentration Point 40
Revised : Drainage areas recalculated
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This model was keyed in by Bulloch Brothers Engineering, Inc. as it appears i
City of Mesquite MPU - 2001, completed by Pentacore Engineering, With the fol
KO cards were added in order to determine how the hydrographs were added at t
locations: where the hydrograph is routed from 40-50, @ A9, @ A9a, @ UN, and
In addition, the the JR card was modified to analyze only the DARFs of 0.89 a

24 IO OUTPUT CONTROL VARIABLES
IPRNT 5 PRINT CONTROL

```
                    IPLOT          0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                      NMIN          2  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1   0  STARTING DATE
                     ITIME         0000  STARTING TIME
                        NQ          300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      1   0  ENDING DATE
                    NDTIME         0958  ENDING TIME
                     ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL      .03 HOURS
                      TOTAL TIME BASE     9.97 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                      NPLAN          1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                     .89

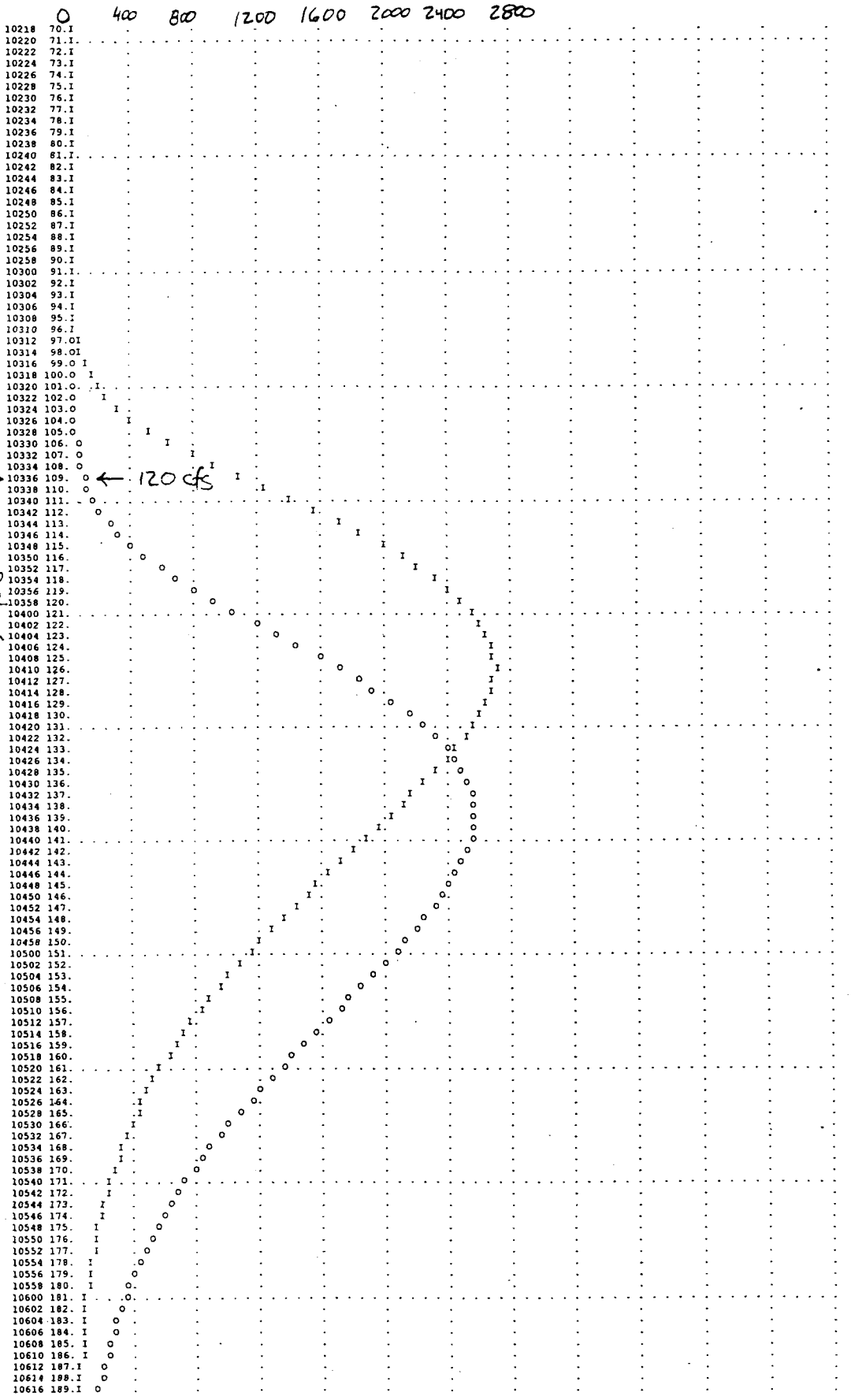
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  86 KK     *     40-50  *
            *            *
            **************

  87 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          2  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
1                                                 STATION    40-50

                     (I) INFLOW,   (O) OUTFLOW
          0.      400.      800.     1200.     1600.     2000.     2400.     2800.       0.        0.        0.        0.        0.
DAHRMN PER
 10000   1I---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.
 10002   2I         .         .         .         .         .         .         .         .         .         .         .         .
 10004   3I         .         .         .         .         .         .         .         .         .         .         .         .
 10006   4I         .         .         .         .         .         .         .         .         .         .         .         .
 10008   5I         .         .         .         .         .         .         .         .         .         .         .         .
 10010   6I         .         .         .         .         .         .         .         .         .         .         .         .
 10012   7I         .         .         .         .         .         .         .         .         .         .         .         .
 10014   8I         .         .         .         .         .         .         .         .         .         .         .         .
 10016   9OI        .         .         .         .         .         .         .         .         .         .         .         .
 10018  10OI        .         .         .         .         .         .         .         .         .         .         .         .
 10020  11OI. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 10022  12OI        .         .         .         .         .         .         .         .         .         .         .         .
 10024  13OI        .         .         .         .         .         .         .         .         .         .         .         .
 10026  14O I       .         .         .         .         .         .         .         .         .         .         .         .
 10028  15O I       .         .         .         .         .         .         .         .         .         .         .         .
 10030  16O I       .         .         .         .         .         .         .         .         .         .         .         .
 10032  17O I       .         .         .         .         .         .         .         .         .         .         .         .
 10034  18O I       .         .         .         .         .         .         .         .         .         .         .         .
 10036  19O I       .         .         .         .         .         .         .         .         .         .         .         .
 10038  20.OI       .         .         .         .         .         .         .         .         .         .         .         .
 10040  21.OI. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 10042  22.OI       .         .         .         .         .         .         .         .         .         .         .         .
 10044  23.OI       .         .         .         .         .         .         .         .         .         .         .         .
 10046  24.OI       .         .         .         .         .         .         .         .         .         .         .         .
 10048  25.OI       .         .         .         .         .         .         .         .         .         .         .         .
 10050  26.OI       .         .         .         .         .         .         .         .         .         .         .         .
 10052  27. I       .         .         .         .         .         .         .         .         .         .         .         .
 10054  28.IO       .         .         .         .         .         .         .         .         .         .         .         .
 10056  29.IO       .         .         .         .         .         .         .         .         .         .         .         .
 10058  30.IO       .         .         .         .         .         .         .         .         .         .         .         .
 10100  31.IO. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 10102  32.IO       .         .         .         .         .         .         .         .         .         .         .         .
 10104  33.IO       .         .         .         .         .         .         .         .         .         .         .         .
 10106  34.IO       .         .         .         .         .         .         .         .         .         .         .         .
 10108  35.IO       .         .         .         .         .         .         .         .         .         .         .         .
 10110  36I O       .         .         .         .         .         .         .         .         .         .         .         .
 10112  37I O       .         .         .         .         .         .         .         .         .         .         .         .
 10114  38I O       .         .         .         .         .         .         .         .         .         .         .         .
 10116  39IO        .         .         .         .         .         .         .         .         .         .         .         .
 10118  40IO        .         .         .         .         .         .         .         .         .         .         .         .
 10120  41IO. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 10122  42IO        .         .         .         .         .         .         .         .         .         .         .         .
 10124  43IO        .         .         .         .         .         .         .         .         .         .         .         .
 10126  44IO        .         .         .         .         .         .         .         .         .         .         .         .
 10128  45IO        .         .         .         .         .         .         .         .         .         .         .         .
 10130  46.I        .         .         .         .         .         .         .         .         .         .         .         .
 10132  47.I        .         .         .         .         .         .         .         .         .         .         .         .
 10134  48.I        .         .         .         .         .         .         .         .         .         .         .         .
 10136  49.I        .         .         .         .         .         .         .         .         .         .         .         .
 10138  50.I        .         .         .         .         .         .         .         .         .         .         .         .
 10140  51.I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 10142  52.I        .         .         .         .         .         .         .         .         .         .         .         .
 10144  53.I        .         .         .         .         .         .         .         .         .         .         .         .
 10146  54.I        .         .         .         .         .         .         .         .         .         .         .         .
 10148  55.I        .         .         .         .         .         .         .         .         .         .         .         .
 10150  56.I        .         .         .         .         .         .         .         .         .         .         .         .
 10152  57.I        .         .         .         .         .         .         .         .         .         .         .         .
 10154  58.I        .         .         .         .         .         .         .         .         .         .         .         .
 10156  59.I        .         .         .         .         .         .         .         .         .         .         .         .
 10158  60.I        .         .         .         .         .         .         .         .         .         .         .         .
 10200  61.I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 10202  62.I        .         .         .         .         .         .         .         .         .         .         .         .
 10204  63.I        .         .         .         .         .         .         .         .         .         .         .         .
 10206  64.I        .         .         .         .         .         .         .         .         .         .         .         .
 10208  65.I        .         .         .         .         .         .         .         .         .         .         .         .
 10210  66.I        .         .         .         .         .         .         .         .         .         .         .         .
 10212  67.I        .         .         .         .         .         .         .         .         .         .         .         .
 10214  68.I        .         .         .         .         .         .         .         .         .         .         .         .
 10216  69.I        .         .         .         .         .         .         .         .         .         .         .         .
```

40 - 50

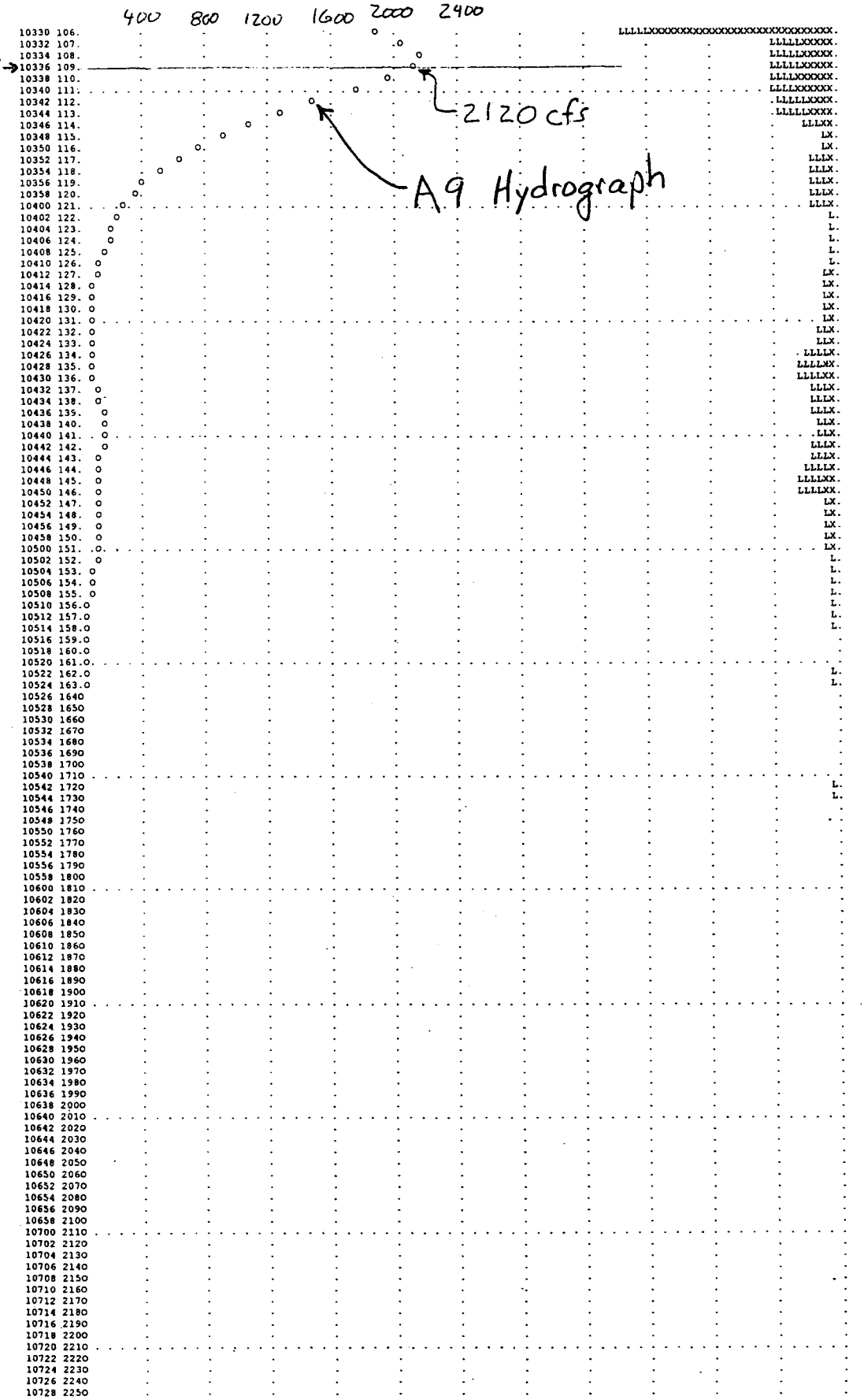

0 400 800 1200 1600 2000 2400 2800
peak Time
@ 50
3.60 HR
6 min / 60 min = 0.060 HR
3 HR - 36 min
120 cfs

```
 89 KK         *         A9  *
               *             *
               ***************

 90 KO                OUTPUT CONTROL VARIABLES
                           IPRNT         5  PRINT CONTROL
                           IPLOT         2  PLOT CONTROL
                           QSCAL         0.  HYDROGRAPH PLOT SCALE
1                                                  STATION       A9

                          (O) OUTFLOW
          0.      400.      800.     1200.     1600.     2000.     2400.        0.        0.        0.        0.        0.        0.
                                                                                          (L) PRECIP,   (X) EXCESS
         .00       .00       .00       .00       .00       .00       .00       .00       .16       .12       .08       .04       .00
DAHRMN PER
 10000   10---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.
 10002   20         .         .         .         .         .         .         .         .         .         .         .      LLLLXX.
 10004   30         .         .         .         .         .         .         .         .         .         .         .      LLLLXX.
 10006   4.O        .         .         .         .         .         .         .         .         .         .         .    LLLLLLXX.
 10008   5.O        .         .         .         .         .         .         .         .         .         .         .  LLLLLLLXXX.
 10010   6. O       .         .         .         .         .         .         .         .         .         .         .  LLLLLLLXXX.
 10012   7.  O      .         .         .         .         .         .         .         .         .         .         .      LLLX.
 10014   8.   O     .         .         .         .         .         .         .         .         .         .         .      LLLX.
 10016   9.    O    .         .         .         .         .         .         .         .         .         .         .      LLLX.
 10018   10.   O    .         .         .         .         .         .         .         .         .         .         .     LLLLX.
 10020   11. .O.----.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.-----LLLLX.
 10022   12.   O    .         .         .         .         .         .         .         .         .         .         .     LLLLXX.
 10024   13.   O    .         .         .         .         .         .         .         .         .         .         .     LLLLXX.
 10026   14.   O    .         .         .         .         .         .         .         .         .         .         .    LLLXX.
 10028   15.   O    .         .         .         .         .         .         .         .         .         .         .      LLLX.
 10030   16.   O    .         .         .         .         .         .         .         .         .         .         .      LLLX.
 10032   17.   O    .         .         .         .         .         .         .         .         .         .         .       LX.
 10034   18.   O    .         .         .         .         .         .         .         .         .         .         .       LX.
 10036   19.   O    .         .         .         .         .         .         .         .         .         .         .       L.
 10038   20.  O     .         .         .         .         .         .         .         .         .         .         .        .
 10040   21. .O.----.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.--------.
 10042   22. O      .         .         .         .         .         .         .         .         .         .         .        .
 10044   23. O      .         .         .         .         .         .         .         .         .         .         .        .
 10046   24.O       .         .         .         .         .         .         .         .         .         .         .        .
 10048   25.O       .         .         .         .         .         .         .         .         .         .         .        .
 10050   26.O       .         .         .         .         .         .         .         .         .         .         .        .
 10052   27.O       .         .         .         .         .         .         .         .         .         .         .        .
 10054   280        .         .         .         .         .         .         .         .         .         .         .        .
 10056   290        .         .         .         .         .         .         .         .         .         .         .        .
 10058   300        .         .         .         .         .         .         .         .         .         .         .        .
 10100   310----.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.--------.
 10102   320        .         .         .         .         .         .         .         .         .         .         .       L.
 10104   330        .         .         .         .         .         .         .         .         .         .         .       L.
 10106   340        .         .         .         .         .         .         .         .         .         .         .       L.
 10108   350        .         .         .         .         .         .         .         .         .         .         .      LX.
 10110   360        .         .         .         .         .         .         .         .         .         .         .      LX.
 10112   37.O       .         .         .         .         .         .         .         .         .         .         .       L.
 10114   38.O       .         .         .         .         .         .         .         .         .         .         .       L.
 10116   39.O       .         .         .         .         .         .         .         .         .         .         .       L.
 10118   40.O       .         .         .         .         .         .         .         .         .         .         .      LX.
 10120   41.O.----.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.-----LX.
 10122   42.O       .         .         .         .         .         .         .         .         .         .         .      LLX.
 10124   43.O       .         .         .         .         .         .         .         .         .         .         .      LLX.
 10126   44.O       .         .         .         .         .         .         .         .         .         .         .      LLX.
 10128   45.O       .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10130   46. O      .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10132   47. O      .         .         .         .         .         .         .         .         .         .         .      LLX.
 10134   48. O      .         .         .         .         .         .         .         .         .         .         .      LLX.
 10136   49. O      .         .         .         .         .         .         .         .         .         .         .      LLX.
 10138   50. O      .         .         .         .         .         .         .         .         .         .         .      LLX.
 10140   51. O----.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.-----LLX.
 10142   52. O      .         .         .         .         .         .         .         .         .         .         .       LX.
 10144   53. O      .         .         .         .         .         .         .         .         .         .         .       LX.
 10146   54. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10148   55. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10150   56. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10152   57. O      .         .         .         .         .         .         .         .         .         .         .        .
 10154   58.O       .         .         .         .         .         .         .         .         .         .         .        .
 10156   59.O       .         .         .         .         .         .         .         .         .         .         .        .
 10158   60.O       .         .         .         .         .         .         .         .         .         .         .        .
 10200   61.O----.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.--------.
 10202   62.O       .         .         .         .         .         .         .         .         .         .         .       L.
 10204   63.O       .         .         .         .         .         .         .         .         .         .         .       L.
 10206   64.O       .         .         .         .         .         .         .         .         .         .         .      LX.
 10208   65.O       .         .         .         .         .         .         .         .         .         .         .     LLX.
 10210   66.O       .         .         .         .         .         .         .         .         .         .         .     LLX.
 10212   67.O       .         .         .         .         .         .         .         .         .         .         .    LLLX.
 10214   68.O       .         .         .         .         .         .         .         .         .         .         .    LLLX.
 10216   69. O      .         .         .         .         .         .         .         .         .         .         .    LLLX.
 10218   70. O      .         .         .         .         .         .         .         .         .         .         .     LLX.
 10220   71. O----.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.-----LLX.
 10222   72. O      .         .         .         .         .         .         .         .         .         .         .      XX.
 10224   73. O      .         .         .         .         .         .         .         .         .         .         .      LX.
 10226   74. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10228   75. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10230   76. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10232   77. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10234   78. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10236   79.O       .         .         .         .         .         .         .         .         .         .         .     LLX.
 10238   80.O       .         .         .         .         .         .         .         .         .         .         .    LLLX.
 10240   81.O----.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.-----LLLX.
 10242   82. O      .         .         .         .         .         .         .         .         .         .         .      LX.
 10244   83. O      .         .         .         .         .         .         .         .         .         .         .      LX.
 10246   84. O      .         .         .         .         .         .         .         .         .         .         .      LL.
 10248   85. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10250   86. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10252   87. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10254   88. O      .         .         .         .         .         .         .         .         .         .         .       L.
 10256   89.O       .         .         .         .         .         .         .         .         .         .         .      LX.
 10258   90.O       .         .         .         .         .         .         .         .         .         .         .     LLX.
 10300   91.O----.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.-----LLX.
 10302   92.O       .         .         .         .         .         .         .         .         .         .         .  LLLLLLXX.
 10304   93. O      .         .         .         .         .         .         .         .         .         .         .  LLLLLLXX.
 10306   94. O      .         .         .         .         .         .         .         .         .         .         .  LLLLLLXX.
 10308   95.  O     .         .         .         .         .         .         .         .         .         .         .  LLLLLXXX.
 10310   96.   O    .         .         .         .         .         .         .         .         .         .         .  LLLLLXXX.
 10312   97.    O   .         .         .         .         .         .         .         .         .         .      LLLLLXXXXXXXXX.
 10314   98.     O  .         .         .         .         .         .         .         .         .         .      LLLLLXXXXXXXXX.
 10316   99.       O.         .         .         .         .         .         .         .         .         .    LLLLLXXXXXXXXXXXXXX.
 10318   100.        .  O      .         .         .         .         .         .         .         .         .  LLLLLXXXXXXXXXXXXXXXX.
 10320   101.---------.---------O---------.---------.---------.---------.---------.---------.---------.---------.-LLLLLXXXXXXXXXXXXXXXX.
 10322   102.        .         .    O    .         .         .         .         .         .         .         .  LLLLLXXXXXXXXXXXXXXXX.
 10324   103.        .         .         O         .         .         .         .         .         .         .    LLLLLXXXXXXXXXXXXXXXX.
 10326   104.        .         .         .    O    .         .         .         .         .         .         .  LLLLLXXXXXXXXXXXXXXXX.
 10328   105.        .         .         .         .O        .         .         .         .         .         .LLLLLXXXXXXXXXXXXXXXXXX.
```

A9



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10732 2270
10734 2280
10736 2290
10738 2300
10740 2310
10742 2320
10744 2330
10746 2340
10748 2350
10750 2360
10752 2370
10754 2380
10756 2390
10758 2400
10800 2410
10802 2420
10804 2430
10806 2440
10808 2450
10810 2460
10812 2470
10814 2480
10816 2490
10818 2500
10820 2510
10822 2520
10824 2530
10826 2540
10828 2550
10830 2560
10832 2570
10834 2580
10836 2590
10838 2600
10840 2610
10842 2620
10844 2630
10846 2640
10848 2650
10850 2660
10852 2670
10854 2680
10856 2690
10858 2700
10900 2710
10902 2720
10904 2730
10906 2740
10908 2750
10910 2760
10912 2770
10914 2780
10916 2790
10918 2800
10920 2810
10922 2820
10924 2830
10926 2840
10928 2850
10930 2860
10932 2870
10934 2880
10936 2890
10938 2900
10940 2910
10942 2920
10944 2930
10946 2940
10948 2950
10950 2960
10952 2970
10954 2980
10956 2990
10958 3000
1

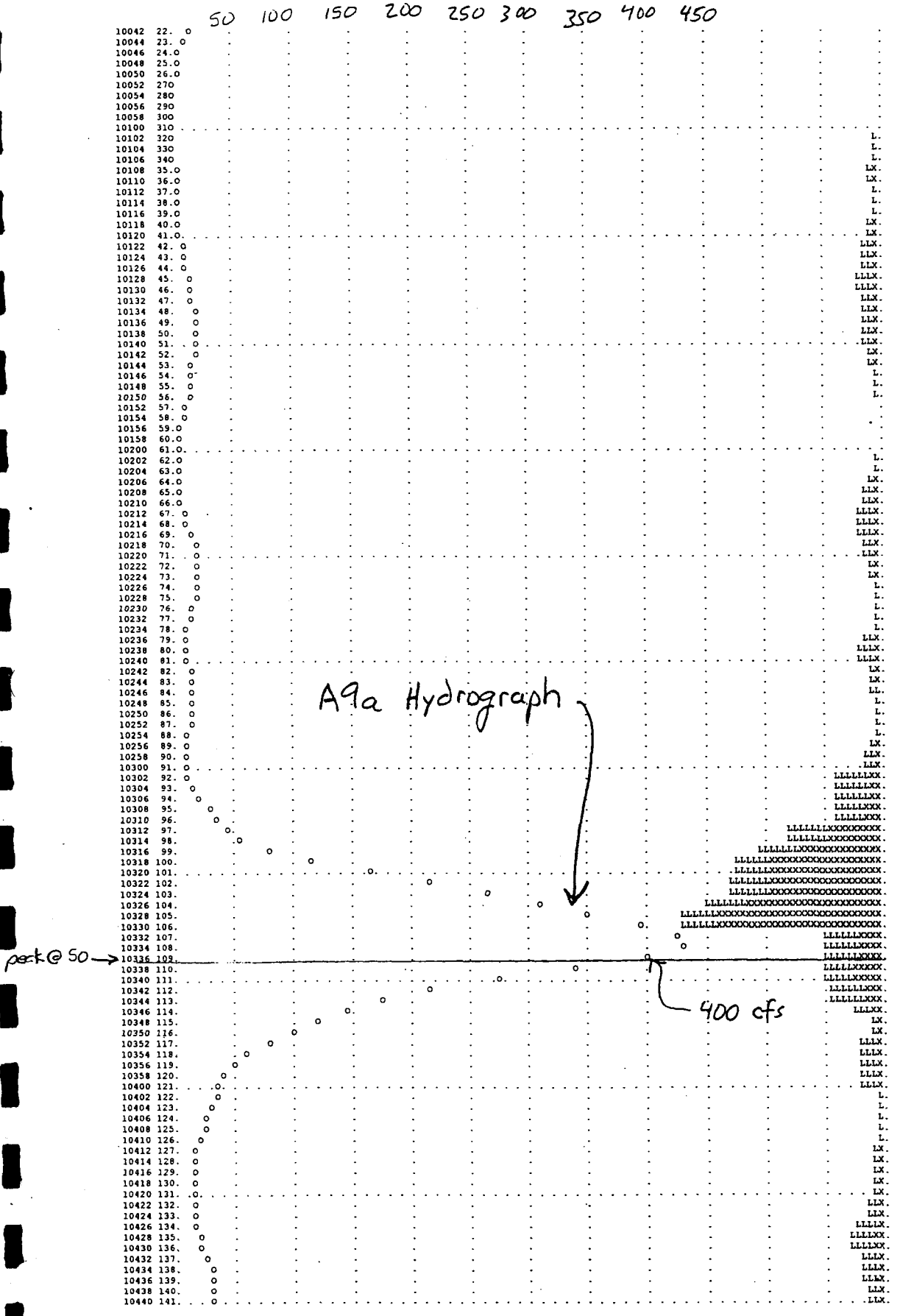
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

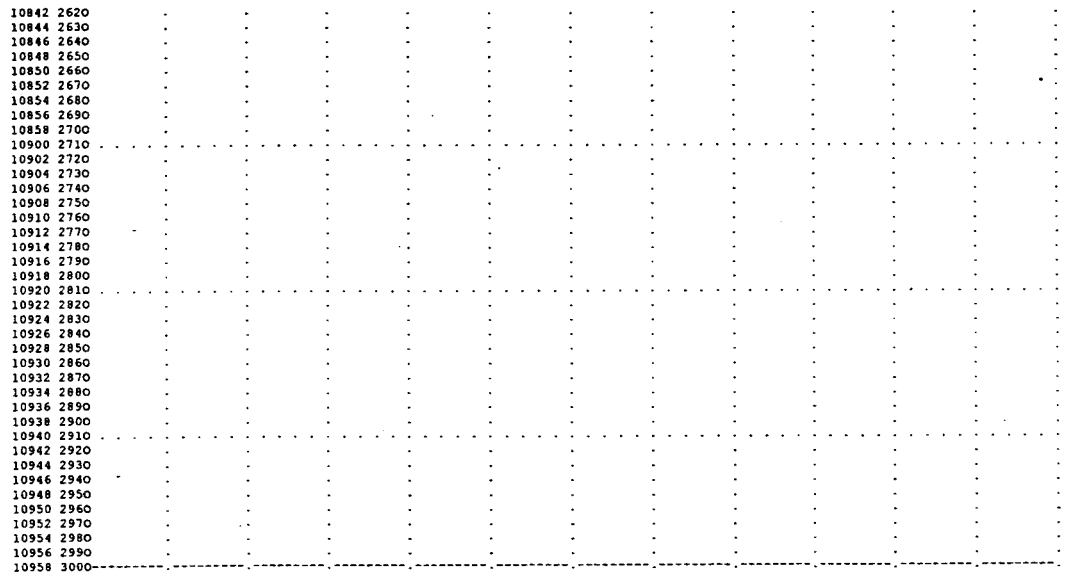
            **************
            *            *
 94 KK      *     A9a    *
            *            *
            **************

 95 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          2  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
1                                              STATION      A9a

                    (O) OUTFLOW
        0.      50.     100.     150.     200.     250.     300.     350.     400.     450.      0.       0.       0.
                                                                                          (L) PRECIP,  (X) EXCESS
       .00     .00      .00      .00      .00      .00      .00      .00      .16      .12      .08      .04      .00
DAHRMN PER
 10000  1O
 10002  2O                                                                                                    LLLLXX.
 10004  3.O                                                                                                    LLLLXX.
 10006  4. O                                                                                                  LLLLLLXX.
 10008  5.  O                                                                                                 LLLLLLLXXX.
 10010  6.    O                                                                                               LLLLLLLXXX.
 10012  7.      O                                                                                                  LLLX.
 10014  8.       O                                                                                                 LLLX.
 10016  9.       O                                                                                                 LLLX.
 10018  10.      O                                                                                                 LLLX.
 10020  11.     O                                                                                                 LLLX.
 10022  12.      O                                                                                                 LLLXX.
 10024  13.      O                                                                                                 LLLXX.
 10026  14.      O                                                                                                 LLLXX.
 10028  15.      O                                                                                                 LLLX.
 10030  16.      O                                                                                                 LLLX.
 10032  17.      O                                                                                                   LX.
 10034  18.     O                                                                                                    LX.
 10036  19.     O                                                                                                     L.
 10038  20.    O
 10040  21.   O
```

A9a


50 100 150 200 250 300 350 400 450
A9a Hydrograph
peak @ 50
400 cfs



```
 99 KK          *************
                *           *
                *     UN    *
                *           *
                *************

100 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          2  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
1                                       STATION       UN

                    (O) OUTFLOW
        0.      100.      200.      300.      400.      500.      600.      700.       0.        0.        0.        0.
                                                                                    (L) PRECIP,  (X) EXCESS
       .00       .00       .00       .00       .00       .00       .00       .00       .16       .12       .08       .04       .00
DAHRMN PER
 10000   1O---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------
 10002   2O         .         .         .         .         .         .         .         .         .         .         .  LLLLLX.
 10004   3O         .         .         .         .         .         .         .         .         .         .         .  LLLLLX.
 10006   4O         .         .         .         .         .         .         .         .         .         .         .  LLLLLLXX.
 10008   5O         .         .         .         .         .         .         .         .         .         .         .  LLLLLLLXXX.
 10010   6.O        .         .         .         .         .         .         .         .         .         .         .  LLLLLLLXXX.
 10012   7.O        .         .         .         .         .         .         .         .         .         .         .  LLLX.
 10014   8. O       .         .         .         .         .         .         .         .         .         .         .  LLLX.
 10016   9. O       .         .         .         .         .         .         .         .         .         .         .  LLLX.
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 10020  11. . O . . .
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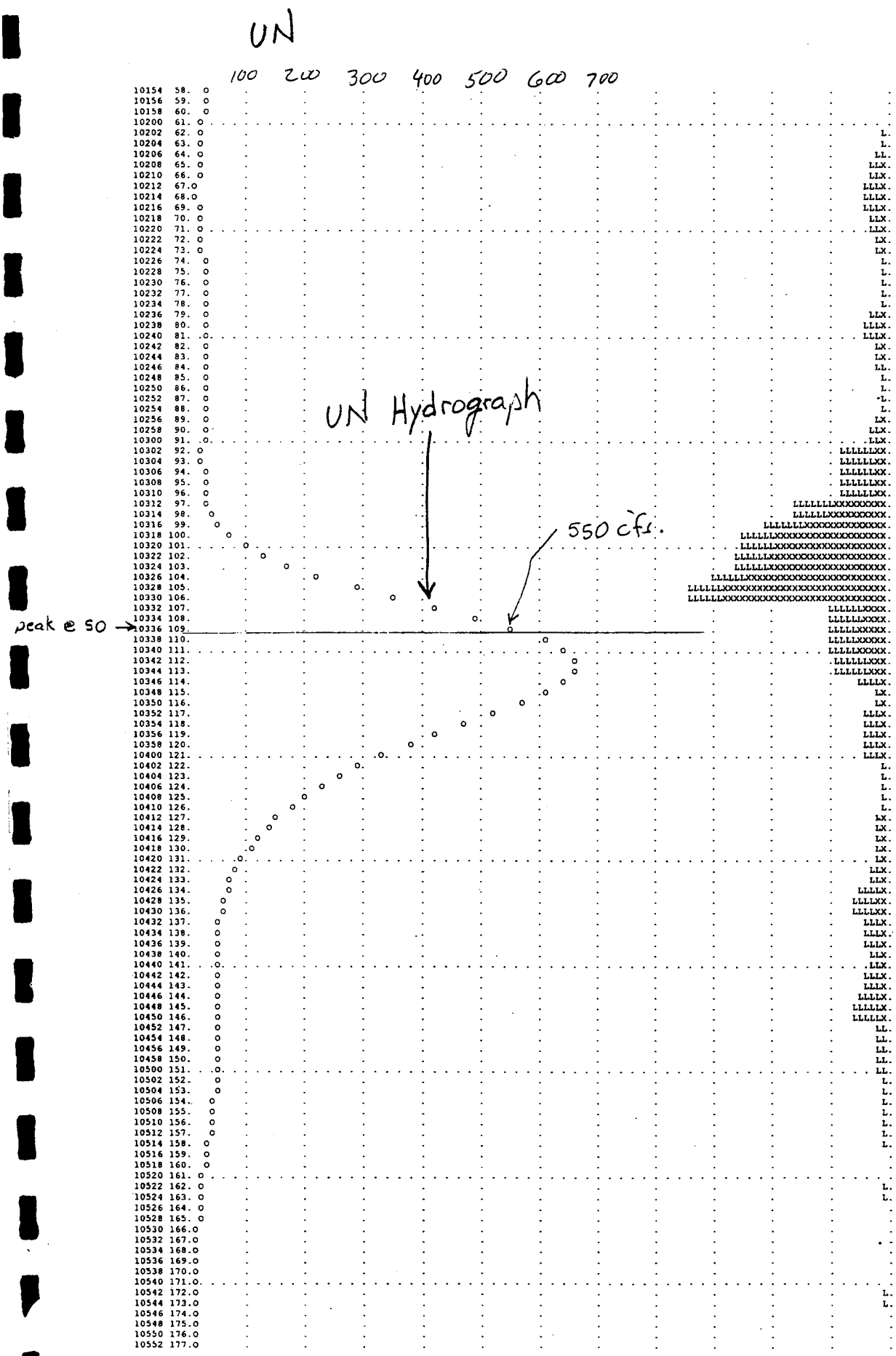
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UN Hydrograph
550 cfs.
peak @ 50

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 10956 2990          .         .         .         .         .         .         .         .         .         .         .         .         .
 10958 3000----------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.
1


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                ***************
                *               *
 105 KK         *        50     *     CNAME
                *               *
                ***************

 106 KO                OUTPUT CONTROL VARIABLES
                            IPRNT          5  PRINT CONTROL
                            IPLOT          2  PLOT CONTROL
                            QSCAL          0.  HYDROGRAPH PLOT SCALE
1                                                    STATION       50

                                  (O) OUTFLOW
                0.       400.      800.     1200.     1600.     2000.     2400.     2800.     3200.        0.        0.        0.        0.
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 10004   3O          .         .         .         .         .         .         .         .         .         .         .         .         .
 10006   4.O         .         .         .         .         .         .         .         .         .         .         .         .         .
 10008   5. O        .         .         .         .         .         .         .         .         .         .         .         .         .
 10010   6.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
 10012   7.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10014   8.    O     .         .         .         .         .         .         .         .         .         .         .         .         .
 10016   9.     O    .         .         .         .         .         .         .         .         .         .         .         .         .
 10018  10.     O    .         .         .         .         .         .         .         .         .         .         .         .         .
 10020  11. . . O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 10022  12.     O    .         .         .         .         .         .         .         .         .         .         .         .         .
 10024  13.     O    .         .         .         .         .         .         .         .         .         .         .         .         .
 10026  14.     O    .         .         .         .         .         .         .         .         .         .         .         .         .
 10028  15.      O   .         .         .         .         .         .         .         .         .         .         .         .         .
 10030  16.      O   .         .         .         .         .         .         .         .         .         .         .         .         .
 10032  17.      O   .         .         .         .         .         .         .         .         .         .         .         .         .
 10034  18.      O   .         .         .         .         .         .         .         .         .         .         .         .         .
 10036  19.     O    .         .         .         .         .         .         .         .         .         .         .         .         .
 10038  20.     O    .         .         .         .         .         .         .         .         .         .         .         .         .
 10040  21. . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
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 10044  23.    O     .         .         .         .         .         .         .         .         .         .         .         .         .
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 10048  25.    O     .         .         .         .         .         .         .         .         .         .         .         .         .
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 10056  29.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10058  30.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10100  31. O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 10102  32. O        .         .         .         .         .         .         .         .         .         .         .         .         .
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 10116  39.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
 10118  40.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
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 10128  45.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
 10130  46.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
 10132  47.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
 10134  48.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
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 10138  50.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10140  51. . O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 10142  52.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10144  53.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10146  54.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10148  55.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10150  56.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
 10152  57.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
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 10156  59.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
 10158  60. O        .         .         .         .         .         .         .         .         .         .         .         .         .
 10200  61. O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
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 10218  70.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10220  71. . O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
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 10224  73.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10226  74.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10228  75.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
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 10232  77.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
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 10236  79.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
 10238  80.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
 10240  81. .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 10242  82.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
 10244  83.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10246  84.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
 10248  85.   O      .         .         .         .         .         .         .         .         .         .         .         .         .
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 10254  88.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
 10256  89.  O       .         .         .         .         .         .         .         .         .         .         .         .         .
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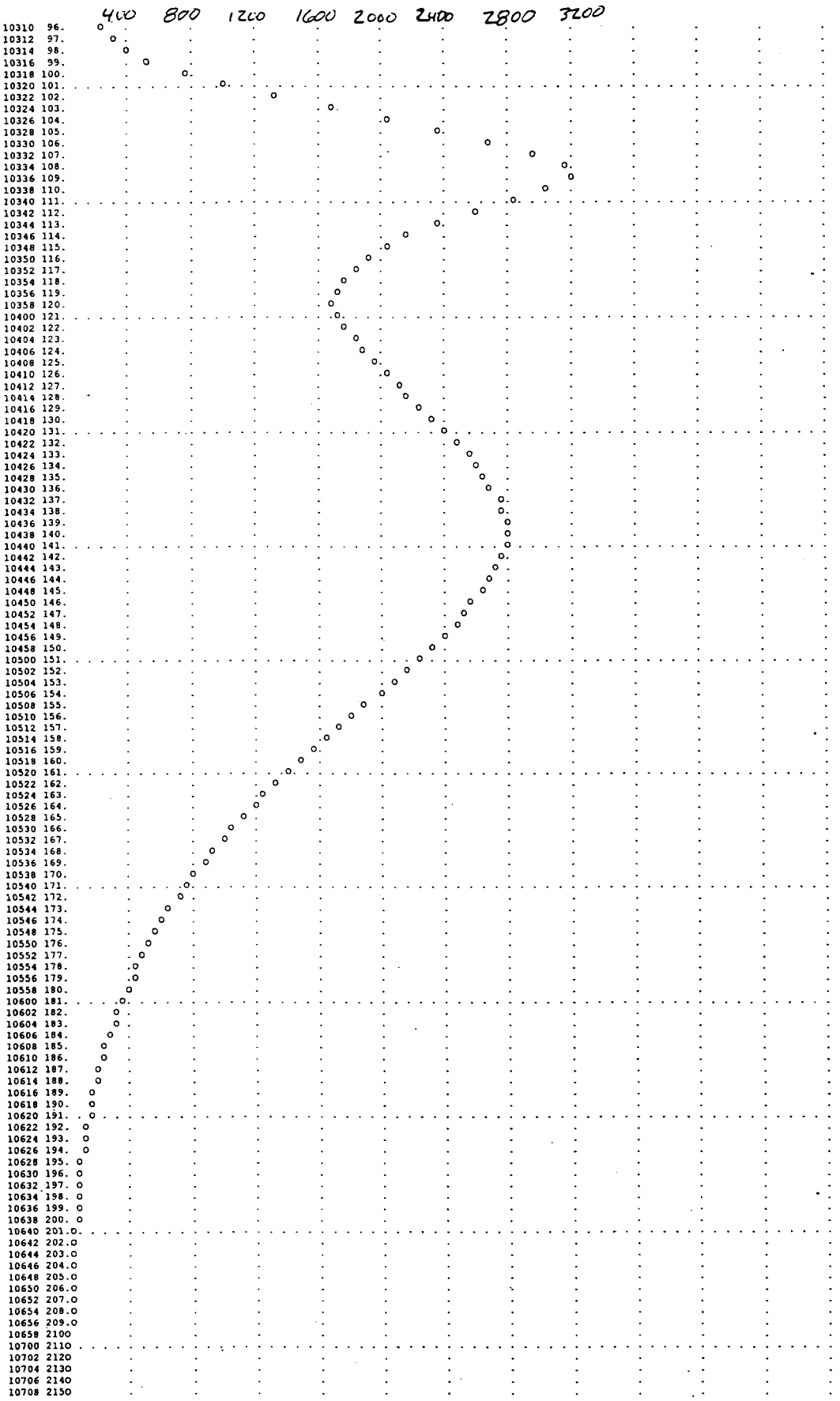
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1200
1600
2000
2400
2800
3200
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10324 103.
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10328 105.
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10544 173.
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10548 175.
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10558 180.
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10602 182.
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10606 184.
10608 185.
10610 186.
10612 187.
10614 188.
10616 189.
10618 190.
10620 191.
10622 192.
10624 193.
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10628 195.
10630 196.
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10634 198.
10636 199.
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10640 201.0
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10646 204.0
10648 205.0
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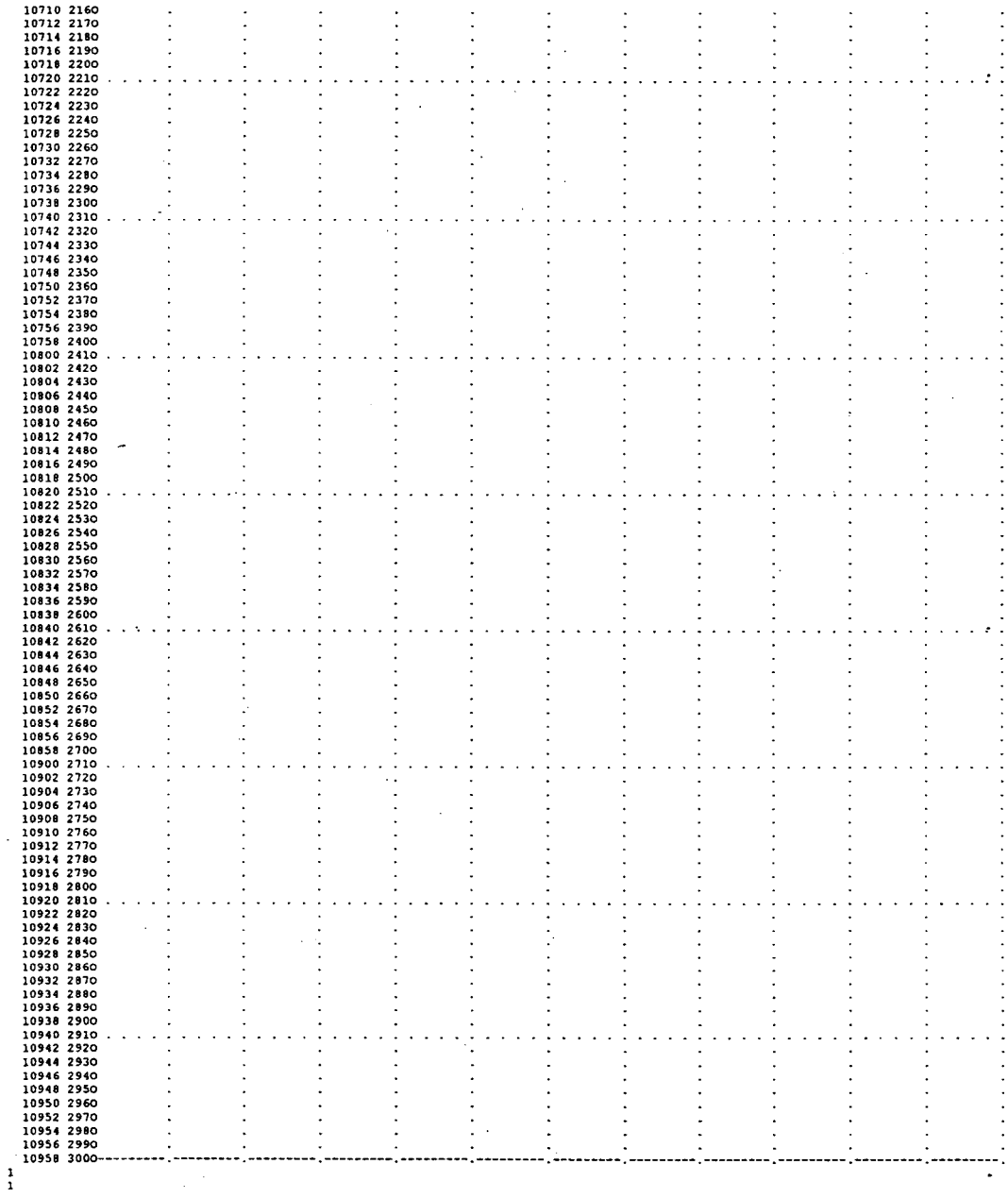


PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .89
HYDROGRAPH AT					
+	A1	1.12	1	FLOW	933.
				TIME	3.80
ROUTED TO					
+	A1-10	1.12	1	FLOW	780.
				TIME	4.23
HYDROGRAPH AT					
+	A2	.80	1	FLOW	619.
				TIME	3.93
2 COMBINED AT					
+	10	1.92	1	FLOW	1265.
				TIME	4.13
ROUTED TO					
+	10-20	1.92	1	FLOW	1195.
				TIME	4.37
HYDROGRAPH AT					
+	A3	.55	1	FLOW	526.
				TIME	3.80

```
HYDROGRAPH AT
+                  A4       .29     1   FLOW        382.
                                        TIME        3.70

 3 COMBINED AT
+                  20      2.76     1   FLOW       1387.
                                        TIME        4.30

ROUTED TO
+                20-40     2.76     1   FLOW       1349.
                                        TIME        4.53

HYDROGRAPH AT
+                  A5       .51     1   FLOW        537.
                                        TIME        3.77

 2 COMBINED AT
+                40A5      3.27     1   FLOW       1423.
                                        TIME        4.47

HYDROGRAPH AT
+                  A6       .92     1   FLOW        979.
                                        TIME        3.77

HYDROGRAPH AT
+                  A7       .29     1   FLOW        404.
                                        TIME        3.63

 2 COMBINED AT
+                  30      1.21     1   FLOW       1340.
                                        TIME        3.73

ROUTED TO
+                30-40     1.21     1   FLOW       1083.
                                        TIME        4.23

HYDROGRAPH AT
+                  A8       .48     1   FLOW        601.
                                        TIME        3.77

 3 COMBINED AT
+                  40      4.96     1   FLOW       2703.
                                        TIME        4.17

ROUTED TO
+                40-50     4.96     1   FLOW       2572.
                                        TIME        4.60
```

← @ 3.60 Q @ 50 = 120 cfs

```
HYDROGRAPH AT
+                  A9      1.40     1   FLOW       2160.
                                        TIME        3.57
```

— @ 3.60 Q = 2120 cfs

```
HYDROGRAPH AT
+                 A9a       .28     1   FLOW        432.
                                        TIME        3.57
```

— @ 3.60 Q = 400 cfs

```
HYDROGRAPH AT
+                  UN       .62     1   FLOW        659.
                                        TIME        3.70
```

— @ 3.60 Q = 550 cfs (83% of Peak)

```
 4 COMBINED AT
+                  50      7.26     1   FLOW       3191.
                                        TIME        3.60
```

— — — — — — — — = 3190 cfs ±

```
ROUTED TO
+                50-60     7.26     1   FLOW       3162.
                                        TIME        3.67

HYDROGRAPH AT
+                 A10       .49     1   FLOW        454.
                                        TIME        3.87
```

* Model using An Addtinal Routing Card From UN → 50 proved To be Insignificant.

```
 2 COMBINED AT
+                  60      7.75     1   FLOW       3505.
                                        TIME        3.70
1
                                    SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                        (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                          INTERPOLATED TO
                                                                      COMPUTATION INTERVAL
          ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT      PEAK    TIME TO     VOLUME
                                                   PEAK                                   PEAK

                              (MIN)     (CFS)      (MIN)      (IN)     (MIN)     (CFS)     (MIN)       (IN)

        FOR PLAN = 1  RATIO=  .89
           50-60  MANE         1.86   3172.06    221.28      1.22      2.00   3162.35    220.00       1.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4729E+03 EXCESS= .0000E+00 OUTFLOW= .4740E+03 BASIN STORAGE= .5596E-01 PERCENT ERROR=   -.3

1                                                  HEC-1 INPUT                                          PAGE  1

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

*** WARNING *** ZZ-CARD MISSING
             1
             2          ZZ
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN   1998            *
*          VERSION 4.1              *
*                                   *
*  RUN DATE   12OCT01  TIME  16:43:24  *
*                                   *
*************************************
```

```
*************************************
*                                   *
*   U.S. ARMY CORPS OF ENGINEERS    *
*   HYDROLOGIC ENGINEERING CENTER   *
*         609 SECOND STREET         *
*       DAVIS, CALIFORNIA 95616      *
*          (916) 756-1104           *
*                                   *
*************************************
```

```
*** HEC-1 ERROR 1 *** INVALID CARD IDENTIFICATION CODE OR CARD OUT OF SEQUENCE
     CARD NO.    1

     IT          HYDROGRAPH TIME DATA
                       NMIN          2  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
```

APPENDIX D

Reference Hydraulics

ABBOTT WASH HEC-RAS ANALYSIS

Bulloch Brothers Engineering, Inc.

RFCD

ADDENDUM - JULY 2003
for:

TECHNICAL DRAINAGE STUDY
Completed For
The Abbott Wash Conveyance Project
A Regional Flood Control Facility
From North of I-15 To The Virgin River
Located in Mesquite, Nevada

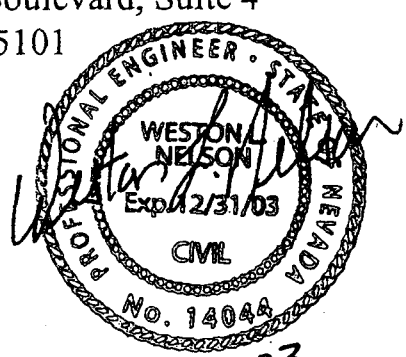
rev'd 9-22-03

Appendix F:
Revised Hec-Ras Analysis @ Outfall to the Virgin River

Prepared For:
The City of Mesquite / 10 East Mesquite Boulevard
Mesquite, Nevada 89027 / Phone: (702) 346-5295

In Conjunction with:
Clark County Regional Flood Control District
600 South Grand Central Parkway Ste 300
Las Vegas, Nevada 89106-4511 / Phone: (702) 455-3139

Prepared by:
Bulloch Brothers Engineering, Inc. / 561 West Mesquite Boulevard, Suite 4
Mesquite, Nevada 89027 / Phone: (702) 346-5101



7-17-03

JULY 2003

APPENDIX F

- **Revised Hec-Ras Discussion and Model at Virgin River Outfall**

Due to restrictions mandated by the U.S. Fish and Wildlife, the Improvement Plans completed for this Project, and Application for "*Section 404 Letters of Permission for the State of Nevada,*" are revised accordingly:

1.) The Gabion protection will terminate at the existing Property Line approximately 10 feet north of the Virgin River. The Gabion protection shown within the Virgin River has been removed.
2.) The bottom width of the Gabion lined trapezoid channel has been increased from 30 feet to 54 feet. The increased width aids in slowing the velocity down.
3.) The first 50 feet (Sta: 1+13 to 1+63±) of the Gabion lined channel will be revised in the following manner: Soil will be washed in around the rock fill in the Gabions and planted with willow cuttings, Yuma Clapper Rail, and other natural vegetation.
4.) The top six inches of the remaining Gabion Lined channel will be grouted, and energy dissipators are added to help slow down the velocity prior to reaching the river. Please refer to Sheet 3 of the Improvement Plans.

The Gabion protection will terminate at the property line approximately 10 feet north of the Virgin River (Station 1+13±).

The expected velocity for a major event at the Outfall is approximately 8 ft/s (no backwater condition). Although this velocity is slightly higher than that allowed by CCRFCD for runoff discharged onto vegetated silty sand, it matches the existing condition velocity at this location. See Appendix D, page D20, SECNO 4 and 5. Therefore, the existing condition is matched. The expected scour depth for the Virgin River during a 100-year event is approximately 4 feet. The Gabion cut-off wall at the termination point extends approximately 5 feet below the channel invert of the Virgin River, and is expected to protect against scour holes that may develop during a storm event.

It is expected that Dewatering will be utilized to stabilize soil conditions during construction at the Outfall. Sumps or wells used in the Dewatering process will be located away from the Virgin River. No river diversion is necessary with the proposed revisions. However, temporary placement of concrete barrier rail over sand bags on the existing river bank, or possibly sheet piling, may be necessary to prevent river flows from entering the work zone.

The following Hec-Ras output is similar to the latest output received in Addendum D submitted in December of 2002 with the exception of revisions at the outfall. A separate hydraulic analysis will be submitted for the revised channel included with the NDOT project where much of the open channel has been replaced with box culvert. The Hec-Ras model included with this submittal does not account for the additional box culvert included with the NDOT project.

HEC-RAS Plan: AWC5-03 River: Abbott Wash Reach: AW Profile: PF 1

Reach	River Sta	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	Shear Chan	Hydr Depth	Hydr Depth C
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(ft)	(ft)
AW	8741.56	2790.00	1620.28	1625.55	1625.87	1627.96	0.009507	12.45	224.17	58.40	1.12	2.21	3.84	3.84
AW	8641.56	2790.00	1619.33	1624.59	1624.92	1627.01	0.009586	12.48	223.52	58.34	1.12	2.23	3.83	3.83
AW	8541.56	2790.00	1618.38	1623.65	1623.97	1626.06	0.009513	12.45	224.12	58.40	1.12	2.22	3.84	3.84
AW	8441.56	2790.00	1617.43	1622.71	1623.02	1625.10	0.009440	12.41	224.73	58.45	1.12	2.20	3.84	3.84
AW	8341.56	2790.00	1616.48	1621.77	1622.07	1624.15	0.009369	12.38	225.34	58.51	1.11	2.19	3.85	3.85
AW	8241.56	2790.00	1615.39	1620.50	1620.99	1623.13	0.010785	13.02	214.34	57.41	1.19	2.44	3.73	3.73
AW	8141.56	2790.00	1614.29	1619.38	1619.89	1622.04	0.010941	13.08	213.25	57.31	1.20	2.47	3.72	3.72
AW	8091.56	2790.00	1613.74	1618.83	1619.34	1621.48	0.010884	13.06	213.67	57.36	1.19	2.46	3.72	3.72
AW	8041.56	2790.00	1613.20	1619.41	1618.79	1620.94	0.005006	9.90	281.79	63.79	0.83	1.34	4.42	4.42
AW	7991.56	2790.00	1612.65	1619.48		1620.64	0.002748	8.66	322.18	67.31	0.70	0.79	4.79	4.79
AW	7941.56	2790.00	1612.10	1619.34	1617.15	1620.57	0.000844	8.89	313.88	43.34	0.58	0.29	7.24	7.24
AW	7900	Bridge												
AW	7611	2790.00	1609.70	1613.70	1614.73	1617.72	0.005221	16.10	173.24	43.34	1.42	1.10	4.00	4.00
AW	7537.59	3334.00	1607.90	1614.19	1614.25	1617.39	0.002699	14.36	232.10	37.76	1.02	0.79	6.15	6.15
AW	7476.58	3334.00	1606.40	1612.24	1613.34	1617.09	0.004596	17.67	188.71	33.10	1.30	1.22	5.70	5.70
AW	7416.02	3334.00	1604.92	1611.28	1612.57	1616.77	0.005052	18.80	177.39	28.50	1.33	1.38	6.22	6.22
AW	7356.36	3334.00	1603.50	1608.83	1611.01	1616.31	0.008053	21.95	151.91	28.50	1.68	1.95	5.33	5.33
AW	7200	Bridge												
AW	6988.71	3334.00	1600.50	1606.11	1608.00	1612.87	0.006935	20.87	159.77	28.50	1.55	1.74	5.61	5.61
AW	6840.4	3520.00	1599.52	1606.01	1607.45	1611.89	0.005319	19.46	180.89	28.50	1.36	1.47	6.35	6.35
AW	6700	3520.00	1598.60	1604.93	1606.53	1611.11	0.005725	19.96	176.39	28.50	1.41	1.55	6.19	6.19
AW	6600	3520.00	1597.94	1604.19	1605.87	1610.54	0.005946	20.22	174.13	28.50	1.44	1.60	6.11	6.11
AW	6500	3520.00	1597.28	1603.48	1605.21	1609.93	0.006099	20.39	172.62	28.50	1.46	1.63	6.06	6.06
AW	6400	3520.00	1596.62	1602.78	1604.55	1609.32	0.006215	20.52	171.52	28.50	1.47	1.65	6.02	6.02
AW	6300	3520.00	1595.96	1602.09	1603.89	1608.69	0.006303	20.62	170.70	28.50	1.48	1.67	5.99	5.99
AW	6200	3520.00	1595.30	1601.41	1603.23	1608.06	0.006371	20.70	170.08	28.50	1.49	1.68	5.97	5.97
AW	6100	3520.00	1594.64	1600.73	1602.57	1607.43	0.006440	20.77	169.46	28.50	1.50	1.70	5.95	5.95
AW	6000	3670.00	1593.98	1600.50	1602.13	1606.83	0.005692	20.18	181.86	28.50	1.41	1.58	6.38	6.38
AW	5900	3670.00	1593.32	1599.76	1601.47	1606.25	0.005905	20.44	179.59	28.50	1.43	1.62	6.30	6.30
AW	5800	3670.00	1592.66	1599.04	1600.81	1605.65	0.006064	20.62	177.96	28.50	1.45	1.65	6.24	6.24
AW	5700	3670.00	1592.00	1598.34	1600.15	1605.04	0.006185	20.76	176.76	28.50	1.47	1.68	6.20	6.20
AW	5600	3670.00	1590.94	1596.98	1599.09	1604.37	0.007148	21.81	168.25	28.50	1.58	1.88	5.90	5.90
AW	5500	3670.00	1589.88	1595.73	1598.03	1603.62	0.007873	22.54	162.83	28.50	1.66	2.02	5.71	5.71
AW	5400	3670.00	1588.82	1594.54	1596.97	1602.80	0.008425	23.06	159.13	28.50	1.72	2.12	5.58	5.58
AW	5300	3670.00	1587.76	1593.39	1595.91	1601.94	0.008864	23.46	156.42	28.50	1.76	2.21	5.49	5.49
AW	5200	3670.00	1586.70	1592.26	1594.84	1601.03	0.009215	23.77	154.38	28.50	1.80	2.27	5.42	5.42
AW	5100	4000.00	1585.64	1591.62	1594.13	1600.17	0.008241	23.46	170.50	28.50	1.69	2.17	5.98	5.98
AW	5092	Bridge												
AW	4991.79	4000.00	1584.50	1590.55	1592.97	1598.90	0.007962	23.19	172.51	28.50	1.66	2.11	6.05	6.05
AW	4900	4000.00	1583.90	1590.22	1592.49	1598.16	0.007347	22.61	176.88	28.50	1.60	1.99	6.21	6.21
AW	4800	4000.00	1583.25	1589.66	1591.87	1597.44	0.007104	22.37	178.81	28.50	1.57	1.95	6.27	6.27
AW	4700	4000.00	1582.60	1589.05	1591.22	1596.74	0.006992	22.25	179.78	28.50	1.56	1.92	6.31	6.31
AW	4600	4000.00	1581.95	1588.43	1590.57	1596.04	0.006882	22.13	180.76	28.50	1.55	1.90	6.34	6.34
AW	4500	4000.00	1581.30	1587.81	1589.92	1595.35	0.006804	22.04	181.47	28.50	1.54	1.88	6.37	6.37
AW	4400	4000.00	1580.65	1587.18	1589.27	1594.67	0.006727	21.96	182.18	28.50	1.53	1.87	6.39	6.39
AW	4300	4000.00	1580.00	1586.55	1588.62	1594.00	0.006681	21.90	182.61	28.50	1.52	1.86	6.41	6.41

HEC-RAS Plan: AWC5-03 River: Abbott Wash Reach: AW Profile: PF 1 (Continued)

Reach	River Sta	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	Shear Chan	Hydr Depth	Hydr Depth C
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(ft)	(ft)
AW	4200	4000.00	1579.35	1585.91	1587.97	1593.33	0.006635	21.85	183.05	28.50	1.52	1.85	6.42	6.42
AW	4100	4000.00	1578.70	1585.28	1587.32	1592.66	0.006589	21.80	183.48	28.50	1.51	1.84	6.44	6.44
AW	4000	4000.00	1578.05	1584.63	1586.67	1592.00	0.006570	21.78	183.66	28.50	1.51	1.83	6.44	6.44
AW	3900	4000.00	1577.40	1583.99	1586.02	1591.34	0.006552	21.76	183.83	28.50	1.51	1.83	6.45	6.45
AW	3800	4000.00	1576.59	1583.08	1585.21	1590.67	0.006870	22.11	180.87	28.50	1.55	1.90	6.35	6.35
AW	3700	4000.00	1575.78	1582.19	1584.40	1589.97	0.007121	22.39	178.66	28.50	1.58	1.95	6.27	6.27
AW	3600	4000.00	1574.98	1581.34	1583.60	1589.25	0.007301	22.58	177.15	28.50	1.60	1.99	6.22	6.22
AW	3486.52	4000.00	1573.90	1580.20	1582.52	1588.26	0.007503	22.79	175.51	28.50	1.62	2.03	6.16	6.16
AW	3420	4000.00	1573.52	1579.58	1581.99	1587.91	0.007926	23.15	172.78	28.50	1.66	2.10	6.06	6.06
AW	3370	Bridge												
AW	3324	4000.00	1572.74	1578.99	1581.21	1586.82	0.007244	22.45	178.17	28.50	1.58	1.97	6.25	6.25
AW	3201.70	4000.00	1571.76	1578.18	1580.38	1585.94	0.007097	22.36	178.87	28.50	1.57	1.94	6.28	6.28
AW	3100	4000.00	1570.93	1577.28	1579.55	1585.22	0.007332	22.61	176.89	28.50	1.60	1.99	6.21	6.21
AW	3000	4000.00	1570.13	1576.44	1578.75	1584.48	0.007477	22.76	175.71	28.50	1.62	2.02	6.17	6.17
AW	2900	4000.00	1569.32	1575.59	1577.94	1583.72	0.007588	22.88	174.83	28.50	1.63	2.05	6.13	6.13
AW	2800	4000.00	1568.51	1574.75	1577.13	1582.97	0.007703	23.00	173.94	28.50	1.64	2.07	6.10	6.10
AW	2700	4000.00	1567.70	1573.92	1576.32	1582.19	0.007781	23.08	173.33	28.50	1.65	2.08	6.08	6.08
AW	2600	4000.00	1566.89	1573.09	1575.51	1581.42	0.007862	23.16	172.73	28.50	1.66	2.10	6.06	6.06
AW	2531.46	4000.00	1566.34	1572.53	1574.96	1580.88	0.007885	23.18	172.55	28.50	1.66	2.11	6.05	6.05
AW	2419.08	4000.00	1565.43	1571.62	1574.05	1579.99	0.007923	23.22	172.27	28.50	1.66	2.11	6.04	6.04
AW	2300	4000.00	1564.47	1570.64	1573.09	1579.05	0.007963	23.26	171.98	28.50	1.67	2.12	6.03	6.03
AW	2181.22	4000.00	1563.51	1569.67	1572.13	1578.10	0.008003	23.30	171.69	28.50	1.67	2.13	6.02	6.02
AW	2081.22	4000.00	1562.70	1565.99	1568.85	1576.85	0.017409	26.44	151.28	46.00	2.57	3.13	3.29	3.29
AW	2080	Bridge												
AW	2000	4000.00	1562.22	1565.81	1568.37	1574.94	0.013245	24.25	164.95	46.00	2.26	2.57	3.59	3.59
AW	1942	4000.00	1561.28	1565.00	1567.59	1574.17	0.013234	24.30	164.63	46.00	2.26	2.57	3.58	3.58
AW	1700	4000.00	1557.38	1563.70	1566.00	1571.70	0.007411	22.70	176.24	28.50	1.61	2.01	6.18	6.18
AW	1600	4000.00	1555.76	1561.66	1564.38	1570.88	0.009136	24.37	164.12	28.50	1.79	2.36	5.76	5.76
AW	1500	4000.00	1554.76	1560.62	1563.38	1569.96	0.009308	24.53	163.09	28.50	1.81	2.39	5.72	5.72
AW	1400	4000.00	1553.76	1559.59	1562.38	1569.03	0.009444	24.65	162.29	28.50	1.82	2.42	5.69	5.69
AW	1300	4000.00	1552.76	1558.57	1561.38	1568.08	0.009553	24.74	161.66	28.50	1.83	2.44	5.67	5.67
AW	1200	4000.00	1551.76	1557.56	1560.38	1567.12	0.009640	24.82	161.16	28.50	1.84	2.45	5.65	5.65
AW	1100	4000.00	1550.76	1556.54	1559.38	1566.15	0.009709	24.88	160.77	28.50	1.85	2.47	5.64	5.64
AW	1000	4000.00	1549.76	1555.53	1558.38	1565.18	0.009765	24.93	160.46	28.50	1.85	2.48	5.63	5.63
AW	900	4000.00	1548.76	1554.52	1557.38	1564.20	0.009811	24.97	160.21	28.50	1.86	2.49	5.62	5.62
AW	800	4000.00	1547.76	1553.51	1556.38	1563.22	0.009847	25.00	160.01	28.50	1.86	2.49	5.61	5.61
AW	724	4000.00	1547.00	1552.56	1555.46	1562.46	0.010230	25.24	158.45	28.50	1.89	2.55	5.56	5.56
AW	718	Bridge												
AW	704	4000.00	1546.80	1552.44	1555.27	1562.06	0.009823	24.90	160.64	28.50	1.85	2.48	5.64	5.64
AW	648	4000.00	1546.24	1552.08	1554.86	1561.51	0.009439	24.64	162.32	28.50	1.82	2.41	5.70	5.70
AW	600	4000.00	1546.00	1551.93	1554.62	1561.06	0.009010	24.26	164.90	28.50	1.78	2.33	5.79	5.79
AW	500	4000.00	1545.50	1551.61	1554.12	1560.19	0.008220	23.51	170.12	28.50	1.70	2.17	5.97	5.97
AW	400	4000.00	1545.00	1551.27	1553.62	1559.40	0.007591	22.88	174.80	28.50	1.63	2.05	6.13	6.13
AW	300	4000.00	1544.50	1550.92	1553.12	1558.67	0.007076	22.34	179.05	28.50	1.57	1.94	6.28	6.28
AW	225	4000.00	1544.12	1550.64	1552.74	1558.16	0.006773	22.01	181.75	28.50	1.54	1.88	6.38	6.38
AW	215	4000.00	1544.03	1548.21	1553.01	1558.05	0.017045	25.17	158.89	80.52	2.17	4.45	4.18	4.18

HEC-RAS Plan: AWC5-03 River: Abbott Wash Reach: AW Profile: PF 1 (Continued)

Reach	River Sta	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	Shear Chan	Hydr. Depth	Hydr. Depth C.
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(ft)	(ft)
AW	214	Inline Weir	baffles											
AW	202	4000.00	1543.92	1550.63	1548.92	1551.61	0.001296	7.95	503.08	96.04	0.61	0.41	5.24	5.24
AW	201	Inline Weir	baffles											
AW	199	4000.00	1543.89	1550.19		1551.34	0.001630	8.62	464.17	93.37	0.68	0.50	4.97	4.97
AW	163	4000.00	1543.73	1550.14		1551.25	0.002404	8.46	472.54	93.41	0.66	0.74	5.06	5.06
AW	113	4000.00	1543.50	1550.00	1548.50	1551.08	0.004500	8.34	479.66	93.66	0.65	1.41	5.12	5.12

w/o Virgin River flowing @ Qp, otherwise, WSE ≈ 1557.4'

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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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: 1029-190-05 Abbott Wash Conv (8/21/02)
Project File : 5103.prj
Run Date and Time: 7/16/2003 10:46:00 PM

Project in English units

Project Description:
Abbott Wash Conveyance

PLAN DATA

Plan Title: AWC5-03
Plan File : C:\Hec\RAS\Abbott Wash Conv-Proj\AWC-May-03-Outfall-rev\5103.p19

Geometry Title: AWC8-02All U-PierB-5-03EngD-Outf
Geometry File : C:\Hec\RAS\Abbott Wash Conv-Proj\AWC-May-03-Outfall-rev\5103.g02

Flow Title : AWC-8-21-02-MFR-Use VR BW-Adj Locations
Flow File : C:\Hec\RAS\Abbott Wash Conv-Proj\AWC-May-03-Outfall-rev\5103.f03

Plan Summary Information:
Number of: Cross Sections = 90 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 2
Bridges = 6

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

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: AWC-8-21-02-MFR-Use VR BW-Adj Locations
Flow File : C:\Hec\RAS\Abbott Wash Conv-Proj\AWC-May-03-Outfall-rev\5103.f03

Flow Data (cfs)

River	Reach	RS	PF 1
Abbott Wash	AW	8741.56	2790
Abbott Wash	AW	7537.59	3334
Abbott Wash	AW	6840.4	3520
Abbott Wash	AW	6000	3670
Abbott Wash	AW	5100	4000

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Abbott Wash	AW	PF 1	Normal S = .0095	Normal S = .0045

Inline Weir Gate Openings
River = Abbott Wash
Reach = AW RS = 238
Gate = Gate #1
# Open Open Ht
0 0

GEOMETRY DATA

Geometry Title: AWC8-02All U-PierB-5-03EngD-Outf
Geometry File : C:\Hec\RAS\Abbott Wash Conv-Proj\AWC-May-03-Outfall-rev\5103.g02

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 8741.56

INPUT
Description: Station: 87+41.56 (Eq. Sta: 38+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1628.98	85	1620.58	100	1620.28	115	1620.58	139	1628.98

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1627.96	Element			
Vel Head (ft)	2.41	Wt. n-Val.		0.028	
W.S. Elev (ft)	1625.55	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1625.87	Flow Area (sq ft)		224.17	
E.G. Slope (ft/ft)	0.009507	Area (sq ft)		224.17	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	58.40	Top Width (ft)		58.40	
Vel Total (ft/s)	12.45	Avg. Vel. (ft/s)		12.45	
Max Chl Dpth (ft)	5.27	Hydr. Depth (ft)		3.84	
Conv. Total (cfs)	28613.9	Conv. (cfs)		28613.9	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		60.10	
Min Ch El (ft)	1620.28	Shear (lb/sq ft)		2.21	
Alpha	1.00	Stream Power (lb/ft s)		27.56	
Frctn Loss (ft)		Cum Volume (acre-ft)		36.16	
C & E Loss (ft)		Cum SA (acres)		6.57	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 8641.56

INPUT
Description: Station: 86+41.56 (Eq. Sta: 37+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1628.03	85	1619.63	100	1619.33	115	1619.63	139	1628.03

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1627.01	Element			
Vel Head (ft)	2.42	Wt. n-Val.		0.028	
W.S. Elev (ft)	1624.59	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1624.92	Flow Area (sq ft)		223.52	
E.G. Slope (ft/ft)	0.009586	Area (sq ft)		223.52	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	58.34	Top Width (ft)		58.34	
Vel Total (ft/s)	12.48	Avg. Vel. (ft/s)		12.48	
Max Chl Dpth (ft)	5.26	Hydr. Depth (ft)		3.83	
Conv. Total (cfs)	28496.5	Conv. (cfs)		28496.5	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		60.03	

Min Ch El (ft)	1619.33	Shear (lb/sq ft)	2.23
Alpha	1.00	Stream Power (lb/ft s)	27.81
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)	35.65
C & E Loss (ft)	0.00	Cum SA (acres)	6.43

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 8541.56

INPUT
Description: Station: 85+41.56 (Eq. Sta: 36+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1627.08	85	1618.68	100	1618.38	115	1618.68	139	1627.08

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1626.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.41	Wt. n-Val.		0.028	
W.S. Elev (ft)	1623.65	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1623.97	Flow Area (sq ft)		224.12	
E.G. Slope (ft/ft)	0.009513	Area (sq ft)		224.12	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	58.40	Top Width (ft)		58.40	
Vel Total (ft/s)	12.45	Avg. Vel. (ft/s)		12.45	
Max Chl Dpth (ft)	5.27	Hydr. Depth (ft)		3.84	
Conv. Total (cfs)	28605.4	Conv. (cfs)		28605.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		60.09	
Min Ch El (ft)	1618.38	Shear (lb/sq ft)		2.22	
Alpha	1.00	Stream Power (lb/ft s)		27.57	
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)		35.13	
C & E Loss (ft)	0.00	Cum SA (acres)		6.30	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 8441.56

INPUT
Description: Station: 84+41.56 (Eq. Sta: 35+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1626.13	85	1617.73	100	1617.43	115	1617.73	139	1626.13

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1625.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.39	Wt. n-Val.		0.028	
W.S. Elev (ft)	1622.71	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1623.02	Flow Area (sq ft)		224.73	
E.G. Slope (ft/ft)	0.009440	Area (sq ft)		224.73	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	58.45	Top Width (ft)		58.45	
Vel Total (ft/s)	12.41	Avg. Vel. (ft/s)		12.41	
Max Chl Dpth (ft)	5.28	Hydr. Depth (ft)		3.84	
Conv. Total (cfs)	28715.3	Conv. (cfs)		28715.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		60.15	
Min Ch El (ft)	1617.43	Shear (lb/sq ft)		2.20	
Alpha	1.00	Stream Power (lb/ft s)		27.34	
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)		34.62	
C & E Loss (ft)	0.00	Cum SA (acres)		6.17	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 8341.56

INPUT
Description: Station: 83+41.56 GB slope=1.10% (Eq. Sta: 34+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1625.18	85	1616.78	100	1616.48	115	1616.78	139	1625.18

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1624.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.38	Wt. n-Val.		0.028	
W.S. Elev (ft)	1621.77	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1622.07	Flow Area (sq ft)		225.34	
E.G. Slope (ft/ft)	0.009369	Area (sq ft)		225.34	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	58.51	Top Width (ft)		58.51	
Vel Total (ft/s)	12.38	Avg. Vel. (ft/s)		12.38	
Max Chl Dpth (ft)	5.29	Hydr. Depth (ft)		3.85	
Conv. Total (cfs)	28825.0	Conv. (cfs)		28825.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		60.22	
Min Ch El (ft)	1616.48	Shear (lb/sq ft)		2.19	
Alpha	1.00	Stream Power (lb/ft s)		27.10	
Frctn Loss (ft)	0.94	Cum Volume (acre-ft)		34.10	
C & E Loss (ft)	0.00	Cum SA (acres)		6.03	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 8241.56

INPUT
Description: Station: 82+41.56 (Eq. Sta: 33+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1624.1	85	1615.7	100	1615.39	115	1615.7	139	1624.1

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1623.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.63	Wt. n-Val.		0.028	
W.S. Elev (ft)	1620.50	Reach Len. (ft)	100.00	100.00	101.00
Crit W.S. (ft)	1620.99	Flow Area (sq ft)		214.34	
E.G. Slope (ft/ft)	0.010785	Area (sq ft)		214.34	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	57.41	Top Width (ft)		57.41	
Vel Total (ft/s)	13.02	Avg. Vel. (ft/s)		13.02	
Max Chl Dpth (ft)	5.11	Hydr. Depth (ft)		3.73	
Conv. Total (cfs)	26865.0	Conv. (cfs)		26865.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		59.05	
Min Ch El (ft)	1615.39	Shear (lb/sq ft)		2.44	
Alpha	1.00	Stream Power (lb/ft s)		31.81	
Frctn Loss (ft)	1.00	Cum Volume (acre-ft)		33.60	
C & E Loss (ft)	0.03	Cum SA (acres)		5.90	

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: Abbott Wash
REACH: AW RS: 8141.56

INPUT
Description: Station: 81+41.56 (Eq. Sta: 32+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1623	85	1614.6	100	1614.29	115	1614.6	139	1623

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1622.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.66	Wt. n-Val.		0.028	
W.S. Elev (ft)	1619.38	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	1619.89	Flow Area (sq ft)		213.25	
E.G. Slope (ft/ft)	0.010941	Area (sq ft)		213.25	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	57.31	Top Width (ft)		57.31	
Vel Total (ft/s)	13.08	Avg. Vel. (ft/s)		13.08	
Max Chl Dpth (ft)	5.09	Hydr. Depth (ft)		3.72	
Conv. Total (cfs)	26673.2	Conv. (cfs)		26673.2	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		58.94	
Min Ch El (ft)	1616.29	Shear (lb/sq ft)		2.47	
Alpha	1.00	Stream Power (lb/ft s)		32.33	
Frctn Loss (ft)	1.09	Cum Volume (acre-ft)		33.11	
C & E Loss (ft)	0.00	Cum SA (acres)		5.77	

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: Abbott Wash
REACH: AW RS: 8091.56

INPUT
Description: Station: 80+91.56 (Eq. Sta: 31+50 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1622.44	85	1614.04	100	1613.74	115	1614.04	139	1622.44

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1621.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.65	Wt. n-Val.		0.028	
W.S. Elev (ft)	1618.83	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	1619.34	Flow Area (sq ft)		213.67	
E.G. Slope (ft/ft)	0.010884	Area (sq ft)		213.67	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	57.36	Top Width (ft)		57.36	
Vel Total (ft/s)	13.06	Avg. Vel. (ft/s)		13.06	
Max Chl Dpth (ft)	5.09	Hydr. Depth (ft)		3.72	
Conv. Total (cfs)	26742.6	Conv. (cfs)		26742.6	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		59.00	
Min Ch El (ft)	1613.74	Shear (lb/sq ft)		2.46	
Alpha	1.00	Stream Power (lb/ft s)		32.13	
Frctn Loss (ft)	0.47	Cum Volume (acre-ft)		32.86	
C & E Loss (ft)	0.16	Cum SA (acres)		5.70	

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 8041.56

INPUT
Description: Station: 80+41.56 (Begin 100' Transition)(Sta: 31+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1621.9	85	1613.5	100	1613.2	115	1613.5	139	1621.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1620.94	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.52	Wt. n-Val.		0.028	
W.S. Elev (ft)	1619.41	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	1618.79	Flow Area (sq ft)		281.79	
E.G. Slope (ft/ft)	0.005006	Area (sq ft)		281.79	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	63.79	Top Width (ft)		63.79	
Vel Total (ft/s)	9.90	Avg. Vel. (ft/s)		9.90	
Max Chl Dpth (ft)	6.21	Hydr. Depth (ft)		4.42	
Conv. Total (cfs)	39434.8	Conv. (cfs)		39434.8	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		65.80	
Min Ch El (ft)	1613.20	Shear (lb/sq ft)		1.34	
Alpha	1.00	Stream Power (lb/ft s)		13.25	
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)		32.58	
C & E Loss (ft)	0.11	Cum SA (acres)		5.63	

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 7991.56

INPUT
Description: Station: 79+91.56 (50' Upstream of PB Culvert, middle of Transition)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1621.35	85	1612.95	100	1612.65	115	1612.95	139	1621.35

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.025	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1620.64	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.16	Wt. n-Val.		0.025	
W.S. Elev (ft)	1619.48	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		322.18	
E.G. Slope (ft/ft)	0.002748	Area (sq ft)		322.18	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	67.31	Top Width (ft)		67.31	
Vel Total (ft/s)	8.66	Avg. Vel. (ft/s)		8.66	
Max Chl Dpth (ft)	6.83	Hydr. Depth (ft)		4.79	
Conv. Total (cfs)	53221.5	Conv. (cfs)		53221.5	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		69.54	
Min Ch El (ft)	1612.65	Shear (lb/sq ft)		0.79	
Alpha	1.00	Stream Power (lb/ft s)		6.88	
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)		32.23	
C & E Loss (ft)	0.01	Cum SA (acres)		5.56	

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.

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 7941.56

INPUT
Description: Station: 79+41.56 Begin PB Culvert GB; Slope=0.73%
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
70	1624.1	78.33	1622.1	78.33	1612.1	100	1612.1	121.67	1612.1		
121.67	1622.1	130	1624.1								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
70	.015	78.33	.015	121.67	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
78.33	121.67	330.57	330.57	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1620.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.23	Wt. n-Val.		0.015	
W.S. Elev (ft)	1619.34	Reach Len. (ft)	0.25	0.25	0.25
Crit W.S. (ft)	1617.25	Flow Area (sq ft)		313.88	
E.G. Slope (ft/ft)	0.000844	Area (sq ft)		313.88	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	43.34	Top Width (ft)		43.34	

Vel Total (ft/s)	8.89	Avg. Vel. (ft/s)	8.89
Max Chl Dpth (ft)	7.24	Hydr. Depth (ft)	7.24
Conv. Total (cfs)	96037.0	Conv. (cfs)	96037.0
Length Wtd. (ft)	0.25	Wetted Per. (ft)	57.82
Min Ch El (ft)	1612.10	Shear (lb/sq ft)	0.29
Alpha	1.00	Stream Power (lb/ft s)	2.54
Frctn Loss (ft)		Cum Volume (acre-ft)	31.87
C & E Loss (ft)		Cum SA (acres)	5.49

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.

BRIDGE RIVER: Abbott Wash
REACH: AW RS: 7900

INPUT
Description: Pioneer Blvd Crossing & NDOT Extension
Distance from Upstream XS = .25
Deck/Roadway Width = 330.07
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
78.33	1628	1622.1	121.67	1628	1622.1

Upstream Bridge Cross Section Data
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
78.33	1622.1	78.33	1612.1	100	1612.1	121.67	1612.1	121.67	1622.1

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
78.33	.015	78.33	.015	100	.015	121.67	.015	121.67	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
78.33	121.67	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
78.33	1624	1619.7	121.67	1624	1619.7

Downstream Bridge Cross Section Data
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
78.33	1619.7	78.33	1609.7	100	1609.7	121.67	1609.7	121.67	1619.7

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
78.33	.015	78.33	.015	100	.015	121.67	.015	121.67	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
78.33	121.67	.05	.1

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins = 1628
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 2

Pier Data
Pier Station Upstream= 92.66 Downstream= 92.66
Upstream num= 2

Width	Elev	Width	Elev
.67	1610	.67	1624

Downstream num= 2

Width	Elev	Width	Elev
.67	1608	.67	1622

Debris Width = 2.67
Debris Height = 10

Pier Data
Pier Station Upstream= 107 Downstream= 107
Upstream num= 2

Width	Elev	Width	Elev
.67	1610	.67	1624

Downstream num= 2

Width	Elev	Width	Elev
.67	1608	.67	1622

Debris Width = 2.67
Debris Height = 10

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Energy

High Flow Method
Energy Only

Additional Bridge Parameters
Do not add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the downstream end
Criteria to check for pressure flow = Upstream water surface

BRIDGE OUTPUT Profile #PF 1
Opening : Single BR

			Inside BR US	Inside BR DS
E.G. US. (ft)	1620.57	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	1619.34	E.G. Elev (ft)	1620.37	1617.73
Q Total (cfs)	2790.00	W.S. Elev (ft)	1617.59	1613.97
Q Bridge (cfs)	2790.00	Crit W.S. (ft)	1617.59	1614.85
Q Weir (cfs)		Max Chl Dpth (ft)	5.49	4.27
Weir Sta Lft (ft)		Vel Total (ft/s)	13.37	15.58
Weir Sta Rgt (ft)		Flow Area (sq ft)	208.73	179.13
Weir Submerg		Froude # Chl	1.01	1.33
Weir Max Depth (ft)		Specif Force (cu ft)	1731.42	1731.53
Min El Weir Flow (ft)	1628.01	Hydr Depth (ft)	5.49	4.27
Min El Pres (ft)	1622.10	W.P. Total (ft)	70.96	67.59
Delta EG (ft)	2.83	Conv. Total (cfs)	42450.5	33983.3
Delta WS (ft)	5.65	Top Width (ft)	38.00	42.00
BR Open Area (sq ft)	380.00	Frctn Loss (ft)		
BR Open Vel (ft/s)	15.58	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.79	1.12
Br Sel Method	Momentum	Power Total (lb/ft s)	10.60	17.37

Warning: During the class B momentum calculations, the supercritical downstream energy was higher than one of the upstream energies. This is not physically possible. The supercritical answer was backed out from an upstream energy.
Note: The momentum method has computed a class B profile.
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 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.
Warning: The composite Mannings n value for the channel was larger than the largest entered n value or smaller than the smallest entered n value.
Note: Manning's n values were composited to a single value in the main channel.
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: The composite Mannings n value for the channel was larger than the largest entered n value or smaller than the smallest entered n value.
Note: Manning's n values were composited to a single value in the main channel.
Note: The energy method has computed a class B profile.

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 7611

INPUT
Description: Station: 76+11 End Culvert Extention by NDOT GB-S-2.45% Begin Contraction
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
70	1621.7	78.33	1619.7	78.33	1609.7	100	1609.7	121.67	1609.7
121.67	1619.7	130	1621.7						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
70	.015	78.33	.015	121.67	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
78.33	121.67	73.41	73.41	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1617.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.03	Wt. n-Val.		0.015	
W.S. Elev (ft)	1613.70	Reach Len. (ft)	73.41	73.41	73.41
Crit W.S. (ft)	1614.73	Flow Area (sq ft)		173.24	
E.G. Slope (ft/ft)	0.005221	Area (sq ft)		173.24	
Q Total (cfs)	2790.00	Flow (cfs)		2790.00	
Top Width (ft)	43.34	Top Width (ft)		43.34	
Vel Total (ft/s)	16.10	Avg. Vel. (ft/s)		16.10	
Max Chl Dpth (ft)	4.00	Hydr. Depth (ft)		4.00	
Conv. Total (cfs)	38612.3	Conv. (cfs)		38612.3	
Length Wtd. (ft)	73.41	Wetted Per. (ft)		51.33	
Min Ch El (ft)	1609.70	Shear (lb/sq ft)		1.10	
Alpha	1.00	Stream Power (lb/ft s)		17.72	
Frctn Loss (ft)		Cum Volume (acre-ft)		30.39	
C & E Loss (ft)		Cum SA (acres)		5.19	

Note: The energy method has computed a class B profile.

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 7537.59

INPUT
Description: Station: 75+37.59 PT of Curve Contraction Transition
Station: 74+70.32
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
70	1620.18	81.12	1618.18	81.12	1608.18	100	1607.9	118.88	1608.18
118.88	1618.18	130	1620.18						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
70	.015	81.12	.015	118.88	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
81.12	118.88	58.88	61	62.68	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1617.39	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.20	Wt. n-Val.		0.015	
W.S. Elev (ft)	1614.19	Reach Len. (ft)	58.88	61.00	62.68
Crit W.S. (ft)	1614.25	Flow Area (sq ft)		232.10	
E.G. Slope (ft/ft)	0.002699	Area (sq ft)		232.10	
Q Total (cfs)	3334.00	Flow (cfs)		3334.00	
Top Width (ft)	37.76	Top Width (ft)		37.76	
Vel Total (ft/s)	14.36	Avg. Vel. (ft/s)		14.36	
Max Chl Dpth (ft)	6.29	Hydr. Depth (ft)		6.15	
Conv. Total (cfs)	64171.4	Conv. (cfs)		64171.4	
Length Wtd. (ft)	61.00	Wetted Per. (ft)		49.78	
Min Ch El (ft)	1607.90	Shear (lb/sq ft)		0.79	
Alpha	1.00	Stream Power (lb/ft s)		11.29	
Frctn Loss (ft)	0.26	Cum Volume (acre-ft)		30.05	
C & E Loss (ft)	0.08	Cum SA (acres)		5.12	

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.

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 7476.58

INPUT
Description: Station: 74+76.58 Middle of Curve Contraction Transition
Station: 74+70.32
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
70	1616.68	83.45	1616.68	83.45	1606.68	100	1606.4	116.55	1606.68
116.55	1616.68	130	1616.68						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
70	.015	83.45	.015	116.55	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
83.45	116.55	58.87	60.57	62.68	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1617.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.85	Wt. n-Val.		0.015	
W.S. Elev (ft)	1612.24	Reach Len. (ft)	58.87	60.57	62.68
Crit W.S. (ft)	1613.34	Flow Area (sq ft)		188.71	
E.G. Slope (ft/ft)	0.004596	Area (sq ft)		188.71	
Q Total (cfs)	3334.00	Flow (cfs)		3334.00	
Top Width (ft)	33.10	Top Width (ft)		33.10	
Vel Total (ft/s)	17.67	Avg. Vel. (ft/s)		17.67	
Max Chl Dpth (ft)	5.84	Hydr. Depth (ft)		5.70	
Conv. Total (cfs)	49179.0	Conv. (cfs)		49179.0	
Length Wtd. (ft)	60.57	Wetted Per. (ft)		44.23	
Min Ch El (ft)	1606.40	Shear (lb/sq ft)		1.22	
Alpha	1.00	Stream Power (lb/ft s)		21.63	
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)		29.76	
C & E Loss (ft)	0.08	Cum SA (acres)		5.07	

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

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 7416.02

INPUT
Description: Station: 74+16.02 PC of Curve End Contraction Transition
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
70	1615.2	85.75	1615.2	85.75	1605.2	100	1604.92	114.25	1605.2
114.25	1615.2	130	1615.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
70	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	57.66	57.66	57.66	.05	.05

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1616.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.49	Wt. n-Val.		0.015	
W.S. Elev (ft)	1611.28	Reach Len. (ft)	57.66	57.66	57.66
Crit W.S. (ft)	1612.57	Flow Area (sq ft)		177.39	
E.G. Slope (ft/ft)	0.005052	Area (sq ft)		177.39	
Q Total (cfs)	3334.00	Flow (cfs)		3334.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	18.80	Avg. Vel. (ft/s)		18.80	
Max Chl Dpth (ft)	6.36	Hydr. Depth (ft)		6.22	
Conv. Total (cfs)	46905.7	Conv. (cfs)		46905.7	
Length Wtd. (ft)	57.66	Wetted Per. (ft)		40.67	
Min Ch El (ft)	1604.92	Shear (lb/sq ft)		1.38	
Alpha	1.00	Stream Power (lb/ft s)		25.85	
Frctn Loss (ft)	0.29	Cum Volume (acre-ft)		29.50	
C & E Loss (ft)	0.03	Cum SA (acres)		5.03	

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

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 7358.36

INPUT
Description: Station: 73+58.36 Begin Culvert GB Slope=0.81%
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1613.5	85.75	1603.5	100	1603.5	114.25	1603.5	114.25	1613.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.

85.75	114.25	380	369.66	361	.05	.05

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1616.31	Element			
Vel Head (ft)	7.48	Wt. n-Val.		0.015	
W.S. Elev (ft)	1608.83	Reach Len. (ft)	0.33	0.33	0.33
Crit W.S. (ft)	1611.01	Flow Area (sq ft)		151.91	
E.G. Slope (ft/ft)	0.008053	Area (sq ft)		151.91	
Q Total (cfs)	3334.00	Flow (cfs)		3334.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	21.95	Avg. Vel. (ft/s)		21.95	
Max Chl Dpth (ft)	5.33	Hydr. Depth (ft)		5.33	
Conv. Total (cfs)	37152.4	Conv. (cfs)		37152.4	
Length Wtd. (ft)	0.33	Wetted Per. (ft)		39.16	
Min Ch El (ft)	1603.50	Shear (lb/sq ft)		1.95	
Alpha	1.00	Stream Power (lb/ft s)		42.80	
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)		29.29	
C & E Loss (ft)	0.10	Cum SA (acres)		4.99	

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

BRIDGE RIVER: Abbott Wash
REACH: AW RS: 7200

INPUT
Description: I-15, Old Mill Road Bridge
Distance from Upstream XS = .33
Deck/Roadway Width = 369
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
85.75 1622.3	1612.5	114.25 1622.3	1612.5

Upstream Bridge Cross Section Data
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1613.5	85.75	1603.5	100	1603.5	114.25	1603.5	114.25	1613.5

Manning's n Values num= 2

Sta	n Val	Sta	n Val
85.75	.015	100	.015

Bank Sta: Left Right Coeff Contr. Expan.
85.75 114.25 .05 .05

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
85.75 1613.94	1609.5	114.25 1613.5	1609.5

Downstream Bridge Cross Section Data
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1610.5	85.75	1600.5	100	1600.5	114.25	1600.5	114.25	1610.5

Manning's n Values num= 2

Sta	n Val	Sta	n Val
85.75	.015	100	.015

Bank Sta: Left Right Coeff Contr. Expan.
85.75 114.25 .05 .1

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins = 1622.25
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data
Pier Station Upstream= 100 Downstream= 100
Upstream num= 2

Width	Elev	Width	Elev
.67	1602	.67	1614

Downstream num= 2

Width	Elev	Width	Elev
.67	1599	.67	1612

Debris Width = 2.5
Debris Height = 9

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Energy

High Flow Method
Energy Only

Additional Bridge Parameters
Do not add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the downstream end
Criteria to check for pressure flow = Upstream water surface

BRIDGE OUTPUT Profile #PF 1
Opening : Single BR

			Inside BR US	Inside BR DS
E.G. US. (ft)	1616.31	Element		
W.S. US. (ft)	1608.83	E.G. Elev (ft)	1616.26	1612.88
Q Total (cfs)	3334.00	W.S. Elev (ft)	1609.78	1606.33
Q Bridge (cfs)	3334.00	Crit W.S. (ft)	1611.49	1608.13
Q Weir (cfs)		Max Chl Dpth (ft)	6.28	5.83
Weir Sta Lft (ft)		Vel Total (ft/s)	20.43	20.54
Weir Sta Rgt (ft)		Flow Area (sq ft)	163.20	162.34
Weir Submerg		Froude # Chl	1.44	1.50
Weir Max Depth (ft)		Specif Force (cu ft)	2627.45	2599.89
Min El Weir Flow (ft)	1622.31	Hydr Depth (ft)	6.28	5.83
Min El Prs (ft)	1612.50	W.P. Total (ft)	51.11	51.16
Delta EG (ft)	3.44	Conv. Total (cfs)	35056.0	34725.8
Delta WS (ft)	2.72	Top Width (ft)	26.00	27.83
BR Open Area (sq ft)	234.00	Frctn Loss (ft)	0.00	1.37
BR Open Vel (ft/s)	20.54	C & E Loss (ft)	0.05	0.00
Coef of Q		Shear Total (lb/sq ft)	1.80	1.83
Br Sel Method	Energy only	Power Total (lb/ft s)	36.84	37.50

Warning: There was not enough momentum to compute a supercritical answer through the bridge. The momentum answer has been disregarded.
Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
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 composite Mannings n value for the channel was larger than the largest entered n value or smaller than the smallest entered n value.
Note: Manning's n values were composited to a single value in the main channel.
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: The composite Mannings n value for the channel was larger than the largest entered n value or smaller than the smallest entered n value.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 6988.71

INPUT
Description: Station: 69+88.71 End Culvert GB; slope=0.66%
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1610.5	85.75	1600.5	100	1600.5	114.25	1600.5	114.25	1610.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
85.75 114.25 140 148.31 156 .05 .1

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1612.97	Element			
Vel Head (ft)	6.76	Wt. n-Val.		0.015	
W.S. Elev (ft)	1606.11	Reach Len. (ft)	140.00	148.31	156.00
Crit W.S. (ft)	1608.00	Flow Area (sq ft)		159.77	
E.G. Slope (ft/ft)	0.006935	Area (sq ft)		159.77	
Q Total (cfs)	3334.00	Flow (cfs)		3334.00	

Top Width (ft)	28.50	Top Width (ft)	28.50
Vel Total (ft/s)	20.87	Avg. Vel. (ft/s)	20.87
Max Chl Dpth (ft)	5.61	Hydr. Depth (ft)	5.61
Conv. Total (cfs)	40035.7	Conv. (cfs)	40035.7
Length Wtd. (ft)	148.31	Wetted Per. (ft)	39.71
Min Ch El (ft)	1600.50	Shear (lb/sq ft)	1.74
Alpha	1.00	Stream Power (lb/ft s)	36.35
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	27.90
C & E Loss (ft)	0.01	Cum SA (acres)	4.76

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 6840.4

INPUT
Description: Station: 68+40.4 End Curve
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1609.8	85.75	1599.8	100	1599.52	114.25	1599.8	114.25	1609.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	140.4	140.4	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1611.89	Element		0.015	
Vel Head (ft)	5.88	Wt. n-Val.			
W.S. Elev (ft)	1606.01	Reach Len. (ft)	140.40	140.40	140.40
Crit W.S. (ft)	1607.45	Flow Area (sq ft)		180.89	
E.G. Slope (ft/ft)	0.005319	Area (sq ft)		180.89	
Q Total (cfs)	3520.00	Flow (cfs)		3520.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	19.46	Avg. Vel. (ft/s)		19.46	
Max Chl Dpth (ft)	6.49	Hydr. Depth (ft)		6.35	
Conv. Total (cfs)	48266.3	Conv. (cfs)		48266.3	
Length Wtd. (ft)	140.40	Wetted Per. (ft)		40.92	
Min Ch El (ft)	1599.52	Shear (lb/sq ft)		1.47	
Alpha	1.00	Stream Power (lb/ft s)		28.56	
Frctn Loss (ft)	0.89	Cum Volume (acre-ft)		27.32	
C & E Loss (ft)	0.09	Cum SA (acres)		4.66	

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

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 6700

INPUT
Description: Station: 67+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1608.88	85.75	1598.88	100	1598.6	114.25	1598.88	114.25	1608.88

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1611.11	Element		0.015	
Vel Head (ft)	6.18	Wt. n-Val.			
W.S. Elev (ft)	1604.93	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1606.53	Flow Area (sq ft)		176.39	
E.G. Slope (ft/ft)	0.005725	Area (sq ft)		176.39	
Q Total (cfs)	3520.00	Flow (cfs)		3520.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	19.96	Avg. Vel. (ft/s)		19.96	
Max Chl Dpth (ft)	6.33	Hydr. Depth (ft)		6.19	
Conv. Total (cfs)	46520.7	Conv. (cfs)		46520.7	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.60	
Min Ch El (ft)	1598.60	Shear (lb/sq ft)		1.55	
Alpha	1.00	Stream Power (lb/ft s)		30.99	
Frctn Loss (ft)	0.77	Cum Volume (acre-ft)		26.75	
C & E Loss (ft)	0.00	Cum SA (acres)		4.57	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 6600

INPUT
Description: Station: 66+00
Station: 54+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1608.22	85.75	1598.22	100	1597.94	114.25	1598.22	114.25	1608.22

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1610.54	Element		0.015	
Vel Head (ft)	6.35	Wt. n-Val.			
W.S. Elev (ft)	1604.19	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1605.87	Flow Area (sq ft)		174.13	
E.G. Slope (ft/ft)	0.005946	Area (sq ft)		174.13	
Q Total (cfs)	3520.00	Flow (cfs)		3520.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	20.22	Avg. Vel. (ft/s)		20.22	
Max Chl Dpth (ft)	6.25	Hydr. Depth (ft)		6.11	
Conv. Total (cfs)	45650.0	Conv. (cfs)		45650.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.44	
Min Ch El (ft)	1597.94	Shear (lb/sq ft)		1.60	
Alpha	1.00	Stream Power (lb/ft s)		32.31	
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)		26.35	
C & E Loss (ft)	0.00	Cum SA (acres)		4.51	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 6500

INPUT
Description: Station: 65+00
Station: 54+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1607.56	85.75	1597.56	100	1597.28	114.25	1597.56	114.25	1607.56

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1609.93	Element		0.015	
Vel Head (ft)	6.46	Wt. n-Val.			
W.S. Elev (ft)	1603.48	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1605.21	Flow Area (sq ft)		172.62	
E.G. Slope (ft/ft)	0.006099	Area (sq ft)		172.62	
Q Total (cfs)	3520.00	Flow (cfs)		3520.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	20.39	Avg. Vel. (ft/s)		20.39	
Max Chl Dpth (ft)	6.20	Hydr. Depth (ft)		6.06	
Conv. Total (cfs)	45072.2	Conv. (cfs)		45072.2	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.34	
Min Ch El (ft)	1597.28	Shear (lb/sq ft)		1.63	
Alpha	1.00	Stream Power (lb/ft s)		33.23	
Frctn Loss (ft)	0.60	Cum Volume (acre-ft)		25.95	
C & E Loss (ft)	0.00	Cum SA (acres)		4.44	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 6400

INPUT
Description: Station: 64+00
Station: 54+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

85.75	1606.9	85.75	1596.9	100	1596.62	114.25	1596.9	114.25	1606.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1609.32	Element			
Vel Head (ft)	6.54	Wt. n-Val.		0.015	
W.S. Elev (ft)	1602.78	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1604.55	Flow Area (sq ft)		171.52	
E.G. Slope (ft/ft)	0.006215	Area (sq ft)		171.52	
Q Total (cfs)	3520.00	Flow (cfs)		3520.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	20.52	Avg. Vel. (ft/s)		20.52	
Max Chl Dpth (ft)	6.16	Hydr. Depth (ft)		6.02	
Conv. Total (cfs)	44650.5	Conv. (cfs)		44650.5	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.26	
Min Ch El (ft)	1596.62	Shear (lb/sq ft)		1.65	
Alpha	1.00	Stream Power (lb/ft s)		33.92	
Frctn Loss (ft)	0.62	Cum Volume (acre-ft)		25.55	
C & E Loss (ft)	0.00	Cum SA (acres)		4.38	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 6300

INPUT
Description: Station: 63+00
Station: 54+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1606.24	85.75	1596.24	100	1595.96	114.25	1596.24	114.25	1606.24

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1608.69	Element			
Vel Head (ft)	6.60	Wt. n-Val.		0.015	
W.S. Elev (ft)	1602.09	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1601.89	Flow Area (sq ft)		170.70	
E.G. Slope (ft/ft)	0.006301	Area (sq ft)		170.70	
Q Total (cfs)	3520.00	Flow (cfs)		3520.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	20.62	Avg. Vel. (ft/s)		20.62	
Max Chl Dpth (ft)	6.13	Hydr. Depth (ft)		5.99	
Conv. Total (cfs)	44337.1	Conv. (cfs)		44337.1	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.20	
Min Ch El (ft)	1595.96	Shear (lb/sq ft)		1.67	
Alpha	1.00	Stream Power (lb/ft s)		34.45	
Frctn Loss (ft)	0.63	Cum Volume (acre-ft)		25.16	
C & E Loss (ft)	0.00	Cum SA (acres)		4.31	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 6200

INPUT
Description: Station: 62+00
Station: 54+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1605.58	85.75	1595.58	100	1595.3	114.25	1595.58	114.25	1605.58

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1608.06	Element			
Vel Head (ft)	6.65	Wt. n-Val.		0.015	
W.S. Elev (ft)	1601.41	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1601.23	Flow Area (sq ft)		170.08	
E.G. Slope (ft/ft)	0.006371	Area (sq ft)		170.08	
Q Total (cfs)	3520.00	Flow (cfs)		3520.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	20.70	Avg. Vel. (ft/s)		20.70	
Max Chl Dpth (ft)	6.11	Hydr. Depth (ft)		5.97	
Conv. Total (cfs)	44100.4	Conv. (cfs)		44100.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.16	
Min Ch El (ft)	1595.30	Shear (lb/sq ft)		1.68	
Alpha	1.00	Stream Power (lb/ft s)		34.86	
Frctn Loss (ft)	0.63	Cum Volume (acre-ft)		24.77	
C & E Loss (ft)	0.00	Cum SA (acres)		4.25	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 6100

INPUT
Description: Station: 61+00
Station: 54+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1604.92	85.75	1594.92	100	1594.64	114.25	1594.92	114.25	1604.92

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1607.43	Element			
Vel Head (ft)	6.70	Wt. n-Val.		0.015	
W.S. Elev (ft)	1600.73	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1602.57	Flow Area (sq ft)		169.46	
E.G. Slope (ft/ft)	0.006440	Area (sq ft)		169.46	
Q Total (cfs)	3520.00	Flow (cfs)		3520.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	20.77	Avg. Vel. (ft/s)		20.77	
Max Chl Dpth (ft)	6.09	Hydr. Depth (ft)		5.95	
Conv. Total (cfs)	43864.2	Conv. (cfs)		43864.2	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.12	
Min Ch El (ft)	1594.64	Shear (lb/sq ft)		1.70	
Alpha	1.00	Stream Power (lb/ft s)		35.28	
Frctn Loss (ft)	0.64	Cum Volume (acre-ft)		24.38	
C & E Loss (ft)	0.00	Cum SA (acres)		4.18	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 6000

INPUT
Description: Station: 60+00
Station: 54+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1604.26	85.75	1594.26	100	1593.98	114.25	1594.26	114.25	1604.26

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1606.83	Element			
Vel Head (ft)	6.32	Wt. n-Val.		0.015	
W.S. Elev (ft)	1600.50	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1602.13	Flow Area (sq ft)		181.86	
E.G. Slope (ft/ft)	0.005692	Area (sq ft)		181.86	
Q Total (cfs)	3670.00	Flow (cfs)		3670.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	20.18	Avg. Vel. (ft/s)		20.18	
Max Chl Dpth (ft)	6.52	Hydr. Depth (ft)		6.38	

Conv. Total (cfs)	48643.4	Conv. (cfs)	48643.4
Length Wtd. (ft)	100.00	Wetted Per. (ft)	40.99
Min Ch El (ft)	1593.98	Shear (lb/sq ft)	1.58
Alpha	1.00	Stream Power (lb/ft s)	31.82
Frctn Loss (ft)	0.60	Cum Volume (acre-ft)	23.98
C & E Loss (ft)	0.00	Cum SA (acres)	4.12

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 5900

INPUT
Description: Station: 59+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1603.6	85.75	1593.6	100	1593.32	114.25	1593.6	114.25	1603.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1606.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.48	Wt. n-Val.		0.015	
W.S. Elev (ft)	1599.76	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1601.47	Flow Area (sq ft)		179.59	
E.G. Slope (ft/ft)	0.005905	Area (sq ft)		179.59	
Q Total (cfs)	3670.00	Flow (cfs)		3670.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	20.44	Avg. Vel. (ft/s)		20.44	
Max Chl Dpth (ft)	6.44	Hydr. Depth (ft)		6.30	
Conv. Total (cfs)	47760.1	Conv. (cfs)		47760.1	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.83	
Min Ch El (ft)	1593.32	Shear (lb/sq ft)		1.62	
Alpha	1.00	Stream Power (lb/ft s)		33.14	
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)		23.56	
C & E Loss (ft)	0.00	Cum SA (acres)		4.05	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 5800

INPUT
Description: Station: 58+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1602.94	85.75	1592.94	100	1592.66	114.25	1592.94	114.25	1602.94

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1605.65	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.60	Wt. n-Val.		0.015	
W.S. Elev (ft)	1599.04	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1600.81	Flow Area (sq ft)		177.96	
E.G. Slope (ft/ft)	0.006064	Area (sq ft)		177.96	
Q Total (cfs)	3670.00	Flow (cfs)		3670.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	20.62	Avg. Vel. (ft/s)		20.62	
Max Chl Dpth (ft)	6.38	Hydr. Depth (ft)		6.24	
Conv. Total (cfs)	47127.9	Conv. (cfs)		47127.9	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.71	
Min Ch El (ft)	1592.66	Shear (lb/sq ft)		1.65	
Alpha	1.00	Stream Power (lb/ft s)		34.13	
Frctn Loss (ft)	0.60	Cum Volume (acre-ft)		23.15	
C & E Loss (ft)	0.00	Cum SA (acres)		3.98	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 5700

INPUT
Description: Station: 57+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1602.28	85.75	1592.28	100	1592	114.25	1592.28	114.25	1602.28

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1605.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.69	Wt. n-Val.		0.015	
W.S. Elev (ft)	1598.34	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1600.15	Flow Area (sq ft)		176.76	
E.G. Slope (ft/ft)	0.006185	Area (sq ft)		176.76	
Q Total (cfs)	3670.00	Flow (cfs)		3670.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	20.76	Avg. Vel. (ft/s)		20.76	
Max Chl Dpth (ft)	6.34	Hydr. Depth (ft)		6.20	
Conv. Total (cfs)	46665.8	Conv. (cfs)		46665.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.63	
Min Ch El (ft)	1592.00	Shear (lb/sq ft)		1.68	
Alpha	1.00	Stream Power (lb/ft s)		34.88	
Frctn Loss (ft)	0.61	Cum Volume (acre-ft)		22.74	
C & E Loss (ft)	0.00	Cum SA (acres)		3.92	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 5600

INPUT
Description: Station: 56+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1601.22	85.75	1591.22	100	1590.94	114.25	1591.22	114.25	1601.22

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1604.37	Element	Left OB	Channel	Right OB
Vel Head (ft)	7.39	Wt. n-Val.		0.015	
W.S. Elev (ft)	1596.98	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1599.09	Flow Area (sq ft)		168.25	
E.G. Slope (ft/ft)	0.007148	Area (sq ft)		168.25	
Q Total (cfs)	3670.00	Flow (cfs)		3670.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	21.81	Avg. Vel. (ft/s)		21.81	
Max Chl Dpth (ft)	6.04	Hydr. Depth (ft)		5.90	
Conv. Total (cfs)	43407.0	Conv. (cfs)		43407.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.03	
Min Ch El (ft)	1590.94	Shear (lb/sq ft)		1.88	
Alpha	1.00	Stream Power (lb/ft s)		40.91	
Frctn Loss (ft)	0.66	Cum Volume (acre-ft)		22.35	
C & E Loss (ft)	0.00	Cum SA (acres)		3.85	

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

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 5500

INPUT
Description: Station: 55+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1600.16	85.75	1590.16	100	1589.88	114.25	1590.16	114.25	1600.16

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1603.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	7.89	Wt. n-Val.		0.015	
W.S. Elev (ft)	1595.73	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1598.03	Flow Area (sq ft)		162.83	
E.G. Slope (ft/ft)	0.007873	Area (sq ft)		162.83	
Q Total (cfs)	3670.00	Flow (cfs)		3670.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.54	Avg. Vel. (ft/s)		22.54	
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)		5.71	
Conv. Total (cfs)	41362.6	Conv. (cfs)		41362.6	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.65	
Min Ch El (ft)	1589.88	Shear (lb/sq ft)		2.02	
Alpha	1.00	Stream Power (lb/ft s)		45.49	
Frctn Loss (ft)	0.75	Cum Volume (acre-ft)		21.97	
C & E Loss (ft)	0.00	Cum SA (acres)		3.79	

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

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 5400

INPUT
Description: Station: 54+00

Station Elevation Data	num=	5							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1599.1	85.75	1589.1	100	1588.82	114.25	1589.1	114.25	1599.1

Manning's n Values	num=	3			
Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1602.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.26	Wt. n-Val.		0.015	
W.S. Elev (ft)	1594.54	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1596.97	Flow Area (sq ft)		159.13	
E.G. Slope (ft/ft)	0.008425	Area (sq ft)		159.13	
Q Total (cfs)	3670.00	Flow (cfs)		3670.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.06	Avg. Vel. (ft/s)		23.06	
Max Chl Dpth (ft)	5.72	Hydr. Depth (ft)		5.58	
Conv. Total (cfs)	39983.5	Conv. (cfs)		39983.5	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.39	
Min Ch El (ft)	1588.82	Shear (lb/sq ft)		2.12	
Alpha	1.00	Stream Power (lb/ft s)		49.00	
Frctn Loss (ft)	0.81	Cum Volume (acre-ft)		21.60	
C & E Loss (ft)	0.00	Cum SA (acres)		3.72	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 5300

INPUT
Description: Station: 53+00

Station Elevation Data	num=	5							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1598.04	85.75	1588.04	100	1587.76	114.25	1588.04	114.25	1598.04

Manning's n Values	num=	3			
Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1601.94	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.55	Wt. n-Val.		0.015	
W.S. Elev (ft)	1593.39	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1595.91	Flow Area (sq ft)		156.42	
E.G. Slope (ft/ft)	0.008864	Area (sq ft)		156.42	
Q Total (cfs)	3670.00	Flow (cfs)		3670.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.46	Avg. Vel. (ft/s)		23.46	
Max Chl Dpth (ft)	5.63	Hydr. Depth (ft)		5.49	
Conv. Total (cfs)	38980.5	Conv. (cfs)		38980.5	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.20	
Min Ch El (ft)	1587.76	Shear (lb/sq ft)		2.21	
Alpha	1.00	Stream Power (lb/ft s)		51.81	
Frctn Loss (ft)	0.86	Cum Volume (acre-ft)		21.24	
C & E Loss (ft)	0.00	Cum SA (acres)		3.66	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 5200

INPUT
Description: Station: 52+00

Station Elevation Data	num=	5							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1596.98	85.75	1586.98	100	1586.7	114.25	1586.98	114.25	1596.98

Manning's n Values	num=	3			
Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1601.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.77	Wt. n-Val.		0.015	
W.S. Elev (ft)	1592.26	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1594.84	Flow Area (sq ft)		154.38	
E.G. Slope (ft/ft)	0.009215	Area (sq ft)		154.38	
Q Total (cfs)	3670.00	Flow (cfs)		3670.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.77	Avg. Vel. (ft/s)		23.77	
Max Chl Dpth (ft)	5.56	Hydr. Depth (ft)		5.42	
Conv. Total (cfs)	38231.8	Conv. (cfs)		38231.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.06	
Min Ch El (ft)	1586.70	Shear (lb/sq ft)		2.27	
Alpha	1.00	Stream Power (lb/ft s)		54.05	
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)		20.88	
C & E Loss (ft)	0.00	Cum SA (acres)		3.59	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 5100

INPUT
Description: Station: 51+00, Upstream End of MB Bridge

Station Elevation Data	num=	5							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1595.64	85.75	1585.64	100	1585.64	114.25	1585.64	114.25	1595.64

Manning's n Values	num=	3			
Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	108.21	108.21	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1600.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.55	Wt. n-Val.		0.015	
W.S. Elev (ft)	1591.62	Reach Len. (ft)	0.10	0.10	0.10
Crit W.S. (ft)	1594.13	Flow Area (sq ft)		170.50	
E.G. Slope (ft/ft)	0.008241	Area (sq ft)		170.50	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28..	
Vel Total (ft/s)	23.46	Avg. Vel. (ft/s)		23.46	
Max Chl Dpth (ft)	5.98	Hydr. Depth (ft)		5.98	
Conv. Total (cfs)	44062.4	Conv. (cfs)		44062.4	
Length Wtd. (ft)	0.10	Wetted Per. (ft)		40.47	
Min Ch El (ft)	1585.64	Shear (lb/sq ft)		2.17	
Alpha	1.00	Stream Power (lb/ft s)		50.86	
Frctn Loss (ft)	0.87	Cum Volume (acre-ft)		20.51	
C & E Loss (ft)	0.00	Cum SA (acres)		3.53	

BRIDGE RIVER: Abbott Wash
REACH: AW RS: 5092

INPUT
Description: Mesquite Boulevard Bridge
Distance from Upstream XS = .1
Deck/Roadway Width = 108.01
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
85.75	1597.6	1594.64	114.25	1597.6	1594.64

Upstream Bridge Cross Section Data
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1597.6	85.75	1585.64	114.25	1585.64	114.25	1597.6

Manning's n Values num= 1

Sta	n Val
85.75	.015

Bank Sta: Left Right Coeff Contr. Expan.
85.75 114.25 .05 .1

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
85.75	1597.4	1593.5	114.25	1597.4	1593.5

Downstream Bridge Cross Section Data
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1597.4	85.75	1584.5	114.25	1584.5	114.25	1597.4

Manning's n Values num= 1

Sta	n Val
85.75	.015

Bank Sta: Left Right Coeff Contr. Expan.
85.75 114.25 .05 .1

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins = 1598
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data
Pier Station Upstream= 100 Downstream= 100
Upstream num= 2

Width	Elev	Width	Elev
.67	1584	.67	1597

Downstream num= 2

Width	Elev	Width	Elev
.67	1582	.67	1595

Debris Width = 2.67
Debris Height = 9

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Energy

High Flow Method
Energy Only

Additional Bridge Parameters
Do not add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the downstream end
Criteria to check for pressure flow = Upstream water surface

BRIDGE OUTPUT Profile #PF 1
Opening : Single BR

			Inside BR US	Inside BR DS
E.G. US. (ft)	1600.17	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	1591.62	E.G. Elev (ft)	1600.04	1598.92
Q Total (cfs)	4000.00	W.S. Elev (ft)	1592.82	1590.78
Q Bridge (cfs)	4000.00	Crit W.S. (ft)	1594.64	1593.14
Q Weir (cfs)		Max Chl Dpth (ft)	7.18	6.28
Weir Sta Lft (ft)		Vel Total (ft/s)	21.56	22.89
Weir Sta Rgt (ft)		Flow Area (sq ft)	185.49	174.76
Weir Submerg		Froude # Chl	1.42	1.61
Weir Max Depth (ft)		Specif Force (cu ft)	3344.85	3392.04
Min El Weir Flow (ft)	1598.00	Hydr Depth (ft)	7.18	6.28
Min El Prs (ft)	1594.64	W.P. Total (ft)	54.55	52.95
Delta EG (ft)	1.27	Conv. Total (cfs)	41547.7	38376.1
Delta WS (ft)	1.07	Top Width (ft)	25.83	27.83
BR Open Area (sq ft)	232.47	Frctn Loss (ft)	0.00	1.08
BR Open Vel (ft/s)	22.89	C & E Loss (ft)	0.13	0.05
Coef of Q		Shear Total (lb/sq ft)	1.97	2.24
Br Sel Method	Energy only	Power Total (lb/ft s)	42.43	51.24

Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
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 cross section had to be extended vertically during the critical depth calculations.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
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: Abbott Wash
REACH: AW RS: 4991.79

INPUT
Description: Station 49+91.79 Downstream End of MB Bridge-GB- S=0.65%
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1594.5	85.75	1584.5	100	1584.5	114.25	1584.5	114.25	1594.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
85.75 114.25 91.79 91.79 91.79 .05 .1

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1598.90	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.35	Wt. n-Val.		0.015	
W.S. Elev (ft)	1590.55	Reach Len. (ft)	91.79	91.79	91.79
Crit W.S. (ft)	1592.97	Flow Area (sq ft)		172.51	
E.G. Slope (ft/ft)	0.007962	Area (sq ft)		172.51	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.19	Avg. Vel. (ft/s)		23.19	
Max Chl Dpth (ft)	6.05	Hydr. Depth (ft)		6.05	
Conv. Total (cfs)	44827.8	Conv. (cfs)		44827.8	
Length Wtd. (ft)	91.79	Wetted Per. (ft)		40.61	
Min Ch El (ft)	1584.50	Shear (lb/sq ft)		2.11	
Alpha	1.00	Stream Power (lb/ft s)		48.97	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		20.06	
C & E Loss (ft)	0.01	Cum SA (acres)		3.46	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 4900

INPUT
Description: Station: 49+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1594.12	85.75	1584.12	100	1583.9	114.25	1584.12	114.25	1594.12

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
85.75 114.25 103 100 97 0 0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1598.16	Element	Left OB	Channel	Right OB
Vel Head (ft)	7.94	Wt. n-Val.		0.015	
W.S. Elev (ft)	1590.22	Reach Len. (ft)	103.00	100.00	97.00
Crit W.S. (ft)	1592.49	Flow Area (sq ft)		176.88	
E.G. Slope (ft/ft)	0.007347	Area (sq ft)		176.88	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.61	Avg. Vel. (ft/s)		22.61	
Max Chl Dpth (ft)	6.12	Hydr. Depth (ft)		6.21	
Conv. Total (cfs)	46665.8	Conv. (cfs)		46665.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.70	
Min Ch El (ft)	1583.90	Shear (lb/sq ft)		1.99	
Alpha	1.00	Stream Power (lb/ft s)		45.08	
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)		19.69	
C & E Loss (ft)	0.04	Cum SA (acres)		3.40	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 4800

INPUT
Description: Station: 48+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1593.53	85.75	1583.53	100	1583.25	114.25	1583.53	114.25	1593.53

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	103	100	97	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1597.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	7.77	Wt. n-Val.		0.015	
W.S. Elev (ft)	1589.66	Reach Len. (ft)	103.00	100.00	97.00
Crit W.S. (ft)	1591.87	Flow Area (sq ft)		178.81	
E.G. Slope (ft/ft)	0.007104	Area (sq ft)		178.81	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.37	Avg. Vel. (ft/s)		22.37	
Max Chl Dpth (ft)	6.41	Hydr. Depth (ft)		6.27	
Conv. Total (cfs)	47456.3	Conv. (cfs)		47456.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.77	
Min Ch El (ft)	1583.25	Shear (lb/sq ft)		1.95	
Alpha	1.00	Stream Power (lb/ft s)		43.51	
Frctn Loss (ft)	0.72	Cum Volume (acre-ft)		19.28	
C & E Loss (ft)	0.00	Cum SA (acres)		3.33	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 4700

INPUT
Description: Station: 47+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1592.88	85.75	1582.88	100	1582.6	114.25	1582.88	114.25	1592.88

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	102	100	98	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1596.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	7.69	Wt. n-Val.		0.015	
W.S. Elev (ft)	1589.05	Reach Len. (ft)	102.00	100.00	98.00
Crit W.S. (ft)	1591.22	Flow Area (sq ft)		179.78	
E.G. Slope (ft/ft)	0.006992	Area (sq ft)		179.78	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.25	Avg. Vel. (ft/s)		22.25	
Max Chl Dpth (ft)	6.45	Hydr. Depth (ft)		6.31	
Conv. Total (cfs)	47835.8	Conv. (cfs)		47835.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.84	
Min Ch El (ft)	1582.60	Shear (lb/sq ft)		1.92	
Alpha	1.00	Stream Power (lb/ft s)		42.75	
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)		18.87	
C & E Loss (ft)	0.00	Cum SA (acres)		3.27	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 4600

INPUT
Description: Station: 46+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1592.23	85.75	1582.23	100	1581.95	114.25	1582.23	114.25	1592.23

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	103	100	97	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1596.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	7.60	Wt. n-Val.		0.015	
W.S. Elev (ft)	1588.43	Reach Len. (ft)	103.00	100.00	97.00
Crit W.S. (ft)	1590.57	Flow Area (sq ft)		180.76	
E.G. Slope (ft/ft)	0.006882	Area (sq ft)		180.76	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.13	Avg. Vel. (ft/s)		22.13	
Max Chl Dpth (ft)	6.48	Hydr. Depth (ft)		6.34	
Conv. Total (cfs)	48216.2	Conv. (cfs)		48216.2	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.91	
Min Ch El (ft)	1581.95	Shear (lb/sq ft)		1.90	
Alpha	1.00	Stream Power (lb/ft s)		42.01	
Frctn Loss (ft)	0.69	Cum Volume (acre-ft)		18.46	
C & E Loss (ft)	0.00	Cum SA (acres)		3.20	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 4500

INPUT
Description: Station: 45+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1591.58	85.75	1581.58	100	1581.3	114.25	1581.58	114.25	1591.58

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1595.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	7.54	Wt. n-Val.		0.015	
W.S. Elev (ft)	1587.81	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1589.92	Flow Area (sq ft)		181.47	
E.G. Slope (ft/ft)	0.006804	Area (sq ft)		181.47	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.04	Avg. Vel. (ft/s)		22.04	
Max Chl Dpth (ft)	6.51	Hydr. Depth (ft)		6.37	
Conv. Total (cfs)	48492.0	Conv. (cfs)		48492.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.96	
Min Ch El (ft)	1581.30	Shear (lb/sq ft)		1.88	
Alpha	1.00	Stream Power (lb/ft s)		41.48	
Frctn Loss (ft)	0.68	Cum Volume (acre-ft)		18.04	
C & E Loss (ft)	0.00	Cum SA (acres)		3.14	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 4400

INPUT
Description: Station: 44+00

Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1590.93	85.75	1580.93	100	1580.65	114.25	1580.93	114.25	1590.93

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1594.67	Element			
Vel Head (ft)	7.49	Wt. n-Val.		0.015	
W.S. Elev (ft)	1587.18	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1589.27	Flow Area (sq ft)		182.18	
E.G. Slope (ft/ft)	0.006727	Area (sq ft)		182.18	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	21.96	Avg. Vel. (ft/s)		21.96	
Max Chl Dpth (ft)	6.53	Hydr. Depth (ft)		6.39	
Conv. Total (cfs)	48768.4	Conv. (cfs)		48768.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		41.01	
Min Ch El (ft)	1580.65	Shear (lb/sq ft)		1.87	
Alpha	1.00	Stream Power (lb/ft s)		40.96	
Frctn Loss (ft)	0.68	Cum Volume (acre-ft)		17.62	
C & E Loss (ft)	0.00	Cum SA (acres)		3.07	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 4300

INPUT
Description: Station: 43+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1590.28	85.75	1580.28	100	1580	114.25	1580.28	114.25	1590.28

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1594.00	Element			
Vel Head (ft)	7.45	Wt. n-Val.		0.015	
W.S. Elev (ft)	1586.55	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1588.62	Flow Area (sq ft)		182.61	
E.G. Slope (ft/ft)	0.006681	Area (sq ft)		182.61	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	21.90	Avg. Vel. (ft/s)		21.90	
Max Chl Dpth (ft)	6.55	Hydr. Depth (ft)		6.41	
Conv. Total (cfs)	48938.3	Conv. (cfs)		48938.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		41.04	
Min Ch El (ft)	1580.00	Shear (lb/sq ft)		1.86	
Alpha	1.00	Stream Power (lb/ft s)		40.65	
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)		17.21	
C & E Loss (ft)	0.00	Cum SA (acres)		3.01	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 4200

INPUT
Description: Station: 42+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1589.63	85.75	1579.63	100	1579.35	114.25	1579.63	114.25	1589.63

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1593.33	Element			
Vel Head (ft)	7.41	Wt. n-Val.		0.015	
W.S. Elev (ft)	1585.91	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1587.97	Flow Area (sq ft)		183.05	
E.G. Slope (ft/ft)	0.006635	Area (sq ft)		183.05	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	21.85	Avg. Vel. (ft/s)		21.85	
Max Chl Dpth (ft)	6.56	Hydr. Depth (ft)		6.42	
Conv. Total (cfs)	49108.3	Conv. (cfs)		49108.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		41.07	
Min Ch El (ft)	1579.35	Shear (lb/sq ft)		1.85	
Alpha	1.00	Stream Power (lb/ft s)		40.34	
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)		16.79	
C & E Loss (ft)	0.00	Cum SA (acres)		2.94	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 4100

INPUT
Description: Station: 41+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1588.98	85.75	1578.98	100	1578.7	114.25	1578.98	114.25	1588.98

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1592.66	Element			
Vel Head (ft)	7.38	Wt. n-Val.		0.015	
W.S. Elev (ft)	1585.28	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1587.32	Flow Area (sq ft)		183.48	
E.G. Slope (ft/ft)	0.006589	Area (sq ft)		183.48	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	21.80	Avg. Vel. (ft/s)		21.80	
Max Chl Dpth (ft)	6.58	Hydr. Depth (ft)		6.44	
Conv. Total (cfs)	49278.5	Conv. (cfs)		49278.5	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		41.10	
Min Ch El (ft)	1578.70	Shear (lb/sq ft)		1.84	
Alpha	1.00	Stream Power (lb/ft s)		40.03	
Frctn Loss (ft)	0.66	Cum Volume (acre-ft)		16.36	
C & E Loss (ft)	0.00	Cum SA (acres)		2.88	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 4000

INPUT
Description: Station: 40+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1588.33	85.75	1578.33	100	1578.05	114.25	1578.33	114.25	1588.33

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1592.00	Element			
Vel Head (ft)	7.37	Wt. n-Val.		0.015	
W.S. Elev (ft)	1584.63	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1586.67	Flow Area (sq ft)		183.66	
E.G. Slope (ft/ft)	0.006570	Area (sq ft)		183.66	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	21.78	Avg. Vel. (ft/s)		21.78	
Max Chl Dpth (ft)	6.58	Hydr. Depth (ft)		6.44	
Conv. Total (cfs)	49347.2	Conv. (cfs)		49347.2	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		41.11	

Min Ch El (ft)	1578.05	Shear (lb/sq ft)	1.83
Alpha	1.00	Stream Power (lb/ft s)	39.91
Frctn Loss (ft)	0.66	Cum Volume (acre-ft)	15.94
C & E Loss (ft)	0.00	Cum SA (acres)	2.81

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 3900

INPUT
Description: Station: 39+00, GB S=0.81%
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1587.68	85.75	1577.68	100	1577.4	114.25	1577.68	114.25	1587.68

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1591.34	Element			
Vel Head (ft)	7.35	Wt. n-Val.		0.015	
W.S. Elev (ft)	1583.99	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1586.02	Flow Area (sq ft)		183.83	
E.G. Slope (ft/ft)	0.006552	Area (sq ft)		183.83	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	21.76	Avg. Vel. (ft/s)		21.76	
Max Chl Dpth (ft)	6.59	Hydr. Depth (ft)		6.45	
Conv. Total (cfs)	49416.1	Conv. (cfs)		49416.1	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		41.13	
Min Ch El (ft)	1577.40	Shear (lb/sq ft)		1.83	
Alpha	1.00	Stream Power (lb/ft s)		39.78	
Frctn Loss (ft)	0.66	Cum Volume (acre-ft)		15.52	
C & E Loss (ft)	0.00	Cum SA (acres)		2.75	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 3800

INPUT
Description: Station: 38+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1586.87	85.75	1576.87	100	1576.59	114.25	1576.87	114.25	1586.87

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1590.67	Element			
Vel Head (ft)	7.59	Wt. n-Val.		0.015	
W.S. Elev (ft)	1583.08	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1585.21	Flow Area (sq ft)		180.87	
E.G. Slope (ft/ft)	0.006870	Area (sq ft)		180.87	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.11	Avg. Vel. (ft/s)		22.11	
Max Chl Dpth (ft)	6.49	Hydr. Depth (ft)		6.35	
Conv. Total (cfs)	48259.5	Conv. (cfs)		48259.5	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.92	
Min Ch El (ft)	1576.59	Shear (lb/sq ft)		1.90	
Alpha	1.00	Stream Power (lb/ft s)		41.93	
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)		15.10	
C & E Loss (ft)	0.00	Cum SA (acres)		2.68	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 3700

INPUT
Description: Station: 37+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1586.06	85.75	1576.06	100	1575.78	114.25	1576.06	114.25	1586.06

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1589.97	Element			
Vel Head (ft)	7.78	Wt. n-Val.		0.015	
W.S. Elev (ft)	1582.19	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1584.40	Flow Area (sq ft)		178.66	
E.G. Slope (ft/ft)	0.007121	Area (sq ft)		178.66	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.39	Avg. Vel. (ft/s)		22.39	
Max Chl Dpth (ft)	6.41	Hydr. Depth (ft)		6.27	
Conv. Total (cfs)	47401.0	Conv. (cfs)		47401.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.76	
Min Ch El (ft)	1575.78	Shear (lb/sq ft)		1.95	
Alpha	1.00	Stream Power (lb/ft s)		43.62	
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)		14.69	
C & E Loss (ft)	0.00	Cum SA (acres)		2.61	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 3600

INPUT
Description: Station: 36+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1585.26	85.75	1575.26	100	1574.98	114.25	1575.26	114.25	1585.26

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	133.48	133.48	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1589.25	Element			
Vel Head (ft)	7.92	Wt. n-Val.		0.015	
W.S. Elev (ft)	1581.34	Reach Len. (ft)	133.48	133.48	133.48
Crit W.S. (ft)	1583.60	Flow Area (sq ft)		177.15	
E.G. Slope (ft/ft)	0.007301	Area (sq ft)		177.15	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.58	Avg. Vel. (ft/s)		22.58	
Max Chl Dpth (ft)	6.36	Hydr. Depth (ft)		6.22	
Conv. Total (cfs)	46813.7	Conv. (cfs)		46813.7	
Length Wtd. (ft)	133.48	Wetted Per. (ft)		40.66	
Min Ch El (ft)	1574.98	Shear (lb/sq ft)		1.99	
Alpha	1.00	Stream Power (lb/ft s)		44.84	
Frctn Loss (ft)	0.72	Cum Volume (acre-ft)		14.28	
C & E Loss (ft)	0.00	Cum SA (acres)		2.55	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 3466.52

INPUT
Description: Station: 34+66.52, Begin Curve
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1584.18	85.75	1574.18	100	1573.9	114.25	1574.18	114.25	1584.18

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	45	46.52	48	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1588.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.07	Wt. n-Val.		0.015	
W.S. Elev (ft)	1580.20	Reach Len. (ft)	45.00	46.52	48.00
Crit W.S. (ft)	1582.52	Flow Area (sq ft)		175.51	
E.G. Slope (ft/ft)	0.007503	Area (sq ft)		175.51	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.79	Avg. Vel. (ft/s)		22.79	
Max Chl Dpth (ft)	6.30	Hydr. Depth (ft)		6.16	
Conv. Total (cfs)	46180.0	Conv. (cfs)		46180.0	
Length Wtd. (ft)	46.52	Wetted Per. (ft)		40.54	
Min Ch El (ft)	1573.90	Shear (lb/sq ft)		2.03	
Alpha	1.00	Stream Power (lb/ft s)		46.21	
Frctn Loss (ft)	0.99	Cum Volume (acre-ft)		13.74	
C & E Loss (ft)	0.00	Cum SA (acres)		2.46	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 3420

INPUT
Description: Station: 34+20, Begin 2nd South Bridge
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1583.52	85.75	1573.52	100	1573.52	114.25	1573.52	114.25	1583.52

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	88	96	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1587.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.12	Wt. n-Val.		0.015	
W.S. Elev (ft)	1579.58	Reach Len. (ft)	0.50	0.50	0.50
Crit W.S. (ft)	1581.99	Flow Area (sq ft)		172.78	
E.G. Slope (ft/ft)	0.007926	Area (sq ft)		172.78	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.15	Avg. Vel. (ft/s)		23.15	
Max Chl Dpth (ft)	6.06	Hydr. Depth (ft)		6.06	
Conv. Total (cfs)	44928.6	Conv. (cfs)		44928.6	
Length Wtd. (ft)	0.50	Wetted Per. (ft)		40.62	
Min Ch El (ft)	1573.52	Shear (lb/sq ft)		2.10	
Alpha	1.00	Stream Power (lb/ft s)		48.72	
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)		13.56	
C & E Loss (ft)	0.00	Cum SA (acres)		2.43	

BRIDGE RIVER: Abbott Wash
REACH: AW RS: 3370

INPUT
Description: 2nd South Bridge
Distance from Upstream XS = .5
Deck/Roadway Width = 95
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
85.75	1584	1582.52	114.25	1584	1582.52

Upstream Bridge Cross Section Data
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1583.52	85.75	1573.52	100	1573.52	114.25	1573.52	114.25	1583.52

Manning's n Values num= 1

Sta	n Val
85.75	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
85.75	114.25	.05	.1

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
85.75	1584	1581.74	114.25	1584	1581.74

Downstream Bridge Cross Section Data
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1582.74	85.75	1572.74	100	1572.74	114.25	1572.74	114.25	1582.74

Manning's n Values num= 1

Sta	n Val
85.75	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
85.75	114.25	.05	.1

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins = 1584.95
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data
Pier Station Upstream= 100 Downstream= 100
Upstream num= 2

Width	Elev	Width	Elev
.67	1570	.67	1583

Downstream num= 2

Width	Elev	Width	Elev
.67	1570	.67	1583

Debris Width = 2.67
Debris Height = 9

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Energy

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #PF 1
Opening : Single BR

E.G. US. (ft)	1587.91	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	1579.58	E.G. Elev (ft)	1587.76	1586.84
Q Total (cfs)	4000.00	W.S. Elev (ft)	1580.87	1579.24
Q Bridge (cfs)	4000.00	Crit W.S. (ft)	1582.51	1581.38
Q Weir (cfs)		Max Chl Dpth (ft)	7.35	6.50
Weir Sta Lft (ft)		Vel Total (ft/s)	21.06	22.12
Weir Sta Rgt (ft)		Flow Area (sq ft)	189.93	180.82
Weir Submerg		Froude # Chl	1.37	1.53
Weir Max Depth (ft)		Specif Force (cu ft)	3314.51	3335.45
Min El Weir Flow (ft)	1584.95	Hydr Depth (ft)	7.15	6.50
Min El Prs (ft)	1582.52	W.P. Total (ft)	55.24	53.82
Delta EG (ft)	1.09	Conv. Total (cfs)	42858.0	40180.3
Delta WS (ft)	0.59	Top Width (ft)	25.83	27.83
BR Open Area (sq ft)	232.47	Frctn Loss (ft)	0.00	0.88
BR Open Vel (ft/s)	22.12	C & E Loss (ft)	0.14	0.04
Coef of Q		Shear Total (lb/sq ft)	1.87	2.08
Br Sel Method	Energy only	Power Total (lb/ft s)	39.38	45.98

Warning: Pier drag coefficient of 2.0 assumed for Class B flow.
Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
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 cross section had to be extended vertically during the critical depth calculations.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 3324

INPUT
Description: Station: 33+24, End of 2nd South Bridge
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1582.74	85.75	1572.74	100	1572.74	114.25	1572.74	114.25	1582.74

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	117	122.3	127	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1586.82	Element			
Vel Head (ft)	7.83	Wt. n-Val.		0.015	
W.S. Elev (ft)	1578.99	Reach Len. (ft)	117.00	122.30	127.00
Crit W.S. (ft)	1581.21	Flow Area (sq ft)		178.17	
E.G. Slope (ft/ft)	0.007244	Area (sq ft)		178.17	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.45	Avg. Vel. (ft/s)		22.45	
Max Chl Dpth (ft)	6.25	Hydr. Depth (ft)		6.25	
Conv. Total (cfs)	46997.2	Conv. (cfs)		46997.2	
Length Wtd. (ft)	122.30	Wetted Per. (ft)		41.00	
Min Ch El (ft)	1572.74	Shear (lb/sq ft)		1.97	
Alpha	1.00	Stream Power (lb/ft s)		44.12	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		13.15	
C & E Loss (ft)	0.01	Cum SA (acres)		2.37	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 3201.70

INPUT
Description: Station: 32+01.70, End Curve
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1582.04	85.75	1572.04	100	1571.76	114.25	1572.04	114.25	1582.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	101.7	101.7	101.7	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1585.94	Element			
Vel Head (ft)	7.77	Wt. n-Val.		0.015	
W.S. Elev (ft)	1578.18	Reach Len. (ft)	101.70	101.70	101.70
Crit W.S. (ft)	1580.38	Flow Area (sq ft)		178.87	
E.G. Slope (ft/ft)	0.007097	Area (sq ft)		178.87	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.36	Avg. Vel. (ft/s)		22.36	
Max Chl Dpth (ft)	6.42	Hydr. Depth (ft)		6.28	
Conv. Total (cfs)	47480.6	Conv. (cfs)		47480.6	
Length Wtd. (ft)	101.70	Wetted Per. (ft)		40.78	
Min Ch El (ft)	1571.76	Shear (lb/sq ft)		1.94	
Alpha	1.00	Stream Power (lb/ft s)		43.46	
Frctn Loss (ft)	0.88	Cum Volume (acre-ft)		12.65	
C & E Loss (ft)	0.01	Cum SA (acres)		2.29	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 3100

INPUT
Description: Station: 31+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1581.21	85.75	1571.21	100	1570.93	114.25	1571.21	114.25	1581.21

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1585.22	Element			
Vel Head (ft)	7.94	Wt. n-Val.		0.015	
W.S. Elev (ft)	1577.28	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1579.55	Flow Area (sq ft)		176.89	
E.G. Slope (ft/ft)	0.007332	Area (sq ft)		176.89	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.61	Avg. Vel. (ft/s)		22.61	
Max Chl Dpth (ft)	6.35	Hydr. Depth (ft)		6.21	
Conv. Total (cfs)	46713.4	Conv. (cfs)		46713.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.64	
Min Ch El (ft)	1570.93	Shear (lb/sq ft)		1.99	
Alpha	1.00	Stream Power (lb/ft s)		45.06	
Frctn Loss (ft)	0.73	Cum Volume (acre-ft)		12.23	
C & E Loss (ft)	0.00	Cum SA (acres)		2.23	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 3000

INPUT
Description: Station: 30+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1580.41	85.75	1570.41	100	1570.13	114.25	1570.41	114.25	1580.41

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1584.48	Element			
Vel Head (ft)	8.05	Wt. n-Val.		0.015	
W.S. Elev (ft)	1576.44	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1578.75	Flow Area (sq ft)		175.71	
E.G. Slope (ft/ft)	0.007477	Area (sq ft)		175.71	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.76	Avg. Vel. (ft/s)		22.76	
Max Chl Dpth (ft)	6.31	Hydr. Depth (ft)		6.17	
Conv. Total (cfs)	46260.4	Conv. (cfs)		46260.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.56	
Min Ch El (ft)	1570.13	Shear (lb/sq ft)		2.02	
Alpha	1.00	Stream Power (lb/ft s)		46.04	
Frctn Loss (ft)	0.74	Cum Volume (acre-ft)		11.83	
C & E Loss (ft)	0.00	Cum SA (acres)		2.16	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 2900

INPUT
Description: Station: 29+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1579.6	85.75	1569.6	100	1569.32	114.25	1569.6	114.25	1579.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1583.72	Element			
Vel Head (ft)	8.13	Wt. n-Val.		0.015	
W.S. Elev (ft)	1575.59	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1577.94	Flow Area (sq ft)		174.83	
E.G. Slope (ft/ft)	0.007588	Area (sq ft)		174.83	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	

Vel Total (ft/s)	22.88	Avg. Vel. (ft/s)	22.88
Max Chl Dpth (ft)	6.27	Hydr. Depth (ft)	6.13
Conv. Total (cfs)	45918.8	Conv. (cfs)	45918.8
Length Wtd. (ft)	100.00	Wetted Per. (ft)	40.49
Min Ch El (ft)	1569.32	Shear (lb/sq ft)	2.05
Alpha	1.00	Stream Power (lb/ft s)	46.80
Frctn Loss (ft)	0.75	Cum Volume (acre-ft)	11.42
C & E Loss (ft)	0.00	Cum SA (acres)	2.09

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 2800

INPUT
Description: Station: 28+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1578.79	85.75	1568.79	100	1568.51	114.25	1568.79	114.25	1578.79

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1582.97	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.21	Wt. n-Val.		0.015	
W.S. Elev (ft)	1574.75	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1577.13	Flow Area (sq ft)		173.94	
E.G. Slope (ft/ft)	0.007703	Area (sq ft)		173.94	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.00	Avg. Vel. (ft/s)		23.00	
Max Chl Dpth (ft)	6.24	Hydr. Depth (ft)		6.10	
Conv. Total (cfs)	45576.5	Conv. (cfs)		45576.5	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.43	
Min Ch El (ft)	1568.51	Shear (lb/sq ft)		2.07	
Alpha	1.00	Stream Power (lb/ft s)		47.57	
Frctn Loss (ft)	0.76	Cum Volume (acre-ft)		11.02	
C & E Loss (ft)	0.00	Cum SA (acres)		2.03	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 2700

INPUT
Description: Station: 27+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1577.98	85.75	1567.98	100	1567.7	114.25	1567.98	114.25	1577.98

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1582.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.27	Wt. n-Val.		0.015	
W.S. Elev (ft)	1573.92	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1576.32	Flow Area (sq ft)		173.33	
E.G. Slope (ft/ft)	0.007781	Area (sq ft)		173.33	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.08	Avg. Vel. (ft/s)		23.08	
Max Chl Dpth (ft)	6.22	Hydr. Depth (ft)		6.08	
Conv. Total (cfs)	45345.5	Conv. (cfs)		45345.5	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.39	
Min Ch El (ft)	1567.70	Shear (lb/sq ft)		2.08	
Alpha	1.00	Stream Power (lb/ft s)		48.11	
Frctn Loss (ft)	0.77	Cum Volume (acre-ft)		10.62	
C & E Loss (ft)	0.00	Cum SA (acres)		1.96	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 2600

INPUT
Description: Station: 26+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1577.17	85.75	1567.17	100	1566.89	114.25	1567.17	114.25	1577.17

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	68.54	68.54	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1581.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.33	Wt. n-Val.		0.015	
W.S. Elev (ft)	1573.09	Reach Len. (ft)	68.54	68.54	68.54
Crit W.S. (ft)	1575.51	Flow Area (sq ft)		172.73	
E.G. Slope (ft/ft)	0.007862	Area (sq ft)		172.73	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.16	Avg. Vel. (ft/s)		23.16	
Max Chl Dpth (ft)	6.20	Hydr. Depth (ft)		6.06	
Conv. Total (cfs)	45113.5	Conv. (cfs)		45113.5	
Length Wtd. (ft)	68.54	Wetted Per. (ft)		40.35	
Min Ch El (ft)	1566.89	Shear (lb/sq ft)		2.10	
Alpha	1.00	Stream Power (lb/ft s)		48.66	
Frctn Loss (ft)	0.78	Cum Volume (acre-ft)		10.23	
C & E Loss (ft)	0.00	Cum SA (acres)		1.90	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 2531.46

INPUT
Description: Station: 25+31.46 Begin Curve
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1576.62	85.75	1566.62	100	1566.34	114.25	1566.62	114.25	1576.62

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	114	112.38	109	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1580.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.34	Wt. n-Val.		0.015	
W.S. Elev (ft)	1572.53	Reach Len. (ft)	114.00	112.38	109.00
Crit W.S. (ft)	1574.96	Flow Area (sq ft)		172.55	
E.G. Slope (ft/ft)	0.007885	Area (sq ft)		172.55	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.18	Avg. Vel. (ft/s)		23.18	
Max Chl Dpth (ft)	6.19	Hydr. Depth (ft)		6.05	
Conv. Total (cfs)	45045.6	Conv. (cfs)		45045.6	
Length Wtd. (ft)	112.38	Wetted Per. (ft)		40.33	
Min Ch El (ft)	1566.34	Shear (lb/sq ft)		2.11	
Alpha	1.00	Stream Power (lb/ft s)		48.82	
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)		9.96	
C & E Loss (ft)	0.00	Cum SA (acres)		1.85	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 2419.08

INPUT
Description: Station: 24+19.08 End Curve
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1575.71	85.75	1565.71	100	1565.43	114.25	1565.71	114.25	1575.71

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	119.08	119.08	119.08	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1579.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.37	Wt. n-Val.		0.015	
W.S. Elev (ft)	1571.62	Reach Len. (ft)	119.08	119.08	119.08
Crit W.S. (ft)	1574.05	Flow Area (sq ft)		172.27	
E.G. Slope (ft/ft)	0.007923	Area (sq ft)		172.27	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.22	Avg. Vel. (ft/s)		23.22	
Max Chl Dpth (ft)	6.18	Hydr. Depth (ft)		6.04	
Conv. Total (cfs)	44937.0	Conv. (cfs)		44937.0	
Length Wtd. (ft)	119.08	Wetted Per. (ft)		40.31	
Min Ch El (ft)	1565.43	Shear (lb/sq ft)		2.11	
Alpha	1.00	Stream Power (lb/ft s)		49.08	
Frctn Loss (ft)	0.89	Cum Volume (acre-ft)		9.51	
C & E Loss (ft)	0.00	Cum SA (acres)		1.78	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 2300

INPUT
Description: Station: 23+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1574.75	85.75	1564.75	100	1564.47	114.25	1564.75	114.25	1574.75

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	118.78	118.78	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1579.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.40	Wt. n-Val.		0.015	
W.S. Elev (ft)	1570.64	Reach Len. (ft)	118.78	118.78	118.78
Crit W.S. (ft)	1573.09	Flow Area (sq ft)		171.98	
E.G. Slope (ft/ft)	0.007963	Area (sq ft)		171.98	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.26	Avg. Vel. (ft/s)		23.26	
Max Chl Dpth (ft)	6.17	Hydr. Depth (ft)		6.03	
Conv. Total (cfs)	44826.0	Conv. (cfs)		44826.0	
Length Wtd. (ft)	118.78	Wetted Per. (ft)		40.29	
Min Ch El (ft)	1564.47	Shear (lb/sq ft)		2.12	
Alpha	1.00	Stream Power (lb/ft s)		49.35	
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)		9.04	
C & E Loss (ft)	0.00	Cum SA (acres)		1.70	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 2181.22

INPUT
Description: Station: 21+81.22 Begin Transition to Hafen Lane Culverts
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1573.79	85.75	1563.79	100	1563.51	114.25	1563.79	114.25	1573.79

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1578.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.43	Wt. n-Val.		0.015	
W.S. Elev (ft)	1569.67	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1572.13	Flow Area (sq ft)		171.69	
E.G. Slope (ft/ft)	0.008003	Area (sq ft)		171.69	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.30	Avg. Vel. (ft/s)		23.30	
Max Chl Dpth (ft)	6.16	Hydr. Depth (ft)		6.02	
Conv. Total (cfs)	44714.3	Conv. (cfs)		44714.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.27	
Min Ch El (ft)	1563.51	Shear (lb/sq ft)		2.13	
Alpha	1.00	Stream Power (lb/ft s)		49.62	
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)		8.57	
C & E Loss (ft)	0.00	Cum SA (acres)		1.62	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 2081.22

INPUT
Description: Station: 20+81.22 Begin Hafen Lane Culverts GD S=0.59%
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
70	1573	77	1570.7	77	1562.7	100	1562.7	123	1562.7
123	1570.7	130	1573						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
70	.025	77	.015	123	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
77	123	81.22	81.22	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1576.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	10.86	Wt. n-Val.		0.015	
W.S. Elev (ft)	1565.99	Reach Len. (ft)	0.11	0.11	0.11
Crit W.S. (ft)	1568.85	Flow Area (sq ft)		151.28	
E.G. Slope (ft/ft)	0.017409	Area (sq ft)		151.28	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	46.00	Top Width (ft)		46.00	
Vel Total (ft/s)	26.44	Avg. Vel. (ft/s)		26.44	
Max Chl Dpth (ft)	3.29	Hydr. Depth (ft)		3.29	
Conv. Total (cfs)	30316.1	Conv. (cfs)		30316.1	
Length Wtd. (ft)	0.11	Wetted Per. (ft)		52.58	
Min Ch El (ft)	1562.70	Shear (lb/sq ft)		3.13	
Alpha	1.00	Stream Power (lb/ft s)		82.68	
Frctn Loss (ft)	1.14	Cum Volume (acre-ft)		8.20	
C & E Loss (ft)	0.12	Cum SA (acres)		1.54	

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.

BRIDGE RIVER: Abbott Wash
REACH: AW RS: 2080

INPUT
Description: Hafen Lane Culverts
Distance from Upstream XS = .11
Deck/Roadway Width = 81
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
77	1576	1570.7	123	1576	1570.7

Upstream Bridge Cross Section Data
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
77	1570.7	77	1562.7	123	1562.7	123	1570.7

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
77	.015	77	.015	123	.015	123	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
77	123	.05	.1

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
77	1576	1570.22	123	1576	1570.22

Downstream Bridge Cross Section Data
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
77	1570.22	77	1562.22	123	1562.22	123	1570.22

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
77	.015	77	.015	123	.015	123	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
77	123	.05	.1

Upstream Embankment side slope	=	0 horiz. to 1.0 vertical
Downstream Embankment side slope	=	0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	=	.95
Elevation at which weir flow begins	=	1576
Energy head used in spillway design	=	
Spillway height used in design	=	
Weir crest shape	=	Broad Crested

Number of Piers = 3

Pier Data
Pier Station Upstream= 88.33 Downstream= 88.33

Upstream num= 2			
Width	Elev	Width	Elev
.66	1560	.66	1573
Downstream num= 2			
Width	Elev	Width	Elev
.66	1560	.66	1573

Debris Width = 2.66
Debris Height = 8

Pier Data
Pier Station Upstream= 100 Downstream= 100

Upstream num= 2			
Width	Elev	Width	Elev
.66	1560	.66	1573
Downstream num= 2			
Width	Elev	Width	Elev
.66	1560	.66	1573

Debris Width = 2.66
Debris Height = 8

Pier Data
Pier Station Upstream= 111.67 Downstream= 111.67

Upstream num= 2			
Width	Elev	Width	Elev
.66	1560	.66	1573
Downstream num= 2			
Width	Elev	Width	Elev
.66	1560	.66	1573

Debris Width = 2.66
Debris Height = 8

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Energy

High Flow Method
Energy Only

Additional Bridge Parameters
Do not add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream water surface

BRIDGE OUTPUT Profile #PF 1
Opening : Single BR

			Inside BR US	Inside BR DS
E.G. US. (ft)	1576.85	Element		
W.S. US. (ft)	1565.99	E.G. Elev (ft)	1576.75	1574.94
Q Total (cfs)	4000.00	W.S. Elev (ft)	1566.87	1566.01
Q Bridge (cfs)	4000.00	Crit W.S. (ft)	1569.68	1568.57
Q Weir (cfs)		Max Chl Dpth (ft)	4.17	3.79
Weir Sta Lft (ft)		Vel Total (ft/s)	25.22	23.99
Weir Sta Rgt (ft)		Flow Area (sq ft)	158.63	166.74
Weir Submerg		Froude # Chl	2.18	2.17
Weir Max Depth (ft)		Specif Force (cu ft)	3463.29	3295.84
Min El Weir Flow (ft)	1576.01	Hydr Depth (ft)	4.17	3.79
Min El Prs (ft)	1570.70	W.P. Total (ft)	71.40	74.32
Delta EG (ft)	1.91	Conv. Total (cfs)	26756.7	28306.9
Delta WS (ft)	0.18	Top Width (ft)	38.02	44.02
BR Open Area (sq ft)	304.16	Frctn Loss (ft)	0.00	1.71
BR Open Vel (ft/s)	25.22	C & E Loss (ft)	0.10	0.09
Coef of Q		Shear Total (lb/sq ft)	3.10	2.80
Br Sel Method	Energy only	Power Total (lb/ft s)	78.17	67.09

Warning: Pier drag coefficient of 2.0 assumed for Class B flow.
Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
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 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: Abbott Wash
REACH: AW RS: 2000

INPUT
Description: Station: 20+00, End Hafen Lane Culverts GB S=1.62%
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
70	1573	77	1570.22	77	1562.22	100	1562.22	123	1562.22
123	1570.22	130	1573						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
70	.025	77	.015	123	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
77	123	58	58	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1574.94	Element			
Vel Head (ft)	9.13	Wt. n-Val.		0.015	
W.S. Elev (ft)	1565.81	Reach Len. (ft)	58.00	58.00	58.00
Crit W.S. (ft)	1568.37	Flow Area (sq ft)		164.95	
E.G. Slope (ft/ft)	0.013245	Area (sq ft)		164.95	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	46.00	Top Width (ft)		46.00	
Vel Total (ft/s)	24.25	Avg. Vel. (ft/s)		24.25	
Max Chl Dpth (ft)	3.59	Hydr. Depth (ft)		3.59	
Conv. Total (cfs)	34755.8	Conv. (cfs)		34755.8	
Length Wtd. (ft)	58.00	Wetted Per. (ft)		53.17	
Min Ch El (ft)	1562.22	Shear (lb/sq ft)		2.57	
Alpha	1.00	Stream Power (lb/ft s)		62.21	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		7.90	
C & E Loss (ft)	0.01	Cum SA (acres)		1.46	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 1942

INPUT
Description: Station: 19+42 Begin Contraction Transition
Station: 19+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
77	1571.56	77	1561.56	100	1561.28	123	1561.56	123	1571.56

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
77	.025	77	.015	123	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
77	123	242	242	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1574.17	Element			
Vel Head (ft)	9.17	Wt. n-Val.		0.015	
W.S. Elev (ft)	1565.00	Reach Len. (ft)	242.00	242.00	242.00
Crit W.S. (ft)	1567.59	Flow Area (sq ft)		164.63	
E.G. Slope (ft/ft)	0.013234	Area (sq ft)		164.63	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	46.00	Top Width (ft)		46.00	
Vel Total (ft/s)	24.30	Avg. Vel. (ft/s)		24.30	

Max Chl Dpth (ft)	3.72	Hydr. Depth (ft)	3.58
Conv. Total (cfs)	34770.2	Conv. (cfs)	34770.2
Length Wtd. (ft)	242.00	Wetted Per. (ft)	52.88
Min Ch El (ft)	1561.28	Shear (lb/sq ft)	2.57
Alpha	1.00	Stream Power (lb/ft s)	62.50
Frctn Loss (ft)	0.77	Cum Volume (acre-ft)	7.68
C & E Loss (ft)	0.00	Cum SA (acres)	1.40

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 1700

INPUT
Description: Station: 17+00 End Contraction Transition
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1567.66	85.75	1557.66	100	1557.38	114.25	1557.66	114.25	1567.66

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1571.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.00	Wt. n-Val.		0.015	
W.S. Elev (ft)	1563.70	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1566.00	Flow Area (sq ft)		176.24	
E.G. Slope (ft/ft)	0.007411	Area (sq ft)		176.24	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.70	Avg. Vel. (ft/s)		22.70	
Max Chl Dpth (ft)	6.32	Hydr. Depth (ft)		6.18	
Conv. Total (cfs)	46464.3	Conv. (cfs)		46464.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.59	
Min Ch El (ft)	1557.38	Shear (lb/sq ft)		2.01	
Alpha	1.00	Stream Power (lb/ft s)		45.59	
Frctn Loss (ft)	2.35	Cum Volume (acre-ft)		6.73	
C & E Loss (ft)	0.12	Cum SA (acres)		1.19	

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: Abbott Wash
REACH: AW RS: 1600

INPUT
Description: Station: 16+00 GB S=1.0%
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1566.04	85.75	1556.04	100	1555.76	114.25	1556.04	114.25	1566.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1570.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	9.22	Wt. n-Val.		0.015	
W.S. Elev (ft)	1561.66	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1564.38	Flow Area (sq ft)		164.12	
E.G. Slope (ft/ft)	0.009136	Area (sq ft)		164.12	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	24.37	Avg. Vel. (ft/s)		24.37	
Max Chl Dpth (ft)	5.90	Hydr. Depth (ft)		5.76	
Conv. Total (cfs)	41848.2	Conv. (cfs)		41848.2	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.74	
Min Ch El (ft)	1555.76	Shear (lb/sq ft)		2.36	
Alpha	1.00	Stream Power (lb/ft s)		57.41	
Frctn Loss (ft)	0.82	Cum Volume (acre-ft)		6.34	
C & E Loss (ft)	0.00	Cum SA (acres)		1.13	

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

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 1500

INPUT
Description: Station: 15+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1565.04	85.75	1555.04	100	1554.76	114.25	1555.04	114.25	1565.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1569.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	9.34	Wt. n-Val.		0.015	
W.S. Elev (ft)	1560.62	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1563.38	Flow Area (sq ft)		163.09	
E.G. Slope (ft/ft)	0.009308	Area (sq ft)		163.09	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	24.53	Avg. Vel. (ft/s)		24.53	
Max Chl Dpth (ft)	5.86	Hydr. Depth (ft)		5.72	
Conv. Total (cfs)	41460.4	Conv. (cfs)		41460.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.67	
Min Ch El (ft)	1554.76	Shear (lb/sq ft)		2.39	
Alpha	1.00	Stream Power (lb/ft s)		58.59	
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)		5.97	
C & E Loss (ft)	0.00	Cum SA (acres)		1.06	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 1400

INPUT
Description: Station: 14+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1564.04	85.75	1554.04	100	1553.76	114.25	1554.04	114.25	1564.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1569.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	9.43	Wt. n-Val.		0.015	
W.S. Elev (ft)	1559.59	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1562.38	Flow Area (sq ft)		162.29	
E.G. Slope (ft/ft)	0.009444	Area (sq ft)		162.29	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	24.65	Avg. Vel. (ft/s)		24.65	
Max Chl Dpth (ft)	5.83	Hydr. Depth (ft)		5.69	
Conv. Total (cfs)	41160.8	Conv. (cfs)		41160.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.61	
Min Ch El (ft)	1553.76	Shear (lb/sq ft)		2.42	
Alpha	1.00	Stream Power (lb/ft s)		59.53	
Frctn Loss (ft)	0.94	Cum Volume (acre-ft)		5.59	
C & E Loss (ft)	0.00	Cum SA (acres)		1.00	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 1300

INPUT
Description: Station: 13+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

85.75 1563.04 85.75 1553.04 100 1552.76 114.25 1553.04 114.25 1563.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

85.75	114.25	100	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1568.08	Element			
Vel Head (ft)	9.51	Wt. n-Val.		0.015	
W.S. Elev (ft)	1558.57	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1561.38	Flow Area (sq ft)		161.66	
E.G. Slope (ft/ft)	0.009553	Area (sq ft)		161.66	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	24.74	Avg. Vel. (ft/s)		24.74	
Max Chl Dpth (ft)	5.81	Hydr. Depth (ft)		5.67	
Conv. Total (cfs)	40925.4	Conv. (cfs)		40925.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.57	
Min Ch El (ft)	1552.76	Shear (lb/sq ft)		2.44	
Alpha	1.00	Stream Power (lb/ft s)		60.29	
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)		5.22	
C & E Loss (ft)	0.00	Cum SA (acres)		0.93	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 1200

INPUT
Description: Station: 12+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1562.04	85.75	1552.04	100	1551.76	114.25	1552.04	114.25	1562.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

85.75	114.25	100	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1567.12	Element			
Vel Head (ft)	9.57	Wt. n-Val.		0.015	
W.S. Elev (ft)	1557.56	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1560.38	Flow Area (sq ft)		161.16	
E.G. Slope (ft/ft)	0.009640	Area (sq ft)		161.16	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	24.82	Avg. Vel. (ft/s)		24.82	
Max Chl Dpth (ft)	5.79	Hydr. Depth (ft)		5.65	
Conv. Total (cfs)	40741.0	Conv. (cfs)		40741.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.54	
Min Ch El (ft)	1551.76	Shear (lb/sq ft)		2.45	
Alpha	1.00	Stream Power (lb/ft s)		60.89	
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)		4.85	
C & E Loss (ft)	0.00	Cum SA (acres)		0.87	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 1100

INPUT
Description: Station: 11+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1561.04	85.75	1551.04	100	1550.76	114.25	1551.04	114.25	1561.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

85.75	114.25	100	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1566.15	Element			
Vel Head (ft)	9.61	Wt. n-Val.		0.015	
W.S. Elev (ft)	1556.54	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1559.38	Flow Area (sq ft)		160.77	
E.G. Slope (ft/ft)	0.009709	Area (sq ft)		160.77	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	24.88	Avg. Vel. (ft/s)		24.88	
Max Chl Dpth (ft)	5.78	Hydr. Depth (ft)		5.64	
Conv. Total (cfs)	40594.4	Conv. (cfs)		40594.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.51	
Min Ch El (ft)	1550.76	Shear (lb/sq ft)		2.47	
Alpha	1.00	Stream Power (lb/ft s)		61.37	
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)		4.48	
C & E Loss (ft)	0.00	Cum SA (acres)		0.80	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 1000

INPUT
Description: Station: 10+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1560.04	85.75	1550.04	100	1549.76	114.25	1550.04	114.25	1560.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

85.75	114.25	100	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1565.18	Element			
Vel Head (ft)	9.65	Wt. n-Val.		0.015	
W.S. Elev (ft)	1555.53	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1558.38	Flow Area (sq ft)		160.46	
E.G. Slope (ft/ft)	0.009765	Area (sq ft)		160.46	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	24.93	Avg. Vel. (ft/s)		24.93	
Max Chl Dpth (ft)	5.77	Hydr. Depth (ft)		5.63	
Conv. Total (cfs)	40477.7	Conv. (cfs)		40477.7	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.49	
Min Ch El (ft)	1549.76	Shear (lb/sq ft)		2.48	
Alpha	1.00	Stream Power (lb/ft s)		61.76	
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)		4.11	
C & E Loss (ft)	0.00	Cum SA (acres)		0.74	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 900

INPUT
Description: Station: 9+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1559.04	85.75	1549.04	100	1548.76	114.25	1549.04	114.25	1559.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.035	85.75	.015	114.25	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

85.75	114.25	100	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1564.20	Element			
Vel Head (ft)	9.68	Wt. n-Val.		0.015	
W.S. Elev (ft)	1554.52	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1557.38	Flow Area (sq ft)		160.21	
E.G. Slope (ft/ft)	0.009811	Area (sq ft)		160.21	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	24.97	Avg. Vel. (ft/s)		24.97	
Max Chl Dpth (ft)	5.76	Hydr. Depth (ft)		5.62	
Conv. Total (cfs)	40384.4	Conv. (cfs)		40384.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.47	
Min Ch El (ft)	1548.76	Shear (lb/sq ft)		2.49	
Alpha	1.00	Stream Power (lb/ft s)		62.07	

Frctn Loss (ft)	0.98	Cum Volume (acre-ft)	3.74
C & E Loss (ft)	0.00	Cum SA (acres)	0.67

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 800

INPUT
Description: Station: 8+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1558.04	85.75	1548.04	100	1547.76	114.25	1548.04	114.25	1558.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	76	76	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1563.22	Element			
Vel Head (ft)	9.70	Wt. n-Val.		0.015	
W.S. Elev (ft)	1553.51	Reach Len. (ft)	76.00	76.00	76.00
Crit W.S. (ft)	1556.38	Flow Area (sq ft)		160.01	
E.G. Slope (ft/ft)	0.009847	Area (sq ft)		160.01	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	25.00	Avg. Vel. (ft/s)		25.00	
Max Chl Dpth (ft)	5.75	Hydr. Depth (ft)		5.61	
Conv. Total (cfs)	40309.3	Conv. (cfs)		40309.3	
Length Wtd. (ft)	76.00	Wetted Per. (ft)		39.45	
Min Ch El (ft)	1547.76	Shear (lb/sq ft)		2.49	
Alpha	1.00	Stream Power (lb/ft s)		62.33	
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)		3.38	
C & E Loss (ft)	0.00	Cum SA (acres)		0.61	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 724

INPUT
Description: Station: 7+24 Begin Sewer Crossing
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
80	1560	85.75	1559.8	85.75	1547	100	1547	114.25	1547
114.25	1559.8	120	1560						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
80	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	20	20	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1562.46	Element			
Vel Head (ft)	9.90	Wt. n-Val.		0.015	
W.S. Elev (ft)	1552.56	Reach Len. (ft)	0.50	0.50	0.50
Crit W.S. (ft)	1555.46	Flow Area (sq ft)		158.45	
E.G. Slope (ft/ft)	0.010230	Area (sq ft)		158.45	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	25.24	Avg. Vel. (ft/s)		25.24	
Max Chl Dpth (ft)	5.56	Hydr. Depth (ft)		5.56	
Conv. Total (cfs)	39548.0	Conv. (cfs)		39548.0	
Length Wtd. (ft)	0.50	Wetted Per. (ft)		39.62	
Min Ch El (ft)	1547.00	Shear (lb/sq ft)		2.55	
Alpha	1.00	Stream Power (lb/ft s)		64.48	
Frctn Loss (ft)	0.76	Cum Volume (acre-ft)		3.10	
C & E Loss (ft)	0.00	Cum SA (acres)		0.56	

BRIDGE RIVER: Abbott Wash
REACH: AW RS: 718

INPUT
Description: Sewer Crossing
Distance from Upstream XS = .5
Deck/Roadway Width = 19
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
85.75	1559.8	1556	114.25	1559.8	1556

Upstream Bridge Cross Section Data
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
80	1560	85.75	1559.8	85.75	1547	100	1547	114.25	1547
114.25	1559.8	120	1560						

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
80	.035	85.75	.015	114.25	.015	114.25	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
85.75	114.25	.05	.1

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
85.75	1559.8	1555.8	114.25	1559.8	1555.8

Downstream Bridge Cross Section Data
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
80	1560	85.75	1559.8	85.75	1546.8	100	1546.8	114.25	1546.8
114.25	1559.8	120	1560						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
80	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
85.75	114.25	.05	.1

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins = 1560.75
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data
Pier Station Upstream= 100 Downstream= 100
Upstream num= 2

Width	Elev	Width	Elev
.67	1545	.67	1558

Downstream num= 2

Width	Elev	Width	Elev
.67	1545	.67	1558

Debris Width = 2.67
Debris Height = 9

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Energy

High Flow Method
Energy Only

Additional Bridge Parameters
Do not add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream water surface

BRIDGE OUTPUT Profile #PF 1
Opening : Single BR

			Inside BR US	Inside BR DS
E.G. US. (ft)	1562.46	Element		
W.S. US. (ft)	1552.56	E.G. Elev (ft)	1562.35	1562.08
Q Total (cfs)	4000.00	W.S. Elev (ft)	1553.48	1552.63
Q Bridge (cfs)	4000.00	Crit W.S. (ft)	1556.00	1555.44
Q Weir (cfs)		Max Chl Dpth (ft)	6.48	5.83

Weir Sta Lft (ft)		Vel Total (ft/s)	23.90	24.67
Weir Sta Rgt (ft)		Flow Area (sq ft)	167.38	162.12
Weir Submerg		Froude # Chl	1.65	1.80
Weir Max Depth (ft)		Specif Force (cu ft)	3510.93	3537.16
Min El Weir Flow (ft)	1560.75	Hydr Depth (ft)	6.48	5.83
Min El Prs (ft)	1556.00	W.P. Total (ft)	51.75	51.13
Delta EG (ft)	0.39	Conv. Total (cfs)	36264.6	34661.4
Delta WS (ft)	0.12	Top Width (ft)	25.83	27.83
BR Open Area (sq ft)	232.47	Frctn Loss (ft)	0.01	0.24
BR Open Vel (ft/s)	24.67	C & E Loss (ft)	0.10	0.03
Coef of Q		Shear Total (lb/sq ft)	2.46	2.64
Br Sel Method	Energy only	Power Total (lb/ft s)	58.71	65.04

Warning: Pier drag coefficient of 2.0 assumed for Class B flow.
Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
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 cross section had to be extended vertically during the critical depth calculations.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 704

INPUT
Description: Station: 7+04 End Sewer Crossing
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1560	85.75	1559.8	85.75	1546.8	100	1546.8	114.25	1546.8
114.25	1559.8	125	1560						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	56	56	.05	.1

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1562.06	Element			
Vel Head (ft)	9.63	Wt. n-Val.		0.015	
W.S. Elev (ft)	1552.44	Reach Len. (ft)	56.00	56.00	56.00
Crit W.S. (ft)	1555.27	Flow Area (sq ft)		160.64	
E.G. Slope (ft/ft)	0.009821	Area (sq ft)		160.64	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	24.90	Avg. Vel. (ft/s)		24.90	
Max Chl Dpth (ft)	5.64	Hydr. Depth (ft)		5.64	
Conv. Total (cfs)	40358.3	Conv. (cfs)		40358.3	
Length Wtd. (ft)	56.00	Wetted Per. (ft)		39.77	
Min Ch El (ft)	1546.80	Shear (lb/sq ft)		2.48	
Alpha	1.00	Stream Power (lb/ft s)		61.68	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		3.02	
C & E Loss (ft)	0.01	Cum SA (acres)		0.54	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 648

INPUT
Description: Station: 6+48 GB: Slope = 0.50%
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76.75	1560	85.75	1556.52	85.75	1546.52	100	1546.24	114.25	1546.52
114.25	1556.52	123.25	1560						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76.75	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	48	48	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1561.51	Element			
Vel Head (ft)	9.43	Wt. n-Val.		0.015	
W.S. Elev (ft)	1552.08	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)	1554.86	Flow Area (sq ft)		162.32	
E.G. Slope (ft/ft)	0.009439	Area (sq ft)		162.32	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	24.64	Avg. Vel. (ft/s)		24.64	
Max Chl Dpth (ft)	5.84	Hydr. Depth (ft)		5.70	
Conv. Total (cfs)	41171.2	Conv. (cfs)		41171.2	
Length Wtd. (ft)	48.00	Wetted Per. (ft)		39.62	
Min Ch El (ft)	1546.24	Shear (lb/sq ft)		2.41	
Alpha	1.00	Stream Power (lb/ft s)		59.50	
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)		2.81	
C & E Loss (ft)	0.02	Cum SA (acres)		0.51	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 600

INPUT
Description: Station: 6+00
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
74	1556.4	85.75	1556.28	85.75	1546.28	100	1546	114.25	1546.28
114.25	1556.28	126	1556.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
74	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1561.06	Element			
Vel Head (ft)	9.14	Wt. n-Val.		0.015	
W.S. Elev (ft)	1551.93	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1554.62	Flow Area (sq ft)		164.90	
E.G. Slope (ft/ft)	0.009010	Area (sq ft)		164.90	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	24.26	Avg. Vel. (ft/s)		24.26	
Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)		5.79	
Conv. Total (cfs)	42139.9	Conv. (cfs)		42139.9	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		39.80	
Min Ch El (ft)	1546.00	Shear (lb/sq ft)		2.33	
Alpha	1.00	Stream Power (lb/ft s)		56.54	
Frctn Loss (ft)	0.44	Cum Volume (acre-ft)		2.63	
C & E Loss (ft)	0.00	Cum SA (acres)		0.48	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 500

INPUT
Description: Station: 5+00
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
80	1555.9	85.75	1555.78	85.75	1545.78	100	1545.5	114.25	1545.78
114.25	1555.78	120	1556.04						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
80	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1560.19	Element			
Vel Head (ft)	8.58	Wt. n-Val.		0.015	
W.S. Elev (ft)	1551.61	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1554.12	Flow Area (sq ft)		170.12	
E.G. Slope (ft/ft)	0.008220	Area (sq ft)		170.12	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	23.51	Avg. Vel. (ft/s)		23.51	
Max Chl Dpth (ft)	6.11	Hydr. Depth (ft)		5.97	
Conv. Total (cfs)	44118.4	Conv. (cfs)		44118.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.16	
Min Ch El (ft)	1545.50	Shear (lb/sq ft)		2.17	

Alpha	1.00	Stream Power (lb/ft s)	51.11
Frctn Loss (ft)	0.86	Cum Volume (acre-ft)	2.25
C & E Loss (ft)	0.00	Cum SA (acres)	0.41

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

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 400

INPUT
Description: Station: 4+00
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
80	1555.4	85.75	1555.28	85.75	1545.28	100	1545	114.25	1545.28
114.25	1555.28	120	1555.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
80	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1559.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	8.13	Wt. n-Val.		0.015	
W.S. Elev (ft)	1551.27	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1553.62	Flow Area (sq ft)		174.80	
E.G. Slope (ft/ft)	0.007591	Area (sq ft)		174.80	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.88	Avg. Vel. (ft/s)		22.88	
Max Chl Dpth (ft)	6.27	Hydr. Depth (ft)		6.13	
Conv. Total (cfs)	45909.4	Conv. (cfs)		45909.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.49	
Min Ch El (ft)	1545.00	Shear (lb/sq ft)		2.05	
Alpha	1.00	Stream Power (lb/ft s)		46.82	
Frctn Loss (ft)	0.79	Cum Volume (acre-ft)		1.85	
C & E Loss (ft)	0.00	Cum SA (acres)		0.34	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 300

INPUT
Description: Station: 3+00
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
80	1554.92	85.75	1554.78	85.75	1544.78	100	1544.5	114.25	1544.78
114.25	1554.78	120	1555.06						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
80	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	75	75	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1558.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	7.75	Wt. n-Val.		0.015	
W.S. Elev (ft)	1550.92	Reach Len. (ft)	75.00	75.00	75.00
Crit W.S. (ft)	1553.12	Flow Area (sq ft)		179.05	
E.G. Slope (ft/ft)	0.007076	Area (sq ft)		179.05	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.34	Avg. Vel. (ft/s)		22.34	
Max Chl Dpth (ft)	6.42	Hydr. Depth (ft)		6.28	
Conv. Total (cfs)	47552.1	Conv. (cfs)		47552.1	
Length Wtd. (ft)	75.00	Wetted Per. (ft)		40.79	
Min Ch El (ft)	1544.50	Shear (lb/sq ft)		1.94	
Alpha	1.00	Stream Power (lb/ft s)		43.32	
Frctn Loss (ft)	0.73	Cum Volume (acre-ft)		1.45	
C & E Loss (ft)	0.00	Cum SA (acres)		0.28	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 225

INPUT
Description: Station: 2+25 End of Concrete Channel
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
80	1554.52	85.75	1554.4	85.75	1544.4	100	1544.12	114.25	1544.4
114.25	1554.4	120	1554.66						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
80	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	10	10	0	0

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1558.16	Element	Left OB	Channel	Right OB
Vel Head (ft)	7.52	Wt. n-Val.		0.015	
W.S. Elev (ft)	1550.64	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	1552.74	Flow Area (sq ft)		181.75	
E.G. Slope (ft/ft)	0.006773	Area (sq ft)		181.75	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	28.50	Top Width (ft)		28.50	
Vel Total (ft/s)	22.01	Avg. Vel. (ft/s)		22.01	
Max Chl Dpth (ft)	6.52	Hydr. Depth (ft)		6.38	
Conv. Total (cfs)	48602.7	Conv. (cfs)		48602.7	
Length Wtd. (ft)	10.00	Wetted Per. (ft)		40.98	
Min Ch El (ft)	1544.12	Shear (lb/sq ft)		1.88	
Alpha	1.00	Stream Power (lb/ft s)		41.27	
Frctn Loss (ft)	0.52	Cum Volume (acre-ft)		1.14	
C & E Loss (ft)	0.00	Cum SA (acres)		0.23	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 215

INPUT
Description: Station: 2+15
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1553	73	1544.03	100	1544.03	127	1544.03	158	1554

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.045	44	.02	158	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
44	158	13	13	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
888	F		
888	F		

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1558.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	9.84	Wt. n-Val.		0.020	
W.S. Elev (ft)	1548.21	Reach Len. (ft)	13.00	13.00	13.00
Crit W.S. (ft)	1553.01	Flow Area (sq ft)		158.89	
E.G. Slope (ft/ft)	0.017045	Area (sq ft)		281.23	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	80.52	Top Width (ft)		80.52	
Vel Total (ft/s)	25.17	Avg. Vel. (ft/s)		25.17	
Max Chl Dpth (ft)	4.18	Hydr. Depth (ft)		4.18	
Conv. Total (cfs)	30638.2	Conv. (cfs)		30638.2	
Length Wtd. (ft)	13.00	Wetted Per. (ft)		38.00	
Min Ch El (ft)	1544.03	Shear (lb/sq ft)		4.45	
Alpha	1.00	Stream Power (lb/ft s)		112.01	
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)		1.08	
C & E Loss (ft)	0.00	Cum SA (acres)		0.22	

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

INLINE WEIR RIVER: Abbott Wash
REACH: AW RS: 214

INPUT
Description: First Row of Engergy Dissipator Blocks
Distance from Upstream XS = 1
Deck/Roadway Width = 2
Weir Coefficient = 3
Weir Embankment Coordinates num = 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
73	1544	88	1544	88	1545.53	97	1545.53	97	1544
103	1544	103	1545.53	112	1545.53	112	1544	127	1544

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Weir crest shape = Broad Crested

INLINE WEIR/SPILLWAY OUTPUT Profile #PF 1

E.G. Elev (ft)	1555.25	Min El Weir Flow (ft)	1544.04
W.S. Elev (ft)	1551.72	Wr Top Wdth (ft)	
Q Total (cfs)		Total Gate Flow (cfs)	
Q Weir (cfs)		Gate Group Q (cfs)	
Wr Flw Area (sq ft)		Gate Open Ht (ft)	
Weir Sta Lft (ft)		Gate #Open	
Weir Sta Rgt (ft)		Gate Area (sq ft)	
Weir Max Depth (ft)		Gate Submerg	
Weir Avg Depth (ft)		Gate Invert (ft)	
Weir Submerg			

Warning: The program cannot perform supercritical flow through an inline weir. The program sets the water surface to critical depth at the downstream cross section and continues on.

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 202

INPUT
Description: Station: 2+02
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1553	73	1543.92	100	1543.92	127	1543.92	158	1554

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.045	44	.02	158	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
44	158	3	3	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1551.61	Element			
Vel Head (ft)	0.98	Wt. n-Val.		0.020	
W.S. Elev (ft)	1550.63	Reach Len. (ft)	3.00	3.00	3.00
Crit W.S. (ft)	1548.92	Flow Area (sq ft)		503.08	
E.G. Slope (ft/ft)	0.001296	Area (sq ft)		503.08	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	96.04	Top Width (ft)		96.04	
Vel Total (ft/s)	7.95	Avg. Vel. (ft/s)		7.95	
Max Chl Dpth (ft)	6.71	Hydr. Depth (ft)		5.24	
Conv. Total (cfs)	111130.2	Conv. (cfs)		111130.2	
Length Wtd. (ft)	3.00	Wetted Per. (ft)		98.13	
Min Ch El (ft)	1543.92	Shear (lb/sq ft)		0.41	
Alpha	1.00	Stream Power (lb/ft s)		3.30	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.97	
C & E Loss (ft)		Cum SA (acres)		0.19	

INLINE WEIR RIVER: Abbott Wash
REACH: AW RS: 201

INPUT
Description: Second Row of Energy Dissipator Blocks
Second Row of Energy
Dissipator Blocks
Distance from Upstream XS = 1
Deck/Roadway Width = 2
Weir Coefficient = 3
Weir Embankment Coordinates num = 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
73	1543.85	80	1543.85	80	1545.42	89	1545.42	89	1543.85
95.5	1543.85	95.5	1545.42	104.5	1545.42	104.5	1543.85	111	1543.85
111	1545.42	120	1545.42	120	1543.85	127	1543.85		

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Weir crest shape = Broad Crested

INLINE WEIR/SPILLWAY OUTPUT Profile #PF 1

E.G. Elev (ft)	1551.61	Min El Weir Flow (ft)	1543.93
W.S. Elev (ft)	1550.63	Wr Top Wdth (ft)	102.20
Q Total (cfs)	4000.00	Total Gate Flow (cfs)	
Q Weir (cfs)	4000.00	Gate Group Q (cfs)	
Wr Flw Area (sq ft)	559.89	Gate Open Ht (ft)	
Weir Sta Lft (ft)	48.45	Gate #Open	
Weir Sta Rgt (ft)	150.64	Gate Area (sq ft)	
Weir Max Depth (ft)	7.69	Gate Submerg	
Weir Avg Depth (ft)	5.48	Gate Invert (ft)	
Weir Submerg	0.78		

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 199

INPUT
Description: Station: 1+99 (Grade Break, End of Energy Dissipator Blocks)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1553	73	1543.89	100	1543.89	127	1543.89	158	1554

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.045	44	.02	158	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
44	158	36	36	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1551.34	Element			
Vel Head (ft)	1.15	Wt. n-Val.		0.020	
W.S. Elev (ft)	1550.19	Reach Len. (ft)	36.00	36.00	36.00
Crit W.S. (ft)		Flow Area (sq ft)		464.17	
E.G. Slope (ft/ft)	0.001630	Area (sq ft)		464.17	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	93.37	Top Width (ft)		93.37	
Vel Total (ft/s)	8.62	Avg. Vel. (ft/s)		8.62	
Max Chl Dpth (ft)	6.30	Hydr. Depth (ft)		4.97	
Conv. Total (cfs)	99065.5	Conv. (cfs)		99065.5	
Length Wtd. (ft)	36.00	Wetted Per. (ft)		95.34	
Min Ch El (ft)	1543.89	Shear (lb/sq ft)		0.50	
Alpha	1.00	Stream Power (lb/ft s)		4.27	
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)		0.93	
C & E Loss (ft)	0.02	Cum SA (acres)		0.18	

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 163

INPUT
Description: Station: 1+63 (End of 4:1 Flow Expansion)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1553	73	1543.73	100	1543.73	127	1543.73	158	1554

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.045	44	.025	158	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
44	158	50	50	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1551.25	Element			
Vel Head (ft)	1.11	Wt. n-Val.		0.025	
W.S. Elev (ft)	1550.14	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		472.54	
E.G. Slope (ft/ft)	0.002404	Area (sq ft)		472.54	

Q Total (cfs)	4000.00	Flow (cfs)	4000.00
Top Width (ft)	93.41	Top Width (ft)	93.41
Vel Total (ft/s)	8.46	Avg. Vel. (ft/s)	8.46
Max Chl Dpth (ft)	6.41	Hydr. Depth (ft)	5.06
Conv. Total (cfs)	81586.9	Conv. (cfs)	81586.9
Length Wtd. (ft)	50.00	Wetted Per. (ft)	95.44
Min Ch El (ft)	1543.73	Shear (lb/sq ft)	0.74
Alpha	1.00	Stream Power (lb/ft s)	6.29
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.55
C & E Loss (ft)	0.02	Cum SA (acres)	0.11

CROSS SECTION RIVER: Abbott Wash
REACH: AW RS: 113

INPUT
Description: Station: 1+13 End of Improvements, Tie to Virgin River
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1553	73	1543.5	100	1543.5	127	1543.5	156	1553

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.045	44	.035	156	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
44	156	0	0	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1551.08	Element			
Vel Head (ft)	1.08	Wt. n-Val.		0.035	
W.S. Elev (ft)	1550.00	Reach Len. (ft)			
Crit W.S. (ft)	1548.50	Flow Area (sq ft)		479.66	
E.G. Slope (ft/ft)	0.004500	Area (sq ft)		479.66	
Q Total (cfs)	4000.00	Flow (cfs)		4000.00	
Top Width (ft)	93.66	Top Width (ft)		93.66	
Vel Total (ft/s)	8.34	Avg. Vel. (ft/s)		8.34	
Max Chl Dpth (ft)	6.50	Hydr. Depth (ft)		5.12	
Conv. Total (cfs)	59625.8	Conv. (cfs)		59625.8	
Length Wtd. (ft)		Wetted Per. (ft)		95.74	
Min Ch El (ft)	1543.50	Shear (lb/sq ft)		1.41	
Alpha	1.00	Stream Power (lb/ft s)		11.74	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Abbott Wash

Reach	River Sta.	n1	n2	n3
AW	8741.56	.03	.028	.03
AW	8641.56	.03	.028	.03
AW	8541.56	.03	.028	.03
AW	8441.56	.03	.028	.03
AW	8341.56	.03	.028	.03
AW	8241.56	.03	.028	.03
AW	8141.56	.03	.028	.03
AW	8091.56	.03	.028	.03
AW	8041.56	.03	.028	.03
AW	7991.56	.03	.025	.03
AW	7941.56	.015	.015	.015
AW	7900	Bridge		
AW	7611	.015	.015	.015
AW	7537.59	.015	.015	.015
AW	7476.58	.015	.015	.015
AW	7416.02	.015	.015	.015
AW	7358.36	.015	.015	.015
AW	7200	Bridge		
AW	6988.71	.015	.015	.015
AW	6840.4	.015	.015	.015
AW	6700	.025	.015	.025
AW	6600	.025	.015	.025
AW	6500	.025	.015	.025
AW	6400	.025	.015	.025
AW	6300	.025	.015	.025
AW	6200	.025	.015	.025
AW	6100	.025	.015	.025
AW	6000	.025	.015	.025
AW	5900	.025	.015	.025
AW	5800	.025	.015	.025
AW	5700	.025	.015	.025
AW	5600	.025	.015	.025
AW	5500	.025	.015	.025
AW	5400	.025	.015	.025
AW	5300	.025	.015	.025
AW	5200	.015	.015	.015
AW	5100	.015	.015	.015
AW	5092	Bridge		
AW	4991.79	.015	.015	.015
AW	4900	.015	.015	.015
AW	4800	.015	.015	.015
AW	4700	.015	.015	.015
AW	4600	.015	.015	.015
AW	4500	.015	.015	.015
AW	4400	.015	.015	.015
AW	4300	.025	.015	.025
AW	4200	.025	.015	.025
AW	4100	.025	.015	.025
AW	4000	.025	.015	.025
AW	3900	.025	.015	.025
AW	3800	.025	.015	.025
AW	3700	.025	.015	.025
AW	3600	.025	.015	.025
AW	3466.52	.025	.015	.025
AW	3420	.025	.015	.025
AW	3370	Bridge		
AW	3324	.025	.015	.025
AW	3201.70	.025	.015	.025
AW	3100	.025	.015	.025
AW	3000	.025	.015	.025
AW	2900	.025	.015	.025
AW	2800	.025	.015	.025
AW	2700	.025	.015	.025
AW	2600	.025	.015	.025
AW	2531.46	.025	.015	.025
AW	2419.08	.025	.015	.025
AW	2300	.025	.015	.025
AW	2181.22	.025	.015	.025
AW	2081.22	.025	.015	.025
AW	2080	Bridge		
AW	2000	.025	.015	.025
AW	1942	.025	.015	.025
AW	1700	.025	.015	.025
AW	1600	.025	.015	.025
AW	1500	.025	.015	.025
AW	1400	.025	.015	.025
AW	1300	.025	.015	.025
AW	1200	.025	.015	.025
AW	1100	.025	.015	.025
AW	1000	.025	.015	.025
AW	900	.035	.015	.035
AW	800	.035	.015	.035
AW	724	.035	.015	.035
AW	718	Bridge		
AW	704	.035	.015	.035
AW	648	.035	.015	.035
AW	600	.035	.015	.035
AW	500	.035	.015	.035
AW	400	.035	.015	.035
AW	300	.035	.015	.035
AW	225	.035	.015	.035
AW	215	.045	.02	.045
AW	214	Inline Weir		
AW	202	.045	.02	.045
AW	201	Inline Weir		
AW	199	.045	.02	.045
AW	163	.045	.025	.045
AW	113	.045	.035	.045

SUMMARY OF REACH LENGTHS

River: Abbott Wash

Reach	River Sta.	Left	Channel	Right
AW	8741.56	100	100	100
AW	8641.56	100	100	100
AW	8541.56	100	100	100
AW	8441.56	100	100	100
AW	8341.56	100	100	100
AW	8241.56	100	100	101
AW	8141.56	50	50	50
AW	8091.56	50	50	50
AW	8041.56	50	50	50
AW	7991.56	50	50	50
AW	7941.56	330.57	330.57	330.57
AW	7900	Bridge		
AW	7611	73.41	73.41	73.41
AW	7537.59	58.88	61	62.68
AW	7476.58	58.87	60.57	62.68
AW	7416.02	57.66	57.66	57.66
AW	7358.36	380	369.66	361
AW	7200	Bridge		
AW	6988.71	140	148.31	156
AW	6840.4	140.4	140.4	140.4
AW	6700	100	100	100
AW	6600	100	100	100
AW	6500	100	100	100
AW	6400	100	100	100
AW	6300	100	100	100
AW	6200	100	100	100
AW	6100	100	100	100
AW	6000	100	100	100
AW	5900	100	100	100
AW	5800	100	100	100
AW	5700	100	100	100
AW	5600	100	100	100
AW	5500	100	100	100
AW	5400	100	100	100
AW	5300	100	100	100
AW	5200	100	100	100
AW	5100	108.21	108.21	108.21
AW	5092	Bridge		
AW	4991.79	91.79	91.79	91.79
AW	4900	103	100	97
AW	4800	103	100	97
AW	4700	102	100	98
AW	4600	103	100	97
AW	4500	100	100	100
AW	4400	100	100	100
AW	4300	100	100	100
AW	4200	100	100	100
AW	4100	100	100	100
AW	4000	100	100	100
AW	3900	100	100	100
AW	3800	100	100	100
AW	3700	100	100	100
AW	3600	133.48	133.48	133.48
AW	3466.52	45	46.52	48
AW	3420	68	96	104
AW	3370	Bridge		
AW	3324	117	122.3	127
AW	3201.70	101.7	101.7	101.7
AW	3100	100	100	100
AW	3000	100	100	100
AW	2900	100	100	100
AW	2800	100	100	100
AW	2700	100	100	100
AW	2600	68.54	68.54	68.54
AW	2531.46	114	112.38	109
AW	2419.08	119.08	119.08	119.08
AW	2300	118.78	118.78	118.78
AW	2181.22	100	100	100
AW	2081.22	81.22	81.22	81.22
AW	2080	Bridge		
AW	2000	58	58	58
AW	1942	242	242	242
AW	1700	100	100	100
AW	1600	100	100	100
AW	1500	100	100	100
AW	1400	100	100	100
AW	1300	100	100	100
AW	1200	100	100	100
AW	1100	100	100	100
AW	1000	100	100	100
AW	900	100	100	100
AW	800	76	76	76
AW	724	20	20	20
AW	718	Bridge		
AW	704	56	56	56
AW	648	48	48	48
AW	600	100	100	100
AW	500	100	100	100
AW	400	100	100	100
AW	300	75	75	75
AW	225	10	10	10
AW	215	13	13	13
AW	214	Inline Weir		
AW	202	3	3	3
AW	201	Inline Weir		
AW	199	36	36	36
AW	163	50	50	50
AW	113	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Abbott Wash

Reach	River Sta.	Contr.	Expan.
AW	8741.56	.1	.3
AW	8641.56	.1	.3
AW	8541.56	.1	.3
AW	8441.56	.1	.3
AW	8341.56	.1	.3
AW	8241.56	.1	.3
AW	8141.56	.1	.3
AW	8091.56	.1	.3
AW	8041.56	.1	.3
AW	7991.56	.1	.3
AW	7941.56	.1	.3
AW	7900	Bridge	
AW	7611	.05	.1
AW	7537.59	.05	.1
AW	7476.58	.05	.1
AW	7416.02	.05	.05
AW	7358.36	.05	.05
AW	7200	Bridge	
AW	6988.71	.05	.1
AW	6840.4	0	0
AW	6700	0	0
AW	6600	0	0
AW	6500	0	0
AW	6400	0	0
AW	6300	0	0
AW	6200	0	0
AW	6100	0	0
AW	6000	0	0
AW	5900	0	0
AW	5800	0	0
AW	5700	0	0
AW	5600	0	0
AW	5500	0	0
AW	5400	0	0
AW	5300	0	0
AW	5200	0	0
AW	5100	.05	.1
AW	5092	Bridge	
AW	4991.79	.05	.1
AW	4900	0	0
AW	4800	0	0
AW	4700	0	0
AW	4600	0	0
AW	4500	0	0
AW	4400	0	0
AW	4300	0	0
AW	4200	0	0
AW	4100	0	0
AW	4000	0	0

AW	3900		0	0
AW	3800		0	0
AW	3700		0	0
AW	3600		0	0
AW	3466.52		0	0
AW	3420		.05	.1
AW	3370	Bridge		
AW	3324		.05	.1
AW	3201.70		0	0
AW	3100		0	0
AW	3000		0	0
AW	2900		0	0
AW	2800		0	0
AW	2700		0	0
AW	2600		0	0
AW	2531.46		0	0
AW	2419.08		0	0
AW	2300		0	0
AW	2181.22		.05	.1
AW	2081.22		.05	.1
AW	2080	Bridge		
AW	2000		.05	.1
AW	1942		.05	.1
AW	1700		0	0
AW	1600		0	0
AW	1500		0	0
AW	1400		0	0
AW	1300		0	0
AW	1200		0	0
AW	1100		0	0
AW	1000		0	0
AW	900		0	0
AW	800		0	0
AW	724		.05	.1
AW	718	Bridge		
AW	704		.05	.1
AW	648		0	0
AW	600		0	0
AW	500		0	0
AW	400		0	0
AW	300		0	0
AW	225		0	0
AW	215		.1	.5
AW	214	Inline Weir		
AW	202		.3	.5
AW	201	Inline Weir		
AW	199		.3	.5
AW	163		.3	.5
AW	113		.3	.5

Profile Output Table - BBE Std Table 1

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Shear Chan (lb/sq ft)	Hydr Depth (ft)	Hydr Depth C (ft)
AW	8741.56	2790.00	1620.28	1625.55	1625.87	1627.96	0.009507	12.45	224.17	58.40	1.12	2.21	3.84	3.84
AW	8641.56	2790.00	1619.33	1624.59	1624.92	1627.01	0.009586	12.48	223.52	58.34	1.12	2.23	3.83	3.83
AW	8541.56	2790.00	1618.38	1623.65	1623.97	1626.06	0.009513	12.45	224.12	58.40	1.12	2.22	3.84	3.84
AW	8441.56	2790.00	1617.43	1622.71	1623.02	1625.10	0.009440	12.42	224.73	58.45	1.12	2.20	3.84	3.84
AW	8341.56	2790.00	1616.48	1621.77	1622.07	1624.15	0.009369	12.38	225.34	58.51	1.11	2.19	3.85	3.85
AW	8241.56	2790.00	1615.39	1620.50	1620.99	1623.13	0.010785	13.02	214.34	57.41	1.19	2.44	3.73	3.73
AW	8141.56	2790.00	1614.29	1619.38	1619.89	1622.04	0.010941	13.08	213.25	57.31	1.20	2.47	3.72	3.72
AW	8091.56	2790.00	1613.74	1618.83	1619.34	1621.48	0.010884	13.06	213.67	57.36	1.19	2.46	3.72	3.72
AW	8041.56	2790.00	1613.20	1619.41	1618.79	1620.94	0.005006	9.90	281.79	63.79	0.83	1.34	4.42	4.42
AW	7991.56	2790.00	1612.65	1619.48		1620.64	0.002748	8.66	322.18	67.31	0.70	0.79	4.79	4.79
AW	7941.56	2790.00	1612.10	1619.34	1617.15	1620.57	0.000844	8.89	313.88	43.34	0.58	0.29	7.24	7.24
AW	7900	Bridge												
AW	7611	2790.00	1609.70	1613.70	1614.71	1617.72	0.005221	16.10	173.24	43.34	1.42	1.10	4.00	4.00
AW	7537.59	3334.00	1607.90	1614.19	1614.25	1617.39	0.002699	14.36	232.10	37.76	1.02	0.79	6.15	6.15
AW	7476.58	3334.00	1606.40	1612.24	1613.34	1617.09	0.004596	17.67	188.71	33.10	1.30	1.22	5.70	5.70
AW	7416.02	3334.00	1604.92	1611.28	1612.57	1616.77	0.005052	18.80	177.39	28.50	1.33	1.38	6.22	6.22
AW	7358.36	3334.00	1603.50	1608.83	1611.01	1616.31	0.008053	21.95	151.91	28.50	1.68	1.95	5.33	5.33
AW	7200	Bridge												
AW	6988.71	3334.00	1600.50	1606.11	1608.00	1612.87	0.006935	20.87	159.77	28.50	1.55	1.74	5.61	5.61
AW	6840.4	3520.00	1599.52	1606.01	1607.45	1611.89	0.005319	19.46	180.89	28.50	1.36	1.47	6.35	6.35
AW	6700	3520.00	1598.60	1604.93	1606.53	1611.11	0.005725	19.96	176.39	28.50	1.41	1.55	6.19	6.19
AW	6600	3520.00	1597.94	1604.19	1605.87	1610.54	0.005946	20.22	174.13	28.50	1.44	1.60	6.11	6.11
AW	6500	3520.00	1597.28	1603.48	1605.21	1609.93	0.006099	20.39	172.62	28.50	1.46	1.63	6.06	6.06
AW	6400	3520.00	1596.62	1602.78	1604.55	1609.32	0.006215	20.52	171.52	28.50	1.47	1.65	6.02	6.02
AW	6300	3520.00	1595.96	1602.09	1603.89	1608.69	0.006303	20.62	170.70	28.50	1.48	1.67	5.99	5.99
AW	6200	3520.00	1595.30	1601.41	1603.23	1608.06	0.006371	20.70	170.08	28.50	1.49	1.68	5.97	5.97
AW	6100	3520.00	1594.64	1600.73	1602.57	1607.43	0.006440	20.77	169.46	28.50	1.50	1.70	5.95	5.95
AW	6000	3670.00	1593.98	1600.50	1602.13	1606.83	0.005692	20.18	181.86	28.50	1.41	1.58	6.38	6.38
AW	5900	3670.00	1593.32	1599.76	1601.47	1606.25	0.005905	20.44	179.59	28.50	1.43	1.62	6.30	6.30
AW	5800	3670.00	1592.66	1599.04	1600.81	1605.65	0.006064	20.62	177.96	28.50	1.45	1.65	6.24	6.24
AW	5700	3670.00	1592.00	1598.34	1600.15	1605.04	0.006185	20.76	176.76	28.50	1.47	1.68	6.20	6.20
AW	5600	3670.00	1590.94	1596.98	1599.09	1604.37	0.007148	21.81	168.25	28.50	1.58	1.88	5.90	5.90
AW	5500	3670.00	1589.88	1595.71	1598.03	1603.62	0.007873	22.54	162.83	28.50	1.66	2.02	5.71	5.71
AW	5400	3670.00	1588.82	1594.54	1596.97	1602.80	0.008425	23.06	159.13	28.50	1.72	2.12	5.58	5.58
AW	5300	3670.00	1587.76	1593.39	1595.91	1601.94	0.008864	23.46	156.42	28.50	1.76	2.21	5.49	5.49
AW	5200	3670.00	1586.70	1592.26	1594.84	1601.03	0.009215	23.77	154.38	28.50	1.80	2.27	5.42	5.42
AW	5100	4000.00	1585.64	1591.62	1594.13	1600.17	0.008241	23.46	170.50	28.50	1.69	2.17	5.98	5.98
AW	5092	Bridge												
AW	4991.79	4000.00	1584.50	1590.55	1592.97	1598.90	0.007962	23.19	172.51	28.50	1.66	2.11	6.05	6.05
AW	4900	4000.00	1583.90	1590.22	1592.49	1598.16	0.007347	22.61	176.88	28.50	1.60	1.99	6.21	6.21
AW	4800	4000.00	1583.25	1589.66	1591.87	1597.44	0.007104	22.37	178.81	28.50	1.57	1.95	6.27	6.27
AW	4700	4000.00	1582.60	1589.05	1591.22	1596.74	0.006992	22.25	179.78	28.50	1.56	1.92	6.31	6.31
AW	4600	4000.00	1581.95	1588.43	1590.57	1596.04	0.006882	22.13	180.76	28.50	1.55	1.90	6.34	6.34
AW	4500	4000.00	1581.30	1587.81	1589.92	1595.35	0.006804	22.04	181.47	28.50	1.54	1.88	6.37	6.37
AW	4400	4000.00	1580.65	1587.18	1589.27	1594.67	0.006727	21.96	182.18	28.50	1.53	1.87	6.39	6.39
AW	4300	4000.00	1580.00	1586.55	1588.62	1594.00	0.006681	21.90	182.61	28.50	1.52	1.86	6.41	6.41
AW	4200	4000.00	1579.35	1585.91	1587.97	1593.33	0.006635	21.85	183.05	28.50	1.52	1.85	6.42	6.42
AW	4100	4000.00	1578.70	1585.28	1587.32	1592.66	0.006589	21.80	183.48	28.50	1.51	1.84	6.44	6.44
AW	4000	4000.00	1578.05	1584.63	1586.67	1592.00	0.006570	21.78	183.66	28.50	1.51	1.83	6.44	6.44
AW	3900	4000.00	1577.40	1583.99	1586.02	1591.34	0.006552	21.76	183.83	28.50	1.51	1.83	6.45	6.45
AW	3800	4000.00	1576.59	1583.08	1585.21	1590.67	0.006870	22.11	180.87	28.50	1.55	1.90	6.35	6.35
AW	3700	4000.00	1575.78	1582.19	1584.40	1589.97	0.007121	22.39	178.66	28.50	1.58	1.95	6.27	6.27
AW	3600	4000.00	1574.98	1581.34	1583.60	1589.25	0.007301	22.58	177.15	28.50	1.60	1.99	6.22	6.22
AW	3466.52	4000.00	1573.90	1580.20	1582.52	1588.26	0.007503	22.79	175.51	28.50	1.62	2.03	6.16	6.16
AW	3420	4000.00	1573.52	1579.58	1581.99	1587.91	0.007926	23.15	172.78	28.50	1.66	2.10	6.06	6.06
AW	3370	Bridge												
AW	3324	4000.00	1572.74	1578.99	1581.21	1586.82	0.007244	22.45	178.17	28.50	1.58	1.97	6.25	6.25
AW	3201.70	4000.00	1571.76	1578.18	1580.38	1585.94	0.007097	22.16	178.87	28.50	1.57	1.94	6.28	6.28
AW	3100	4000.00	1570.93	1577.28	1579.55	1585.22	0.007332	22.61	176.89	28.50	1.60	1.99	6.21	6.21
AW	3000	4000.00	1570.13	1576.44	1578.75	1584.48	0.007477	22.76	175.71	28.50	1.62	2.02	6.17	6.17
AW	2900	4000.00	1569.32	1575.59	1577.94	1583.72	0.007588	22.88	174.83	28.50	1.63	2.05	6.13	6.13
AW	2800	4000.00	1568.51	1574.75	1577.13	1582.97	0.007703	23.00	173.94	28.50	1.64	2.07	6.10	6.10
AW	2700	4000.00	1567.70	1573.92	1576.32	1582.19	0.007781	23.08	173.33	28.50	1.65	2.08	6.08	6.08
AW	2600	4000.00	1566.89	1573.09	1575.51	1581.42	0.007862	23.16	172.73	28.50	1.66	2.10	6.06	6.06
AW	2531.46	4000.00	1566.34	1572.53	1574.96	1580.88	0.007885	23.18	172.55	28.50	1.66	2.11	6.05	6.05
AW	2419.08	4000.00	1565.43	1571.62	1574.05	1579.99	0.007923	23.22	172.27	28.50	1.66	2.11	6.04	6.04
AW	2300	4000.00	1564.47	1570.64	1573.09	1579.05	0.007963	23.26	171.98	28.50	1.67	2.12	6.03	6.03
AW	2181.22	4000.00	1563.51	1569.67	1572.13	1578.10	0.008003	23.30	171.69	28.50	1.67	2.13	6.02	6.02
AW	2081.22	4000.00	1562.70	1565.99	1568.85	1576.85	0.017409	26.44	151.28	46.00	2.57	3.13	3.29	3.29
AW	2080	Bridge												
AW	2000	4000.00	1562.22	1565.81	1568.17	1574.94	0.013245	24.25	164.95	46.00	2.26	2.57	3.59	3.59
AW	1942	4000.00	1561.28	1565.00	1567.59	1574.17	0.013234	24.30	164.63	46.00	2.26	2.57	3.58	3.58
AW	1700	4000.00	1557.38	1563.70	1566.00	1571.70	0.007411	22.70	176.24	28.50	1.61	2.01	6.18	6.18
AW	1600	4000.00	1555.76	1561.66	1564.38	1570.88	0.009136	24.37	164.12	28.50	1.79	2.36	5.76	5.76
AW	1500	4000.00	1554.76	1560.62	1563.38	1569.96	0.009308	24.53	163.09	28.50	1.81	2.39	5.72	5.72
AW	1400	4000.00	1553.76	1559.59	1562.38	1569.03	0.009444	24.65	162.29	28.50	1.82	2.42	5.69	5.69

AW	1300	4000.00	1552.76	1558.57	1561.38	1568.08	0.009553	24.74	161.66	28.50	1.83	2.44	5.67	5.67
AW	1200	4000.00	1551.76	1557.56	1560.38	1567.12	0.009640	24.82	161.16	28.50	1.84	2.45	5.65	5.65
AW	1100	4000.00	1550.76	1556.54	1559.38	1566.15	0.009709	24.88	160.77	28.50	1.85	2.47	5.64	5.64
AW	1000	4000.00	1549.76	1555.53	1558.38	1565.18	0.009765	24.93	160.46	28.50	1.85	2.48	5.63	5.63
AW	900	4000.00	1548.76	1554.52	1557.38	1564.20	0.009811	24.97	160.21	28.50	1.86	2.49	5.62	5.62
AW	800	4000.00	1547.76	1553.51	1556.38	1563.22	0.009847	25.00	160.01	28.50	1.86	2.49	5.61	5.61
AW	724	4000.00	1547.00	1552.56	1555.46	1562.46	0.010230	25.24	158.45	28.50	1.89	2.55	5.56	5.56
AW	718	Bridge												
AW	704	4000.00	1546.80	1552.44	1555.27	1562.06	0.009823	24.90	160.64	28.50	1.85	2.48	5.64	5.64
AW	648	4000.00	1546.24	1552.08	1554.86	1561.51	0.009439	24.64	162.32	28.50	1.82	2.41	5.70	5.70
AW	600	4000.00	1546.00	1551.93	1554.62	1561.06	0.009010	24.26	164.90	28.50	1.78	2.33	5.79	5.79
AW	500	4000.00	1545.50	1551.61	1554.12	1560.19	0.008220	23.51	170.12	28.50	1.70	2.17	5.97	5.97
AW	400	4000.00	1545.00	1551.27	1553.62	1559.40	0.007591	22.88	174.80	28.50	1.63	2.05	6.13	6.13
AW	300	4000.00	1544.50	1550.92	1553.12	1558.67	0.007076	22.34	179.05	28.50	1.57	1.94	6.28	6.28
AW	225	4000.00	1544.12	1550.64	1552.74	1558.16	0.006773	22.01	181.75	28.50	1.54	1.88	6.38	6.38
AW	215	4000.00	1544.03	1548.21	1553.01	1558.05	0.017045	25.17	158.89	80.52	2.17	4.45	4.18	4.18
AW	214	Inline Weir												
AW	202	4000.00	1543.92	1550.63	1548.92	1551.61	0.001296	7.95	503.08	96.04	0.61	0.41	5.24	5.24
AW	201	Inline Weir												
AW	199	4000.00	1543.89	1550.19		1551.34	0.001630	8.62	464.17	93.37	0.68	0.50	4.97	4.97
AW	163	4000.00	1543.73	1550.14		1551.25	0.002404	8.46	472.54	93.41	0.66	0.74	5.06	5.06
AW	113	4000.00	1543.50	1550.00	1548.50	1551.08	0.004500	8.34	479.66	93.66	0.65	1.41	5.12	5.12

Profile Output Table - Bridge Only

Reach	River Sta	E.G. US. (ft)	Min El Prs (ft)	BR Open Area (sq ft)	Prs Q WS (ft)	Q Total (cfs)	Min El Weir Flow (ft)	Q Weir (cfs)	Delta EG (ft)
AW	7900	1620.57	1622.10	380.00		2790.00	1628.01		2.83
AW	7200	1616.31	1612.50	234.00	1608.83	3334.00	1622.31		3.44
AW	5092	1600.17	1594.64	232.47	1591.62	4000.00	1598.00		1.27
AW	3370	1587.91	1582.52	232.47	1579.58	4000.00	1584.95		1.09
AW	2080	1576.85	1570.70	304.16	1565.99	4000.00	1576.01		1.91
AW	718	1562.46	1556.00	232.47	1552.56	4000.00	1560.75		0.39

Profile Output Table - Inline Weir/Spillway

Reach	River Sta	E.G. Elev (ft)	W.S. Elev (ft)	Q Total (cfs)	Q Weir (cfs)	Total Gate Flow (cfs)
AW	214	1555.25	1551.72			
AW	201	1551.61	1550.63	4000.00	4000.00	

Errors Warnings and Notes for Plan : AWC5-03

Location:	River: Abbott Wash Reach: AW RS: 8241.56 Profile: PF 1
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.
Location:	River: Abbott Wash Reach: AW RS: 8141.56 Profile: PF 1
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.
Location:	River: Abbott Wash Reach: AW RS: 8091.56 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	selected the water surface that had the least amount of error between computed and assumed
	values.
Location:	River: Abbott Wash Reach: AW RS: 8041.56 Profile: PF 1
Note:	Hydraulic jump has occurred between this cross section and the previous upstream section.
Location:	River: Abbott Wash Reach: AW RS: 7991.56 Profile: PF 1
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.
Location:	River: Abbott Wash Reach: AW RS: 7941.56 Profile: PF 1
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.
Location:	River: Abbott Wash Reach: AW RS: 7900 Profile: PF 1
Warning:	During the class B momentum calculations, the supercritical downstream energy was higher than one
	of the upstream energies. This is not physically possible. The supercritical answer was backed out
	from an upstream energy.
Note:	The momentum method has computed a class B profile.
Location:	River: Abbott Wash Reach: AW RS: 7900 Profile: PF 1 Upstream
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 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.
Warning:	The composite Mannings n value for the channel was larger than the largest entered n value or
	smaller than the smallest entered n value.
Note:	Manning's n values were composited to a single value in the main channel.
Location:	River: Abbott Wash Reach: AW RS: 7900 Profile: PF 1 Downstream
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:	The composite Mannings n value for the channel was larger than the largest entered n value or
	smaller than the smallest entered n value.
Note:	Manning's n values were composited to a single value in the main channel.
Note:	The energy method has computed a class B profile.
Location:	River: Abbott Wash Reach: AW RS: 7611 Profile: PF 1
Note:	The energy method has computed a class B profile.
Location:	River: Abbott Wash Reach: AW RS: 7537.59 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for

Errors Warnings and Notes for Plan : AWC5-03 (Continued)

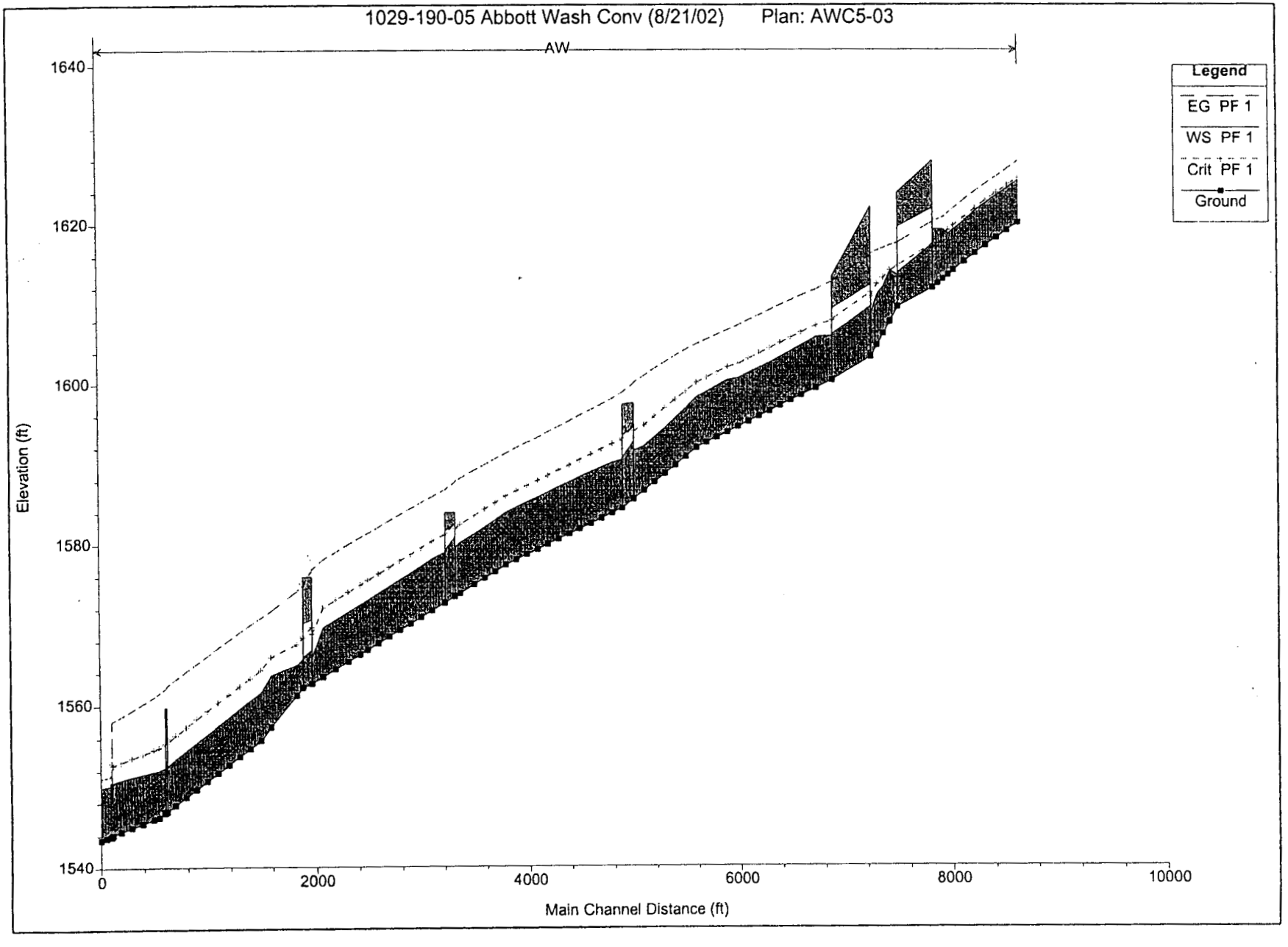
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 7476.58 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 7416.02 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 7358.36 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 7200 Profile: PF 1
Warning:	There was not enough momentum to compute a supercritical answer through the bridge. The
	momentum answer has been disregarded.
Note:	Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The
	momentum answer has been disregarded.
Location:	River: Abbott Wash Reach: AW RS: 7200 Profile: PF 1 Upstream
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 composite Mannings n value for the channel was larger than the largest entered n value or
	smaller than the smallest entered n value.
Note:	Manning's n values were composited to a single value in the main channel.
Location:	River: Abbott Wash Reach: AW RS: 7200 Profile: PF 1 Downstream
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:	The composite Mannings n value for the channel was larger than the largest entered n value or
	smaller than the smallest entered n value.
Note:	Manning's n values were composited to a single value in the main channel.
Location:	River: Abbott Wash Reach: AW RS: 6840.4 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 5600 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 5500 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 5092 Profile: PF 1
Note:	Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The
	momentum answer has been disregarded.
Location:	River: Abbott Wash Reach: AW RS: 5092 Profile: PF 1 Upstream
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 cross section had to be extended vertically during the critical depth calculations.
Warning:	The parabolic search method failed to converge on critical depth. The program will try the cross
	section slice/secant method to find critical depth.
Location:	River: Abbott Wash Reach: AW RS: 5092 Profile: PF 1 Downstream
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.
Location:	River: Abbott Wash Reach: AW RS: 3370 Profile: PF 1

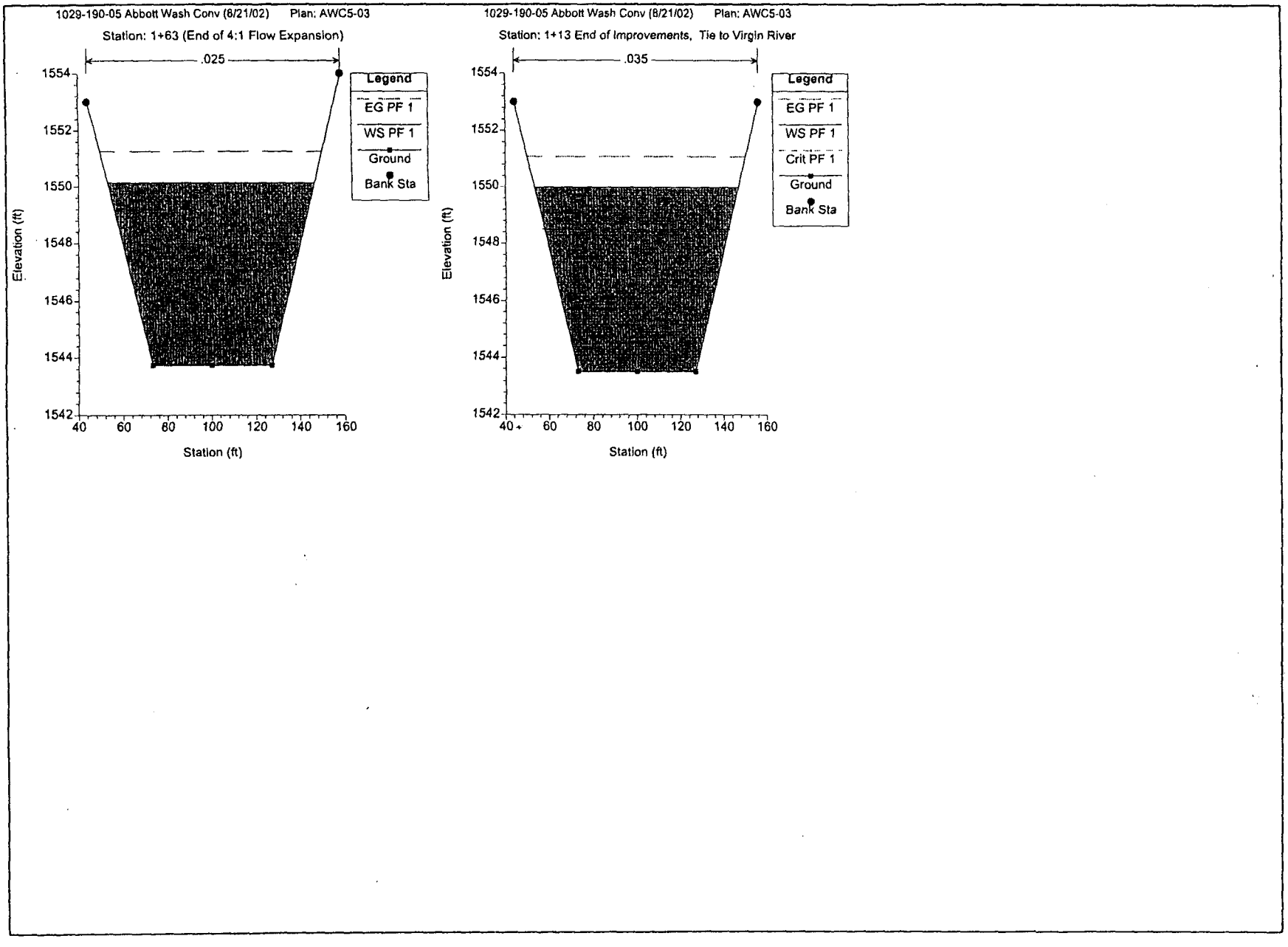
Errors Warnings and Notes for Plan : AWC5-03 (Continued)

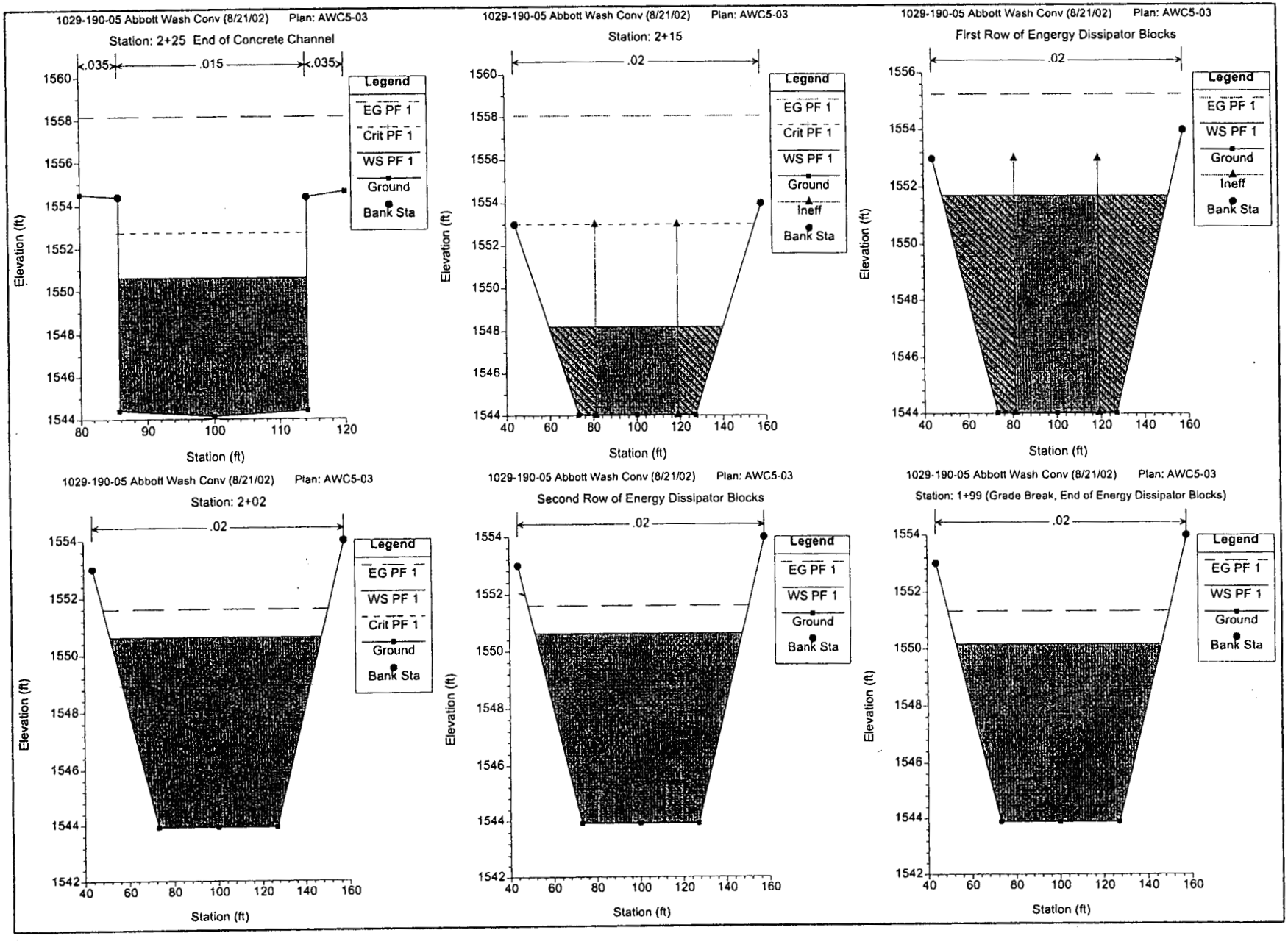
Warning:	Pier drag coefficient of 2.0 assumed for Class B flow.
Note:	Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The
	momentum answer has been disregarded.
Location:	River: Abbott Wash Reach: AW RS: 3370 Profile: PF 1 Upstream
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The cross section had to be extended vertically during the critical depth calculations.
Warning:	The parabolic search method failed to converge on critical depth. The program will try the cross
	section slice/secant method to find critical depth.
Location:	River: Abbott Wash Reach: AW RS: 3370 Profile: PF 1 Downstream
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 2081.22 Profile: PF 1
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.
Location:	River: Abbott Wash Reach: AW RS: 2080 Profile: PF 1
Warning:	Pier drag coefficient of 2.0 assumed for Class B flow.
Note:	Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The
	momentum answer has been disregarded.
Location:	River: Abbott Wash Reach: AW RS: 2080 Profile: PF 1 Upstream
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 2080 Profile: PF 1 Downstream
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.
Location:	River: Abbott Wash Reach: AW RS: 1700 Profile: PF 1
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.
Location:	River: Abbott Wash Reach: AW RS: 1600 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 718 Profile: PF 1
Warning:	Pier drag coefficient of 2.0 assumed for Class B flow.
Note:	Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The
	momentum answer has been disregarded.
Location:	River: Abbott Wash Reach: AW RS: 718 Profile: PF 1 Upstream
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 cross section had to be extended vertically during the critical depth calculations.
Warning:	The parabolic search method failed to converge on critical depth. The program will try the cross
	section slice/secant method to find critical depth.
Location:	River: Abbott Wash Reach: AW RS: 718 Profile: PF 1 Downstream
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 500 Profile: PF 1

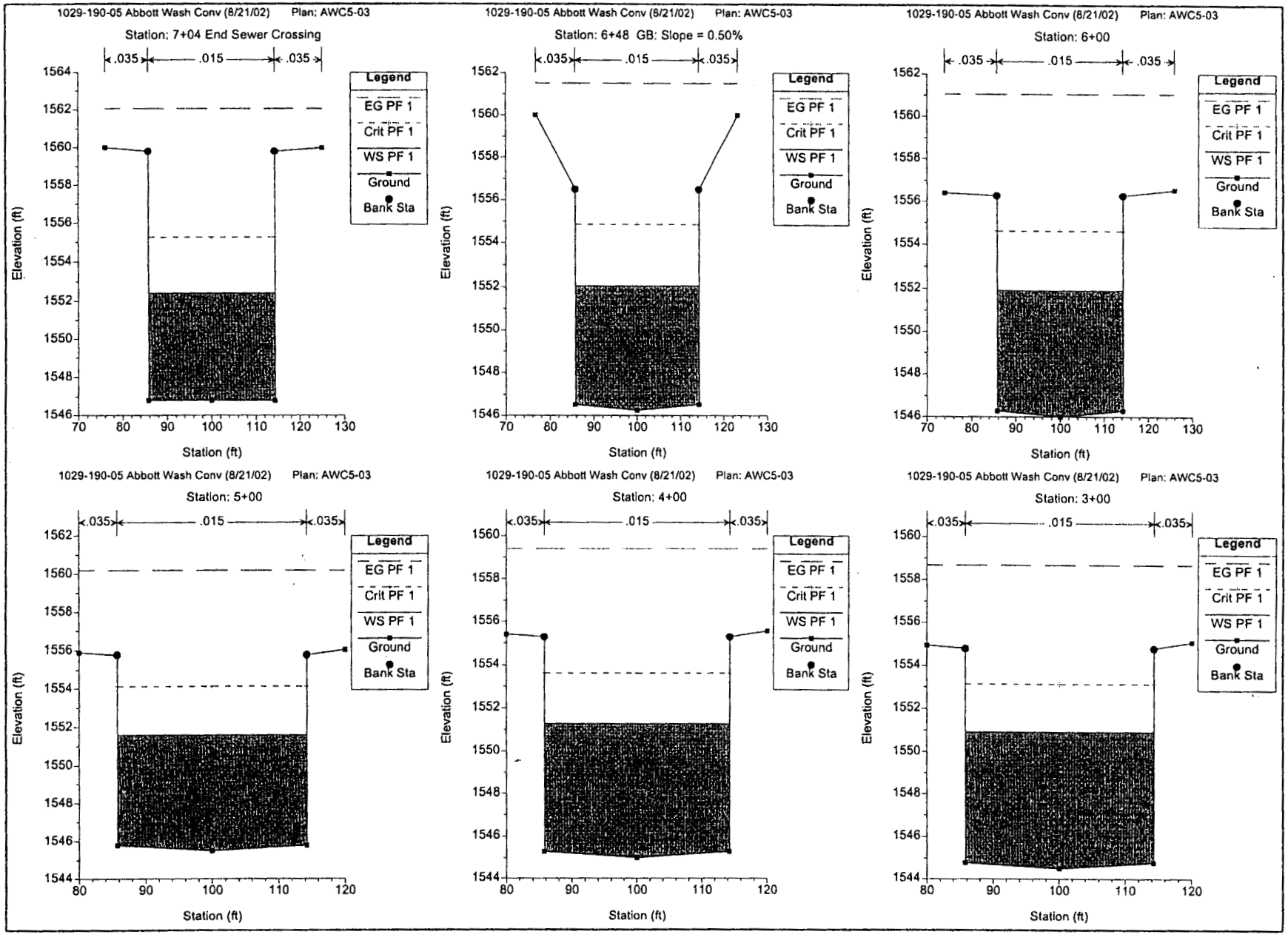
Errors Warnings and Notes for Plan : AWC5-03 (Continued)

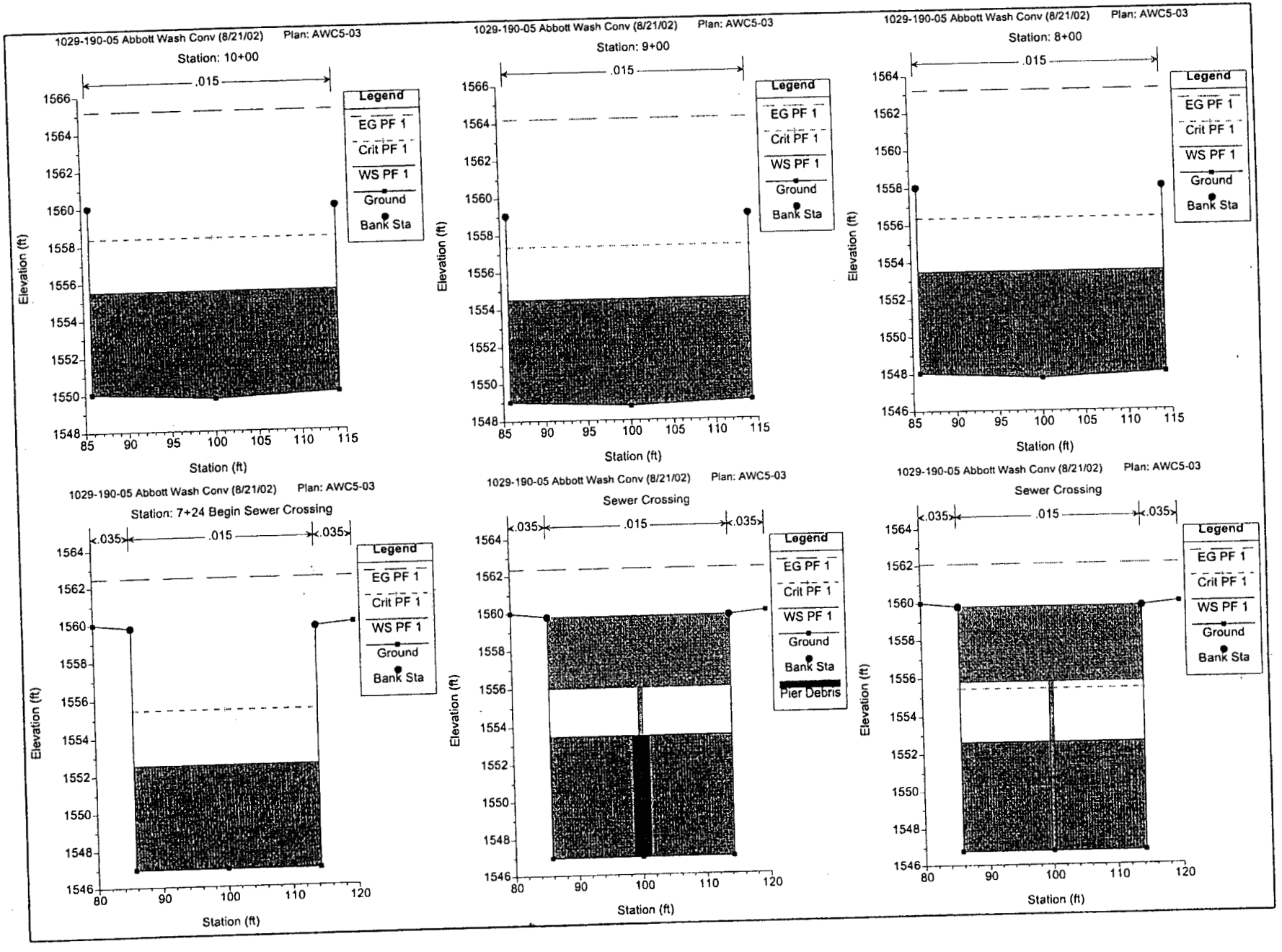
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Location:	River: Abbott Wash Reach: AW RS: 215 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional 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:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy
	was used.
Location:	River: Abbott Wash Reach: AW RS: 214 Profile: PF 1
Warning:	The program cannot perform supercritical flow through an inline weir. The program sets the water
	surface to critical depth at the downstream cross section and continues on.

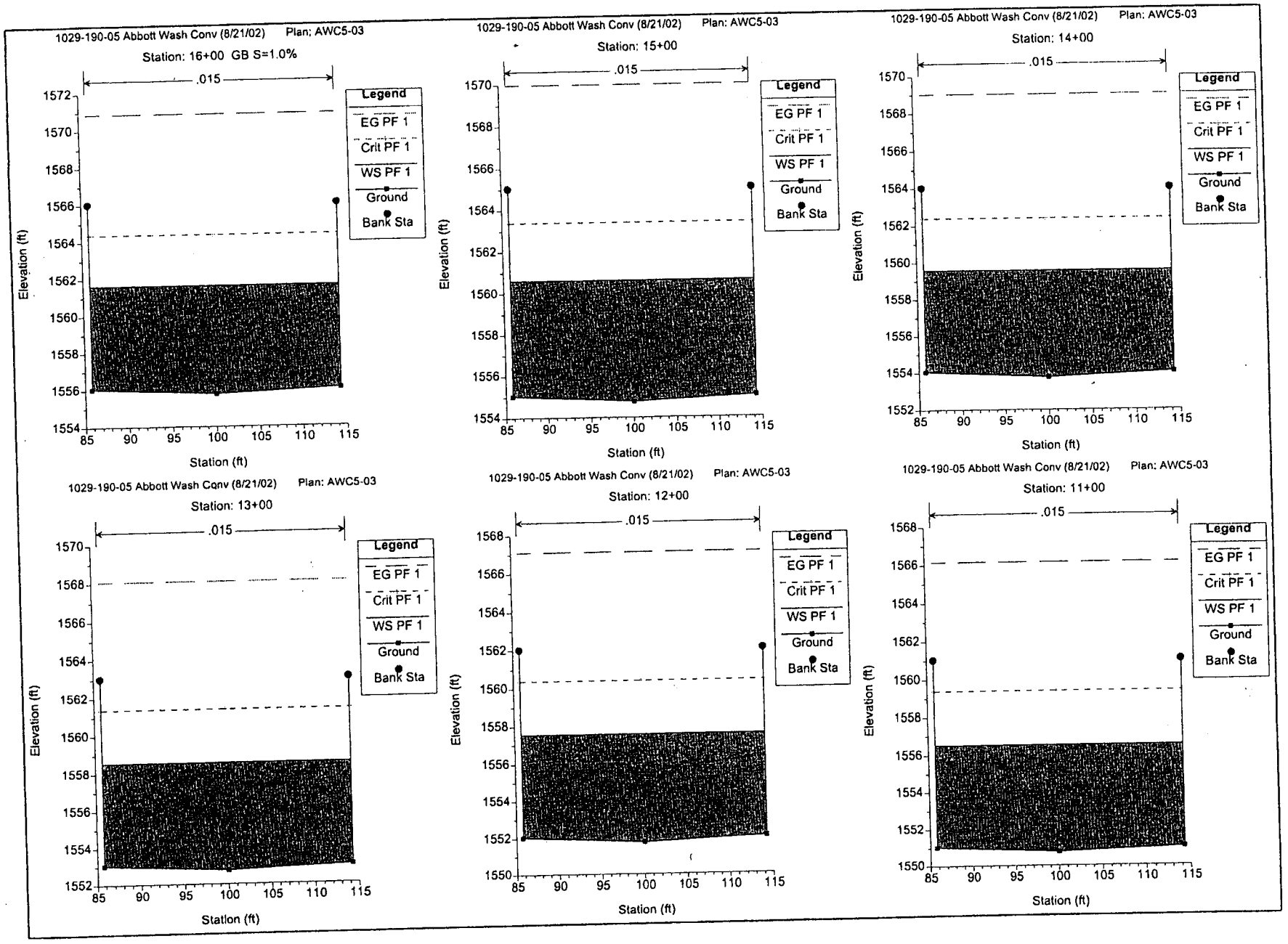

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
AW
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
1640
1620
1600
1580
1560
1540
0
2000
4000
6000
8000
10000
Main Channel Distance (ft)

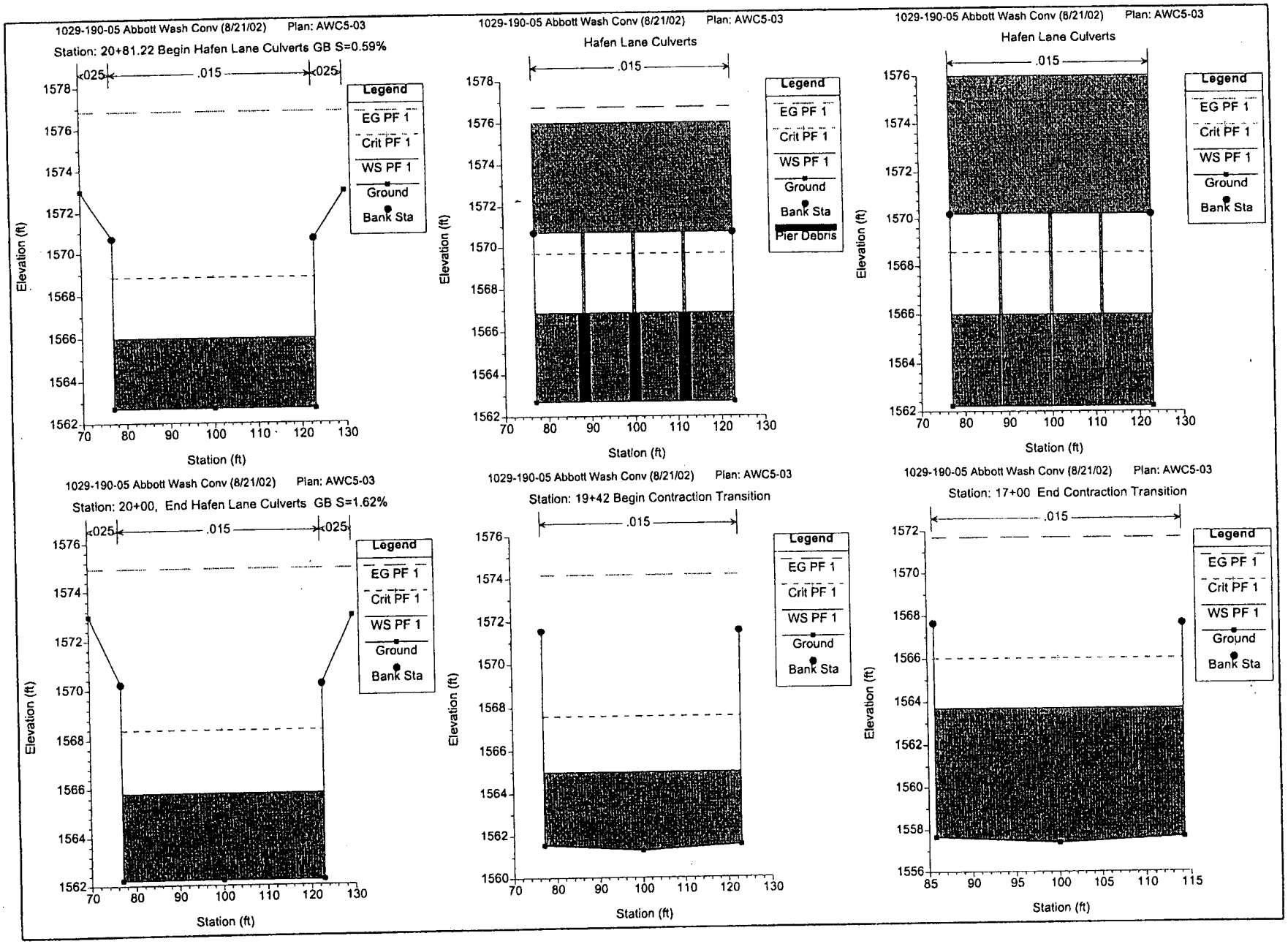

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 1+63 (End of 4:1 Flow Expansion)
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 1+13 End of Improvements, Tie to Virgin River
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

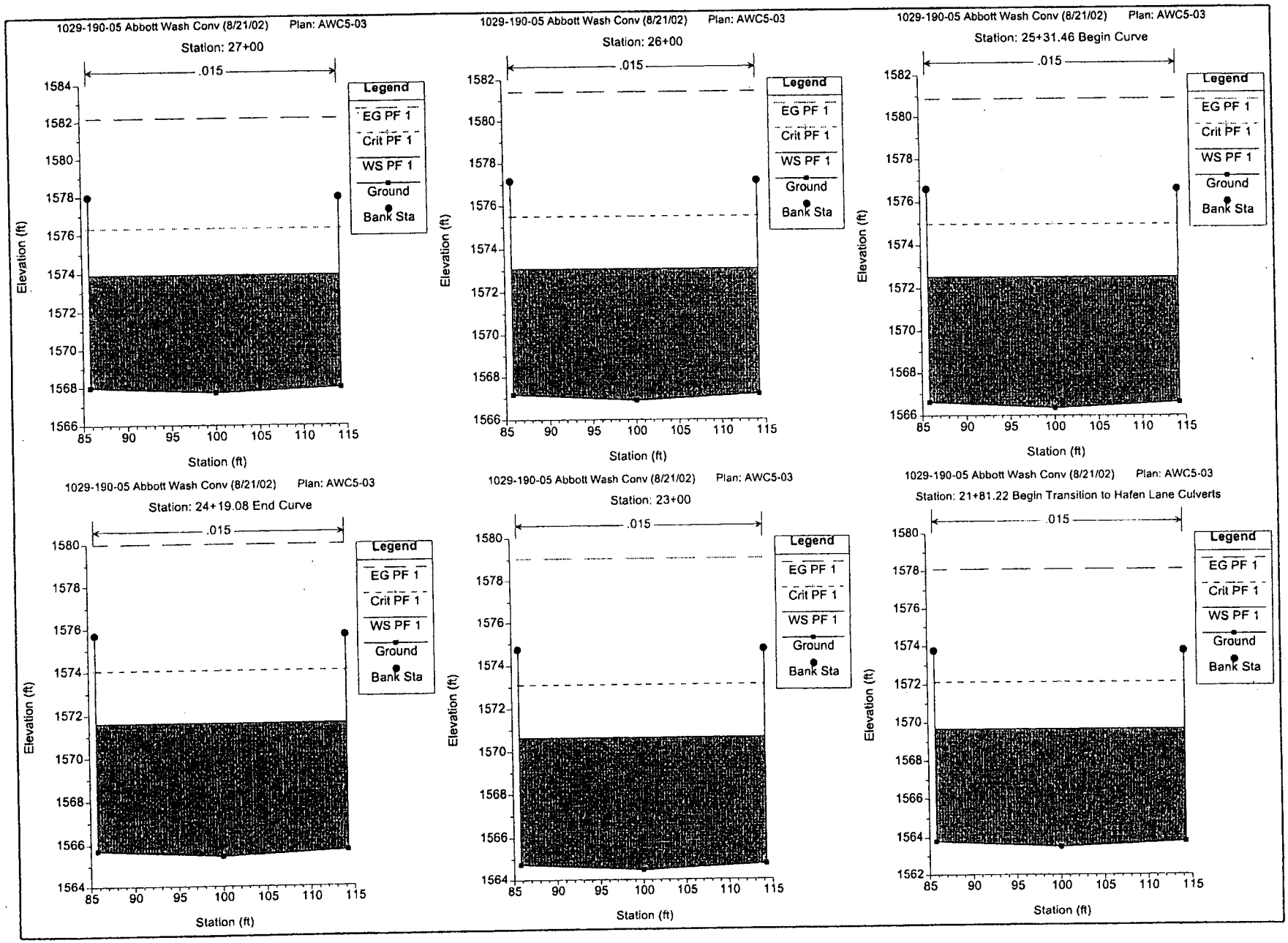

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 2+25 End of Concrete Channel
.035
.015
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 2+15
.02
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
First Row of Engergy Dissipator Blocks
.02
Legend
EG PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 2+02
.02
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Second Row of Energy Dissipator Blocks
.02
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 1+99 (Grade Break, End of Energy Dissipator Blocks)
.02
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

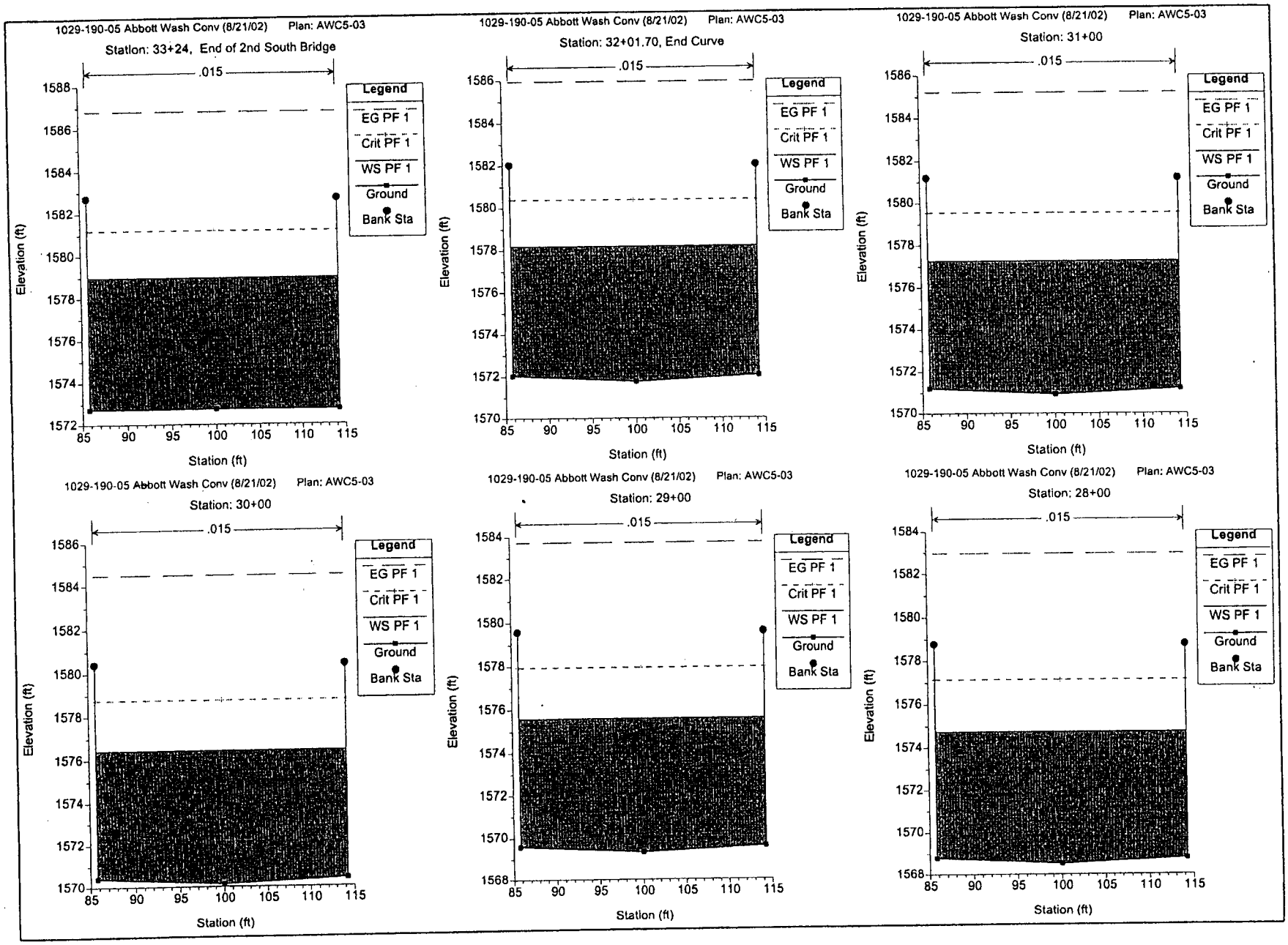

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 7+04 End Sewer Crossing
.035
.015
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 6+48 GB: Slope = 0.50%
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 6+00
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 5+00
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 4+00
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 3+00

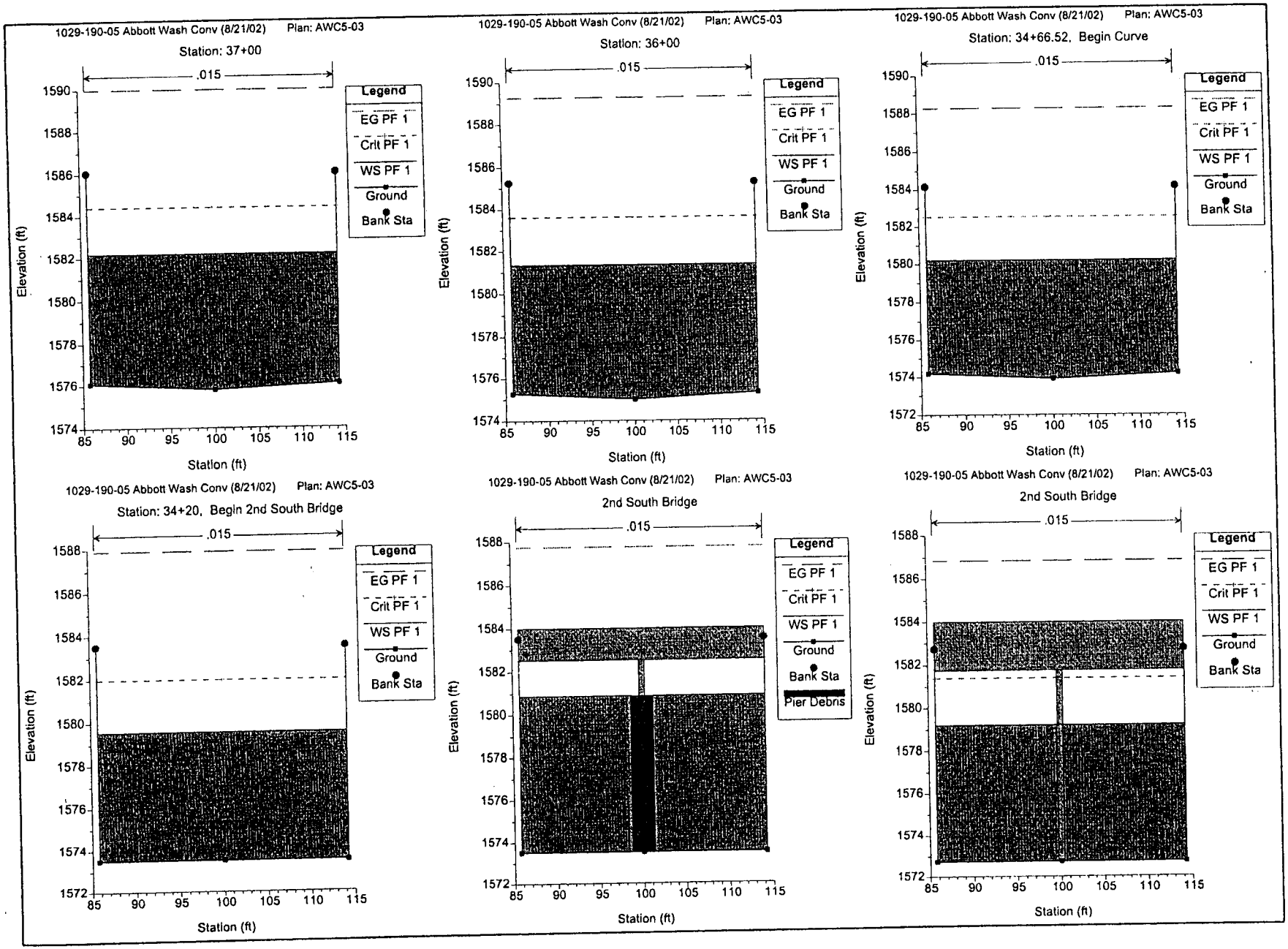

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 10+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 9+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 8+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 7+24 Begin Sewer Crossing
.035
.015
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Sewer Crossing
.035
.015
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Sewer Crossing
.035
.015
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

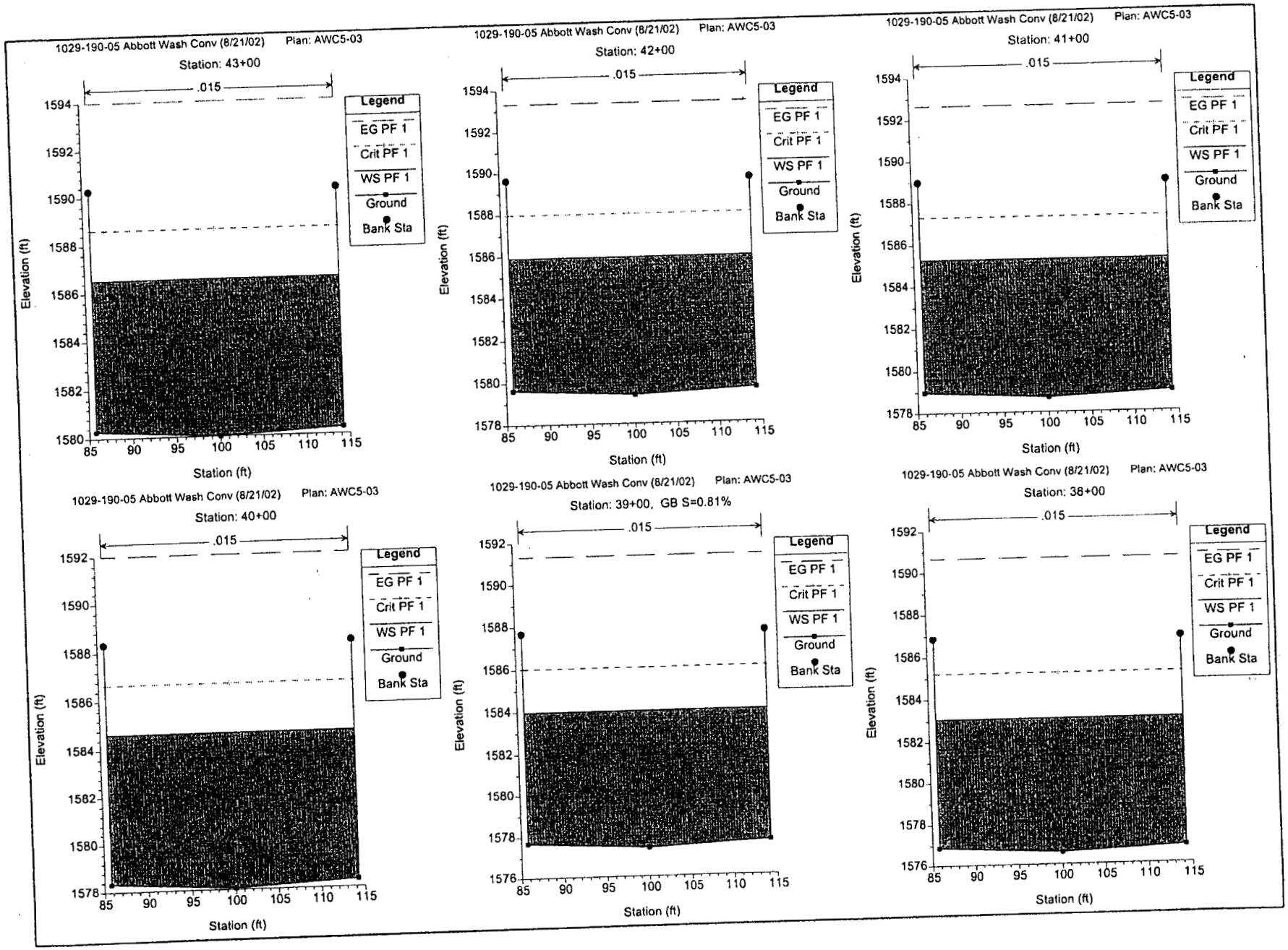

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 16+00 GB S=1.0%
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 15+00
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 14+00
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 13+00
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 12+00
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 11+00

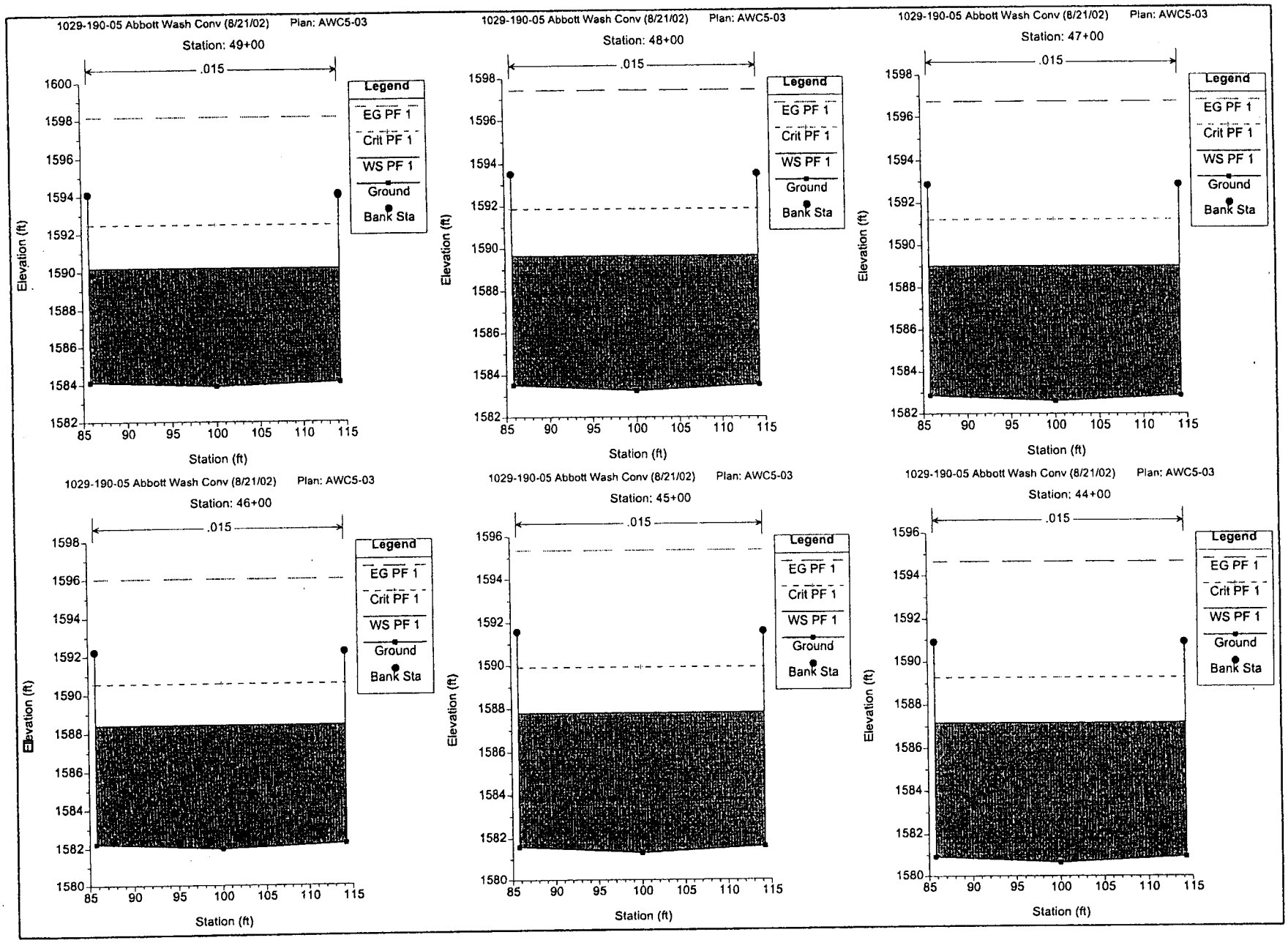

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 20+81.22 Begin Hafen Lane Culverts GB S=0.59%
.025
.015
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Hafen Lane Culverts
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Hafen Lane Culverts
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 20+00, End Hafen Lane Culverts GB S=1.62%
.025
.015
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 19+42 Begin Contraction Transition
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 17+00 End Contraction Transition
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

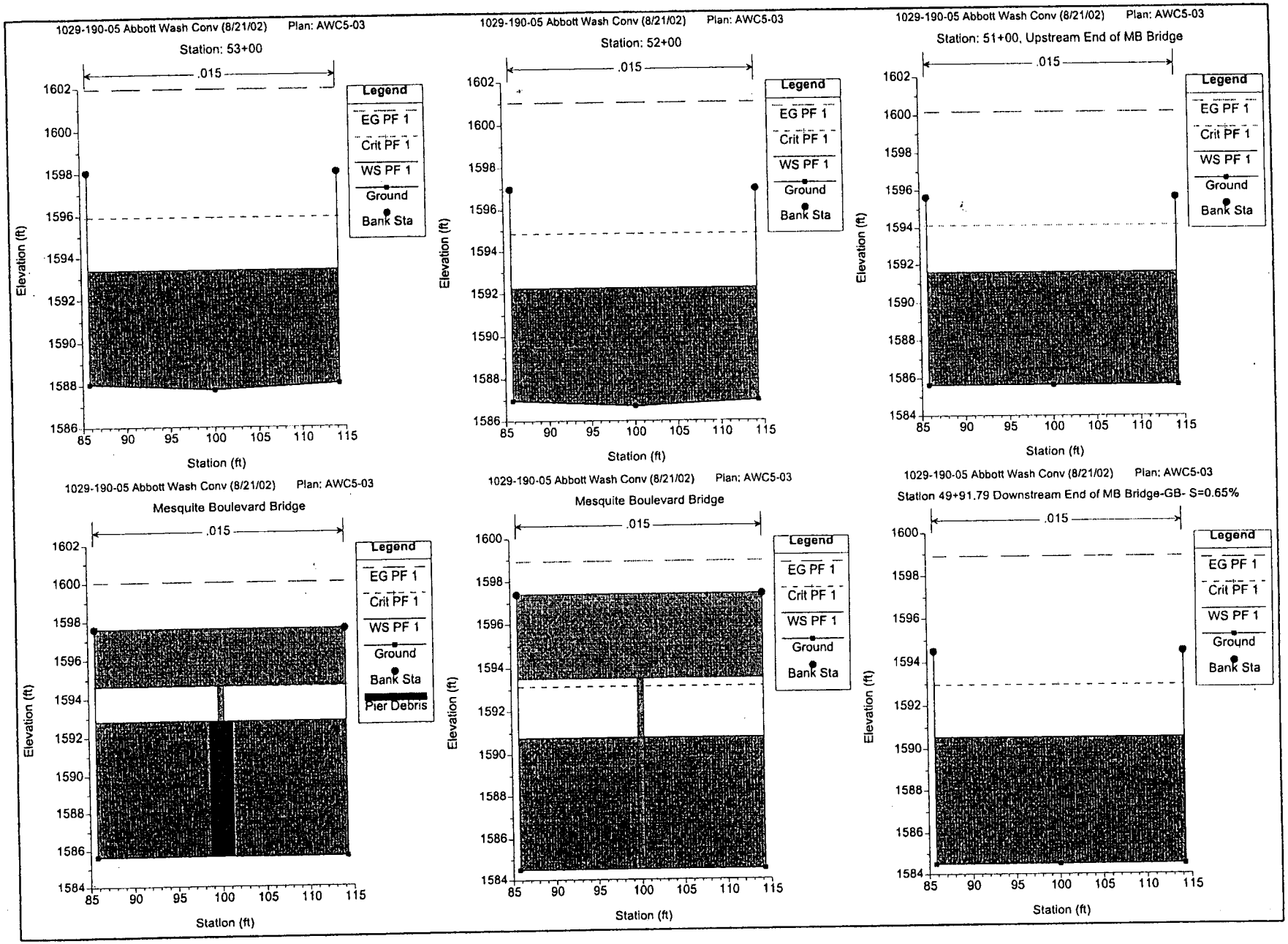

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 27+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 26+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 25+31.46 Begin Curve
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 24+19.08 End Curve
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 23+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 21+81.22 Begin Transition to Hafen Lane Culverts
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

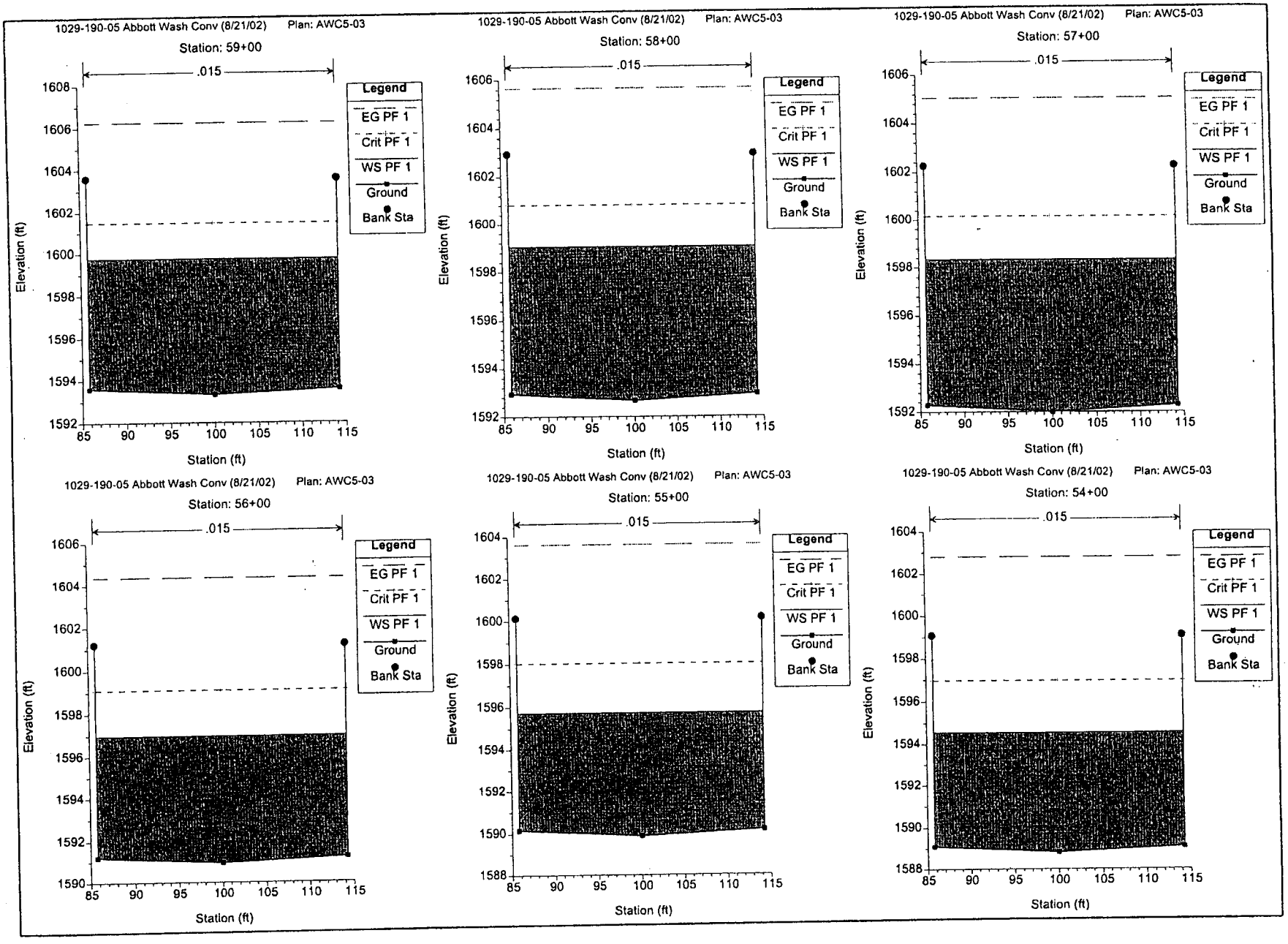

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 33+24, End of 2nd South Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 32+01.70, End Curve
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 31+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 30+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 29+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 28+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

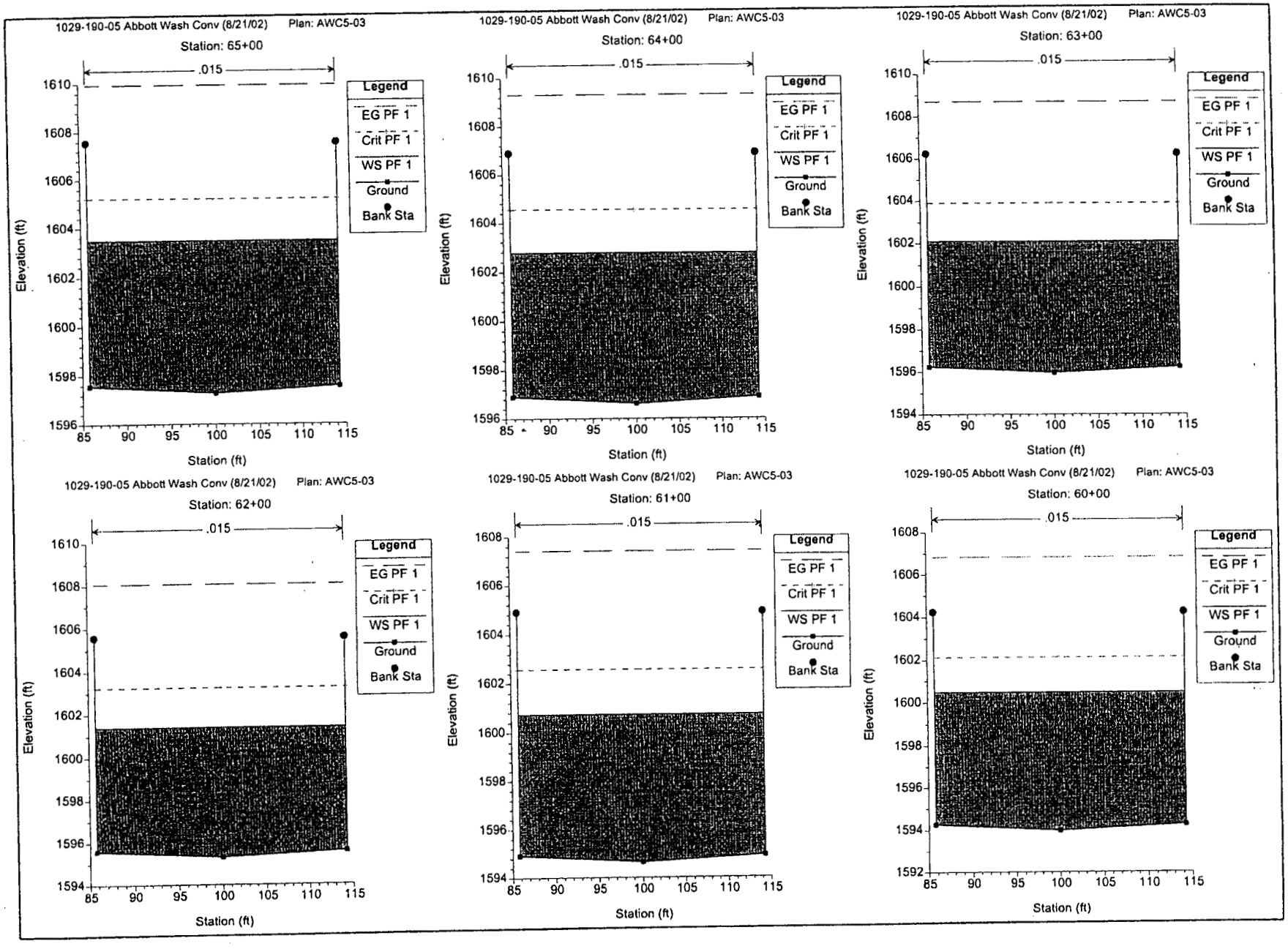

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 37+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 36+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 34+66.52, Begin Curve
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 34+20, Begin 2nd South Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
2nd South Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
2nd South Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

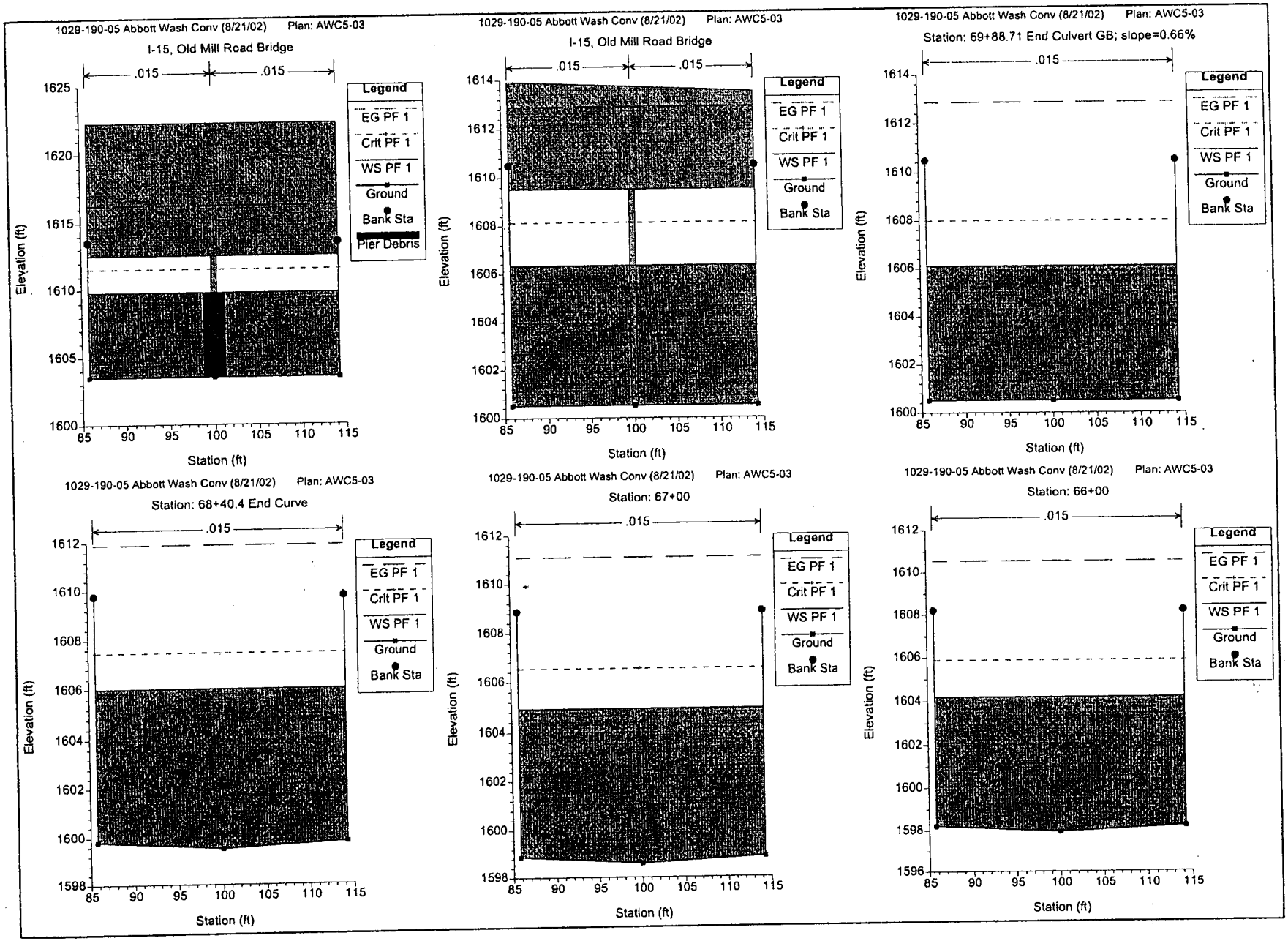

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 43+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 42+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 41+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 40+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 39+00, GB S=0.81%
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 38+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

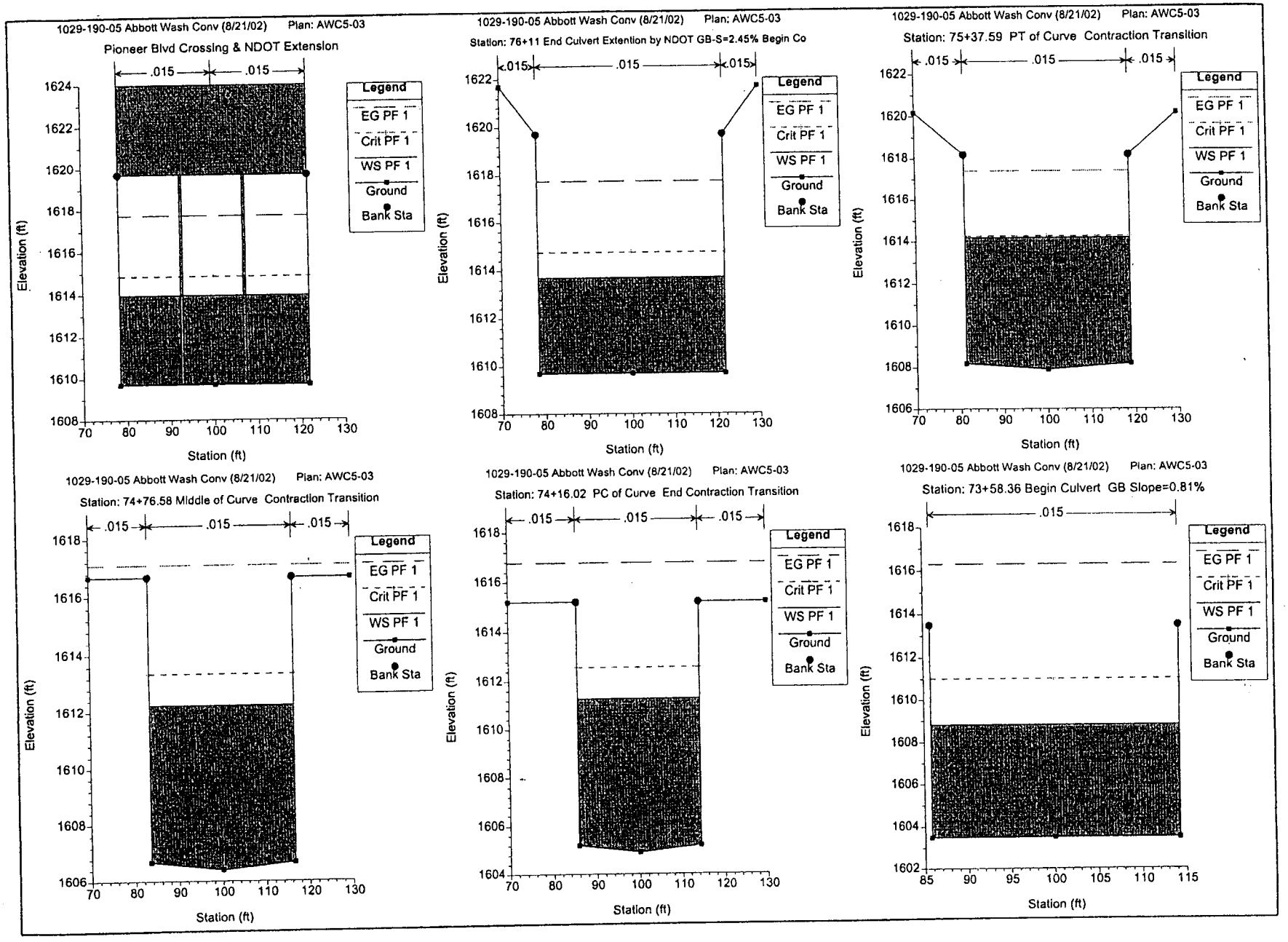

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 49+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 48+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 47+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 46+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 45+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 44+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

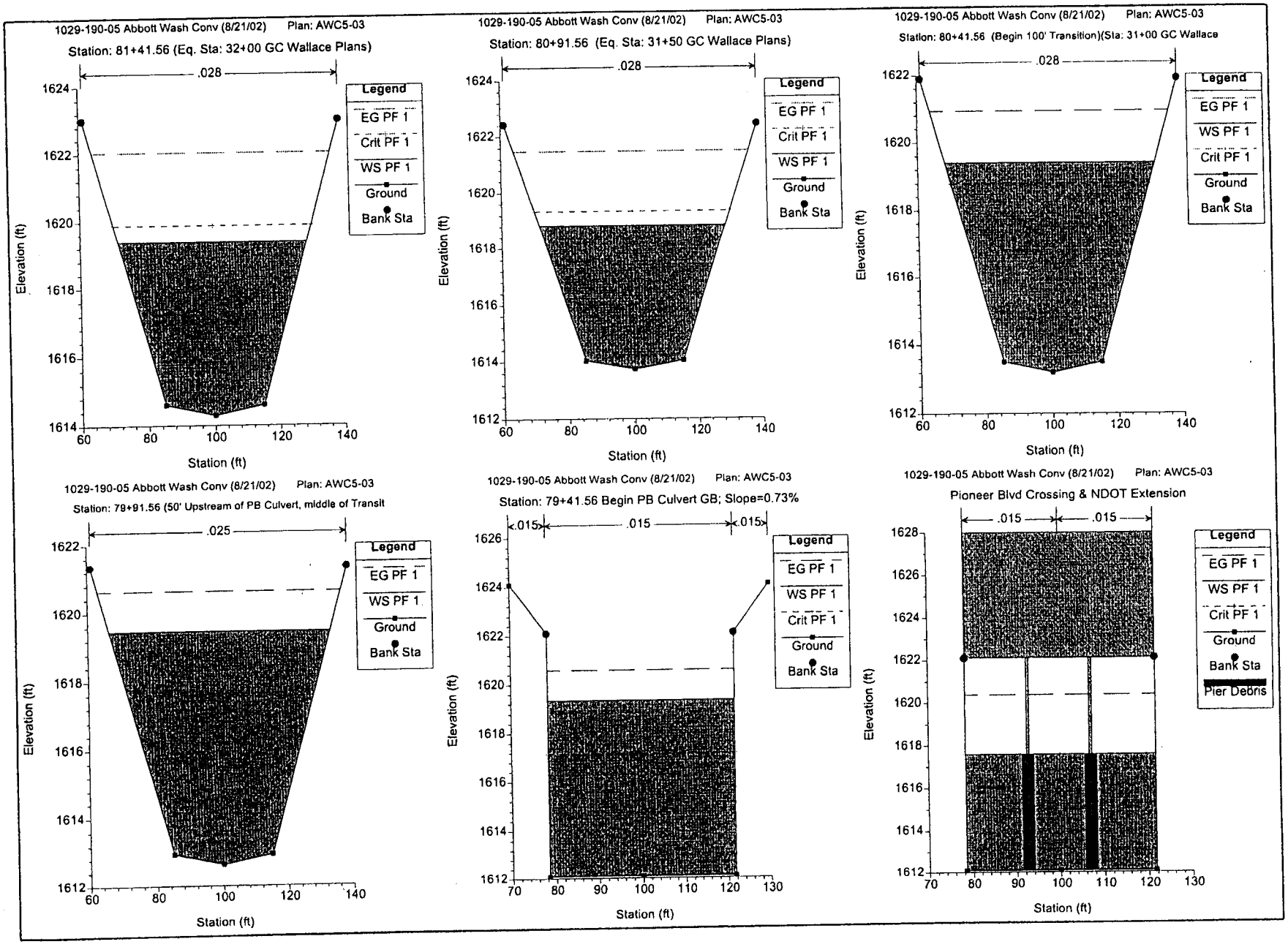

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 53+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 52+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 51+00, Upstream End of MB Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Mesquite Boulevard Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Mesquite Boulevard Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station 49+91.79 Downstream End of MB Bridge-GB- S=0.65%
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

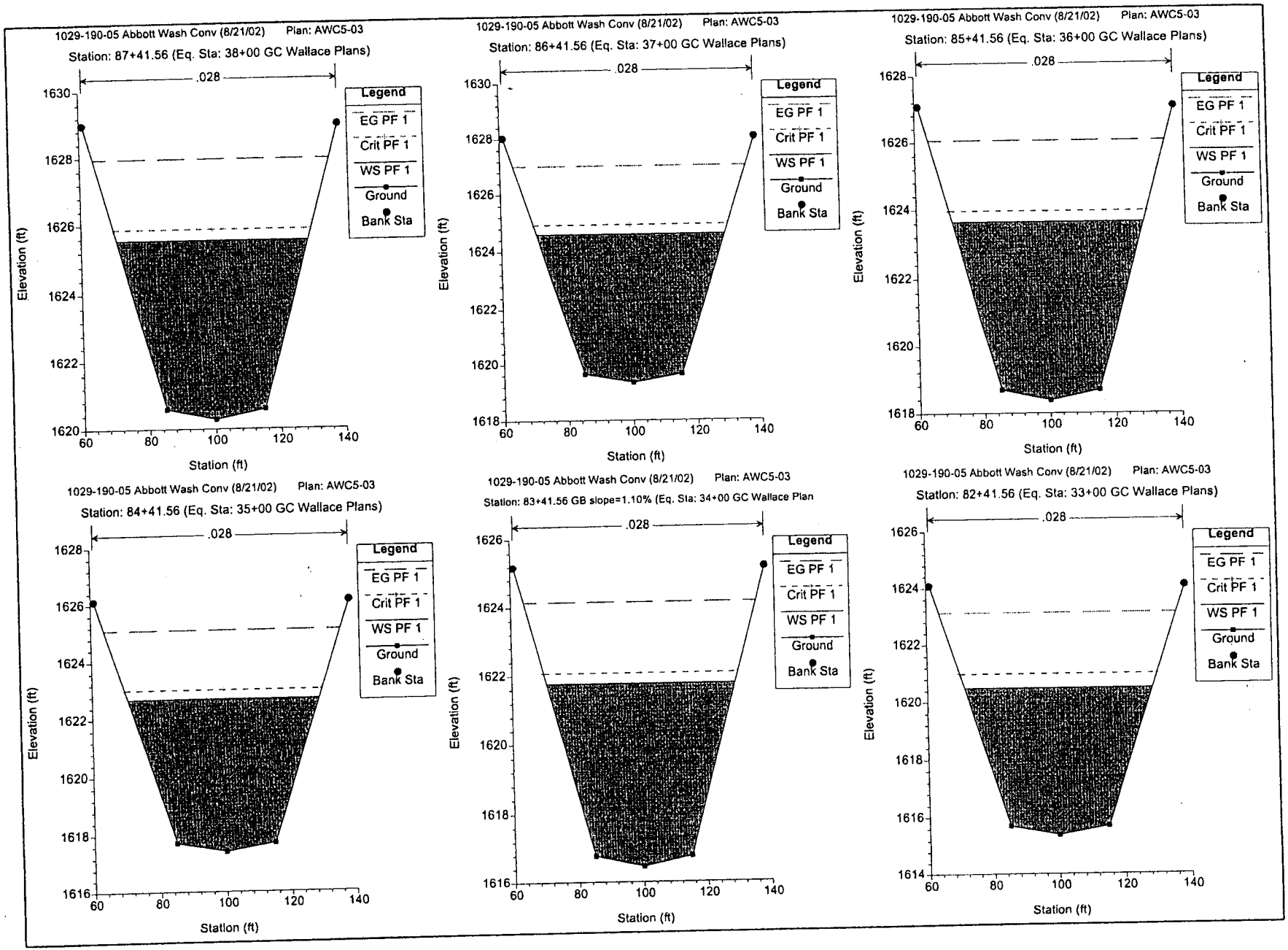

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 59+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 58+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 57+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 56+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 55+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 54+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 65+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 64+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 63+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 62+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 61+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 60+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
I-15, Old Mill Road Bridge
.015
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
I-15, Old Mill Road Bridge
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 69+88.71 End Culvert GB; slope=0.66%
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 68+40.4 End Curve
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 67+00
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 66+00


1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Pioneer Blvd Crossing & NDOT Extension
Station: 76+11 End Culvert Extention by NDOT GB-S=2.45% Begin Co
Station: 75+37.59 PT of Curve Contraction Transition
Station: 74+76.58 Middle of Curve Contraction Transition
Station: 74+16.02 PC of Curve End Contraction Transition
Station: 73+58.36 Begin Culvert GB Slope=0.81%
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 81+41.56 (Eq. Sta: 32+00 GC Wallace Plans)
.028
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 80+91.56 (Eq. Sta: 31+50 GC Wallace Plans)
.028
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 80+41.56 (Begin 100' Transition)(Sta: 31+00 GC Wallace
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 79+91.56 (50' Upstream of PB Culvert, middle of Transit
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 79+41.56 Begin PB Culvert GB; Slope=0.73%
.015
.015
.015
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Pioneer Blvd Crossing & NDOT Extension
.015
.015
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)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Station: 87+41.56 (Eq. Sta: 38+00 GC Wallace Plans)
.028
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 86+41.56 (Eq. Sta: 37+00 GC Wallace Plans)
.028
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 85+41.56 (Eq. Sta: 36+00 GC Wallace Plans)
.028
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 84+41.56 (Eq. Sta: 35+00 GC Wallace Plans)
.028
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 83+41.56 GB slope=1.10% (Eq. Sta: 34+00 GC Wallace Plan
.028
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03
Station: 82+41.56 (Eq. Sta: 33+00 GC Wallace Plans)
.028
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

ABBOTT WASH CONVEYANCE PROJECT
I-15 TO VIRGIN RIVER
HYDRAULIC REVIEW OF CHANNEL ALIGNMENT & GEOMETRY

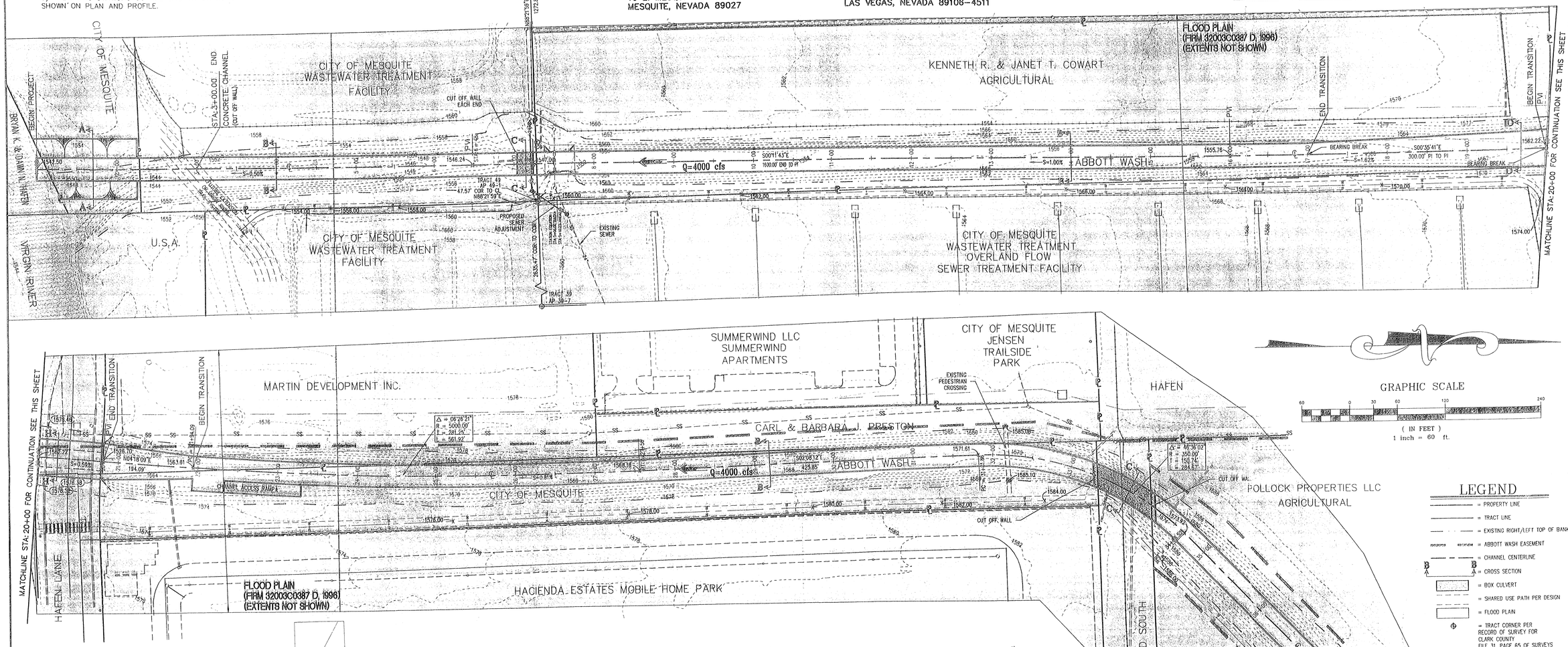
NOTES:
1) FINAL IMPROVEMENTS SHALL IDENTIFY EXISTING DRAINAGE STRUCTURES, SIZE, SHAPE AND LOCATION DIRECTED INTO ABBOTT WASH.
2) REFER TO FIGURE 710 IN SECTION 700 OF CCRFCD MANUAL FOR TYPICAL CHANNEL ACCESS RAMP.
3) HEC-RAS STATIONS CORRESPOND TO STATIONS SHOWN ON PLAN AND PROFILE.

COMPLETED FOR:
THE CITY OF MESQUITE
10 E. MESQUITE BLVD
MESQUITE, NEVADA 89027

IN CONJUNCTION WITH:
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
600 S. GRAND CENTRAL PARKWAY STE. 300
LAS VEGAS, NEVADA 89106-4511

INDEX

SHEET 1	PLAN VIEW/DRAINAGE PLAN	STA: 1+00.00 TO 40+50.00
SHEET 2	PLAN VIEW/DRAINAGE PLAN	STA: 40+50.00 TO 79+41.06
SHEET 3	PROFILE VIEW	STA: 1+00.00 TO 79+41.06



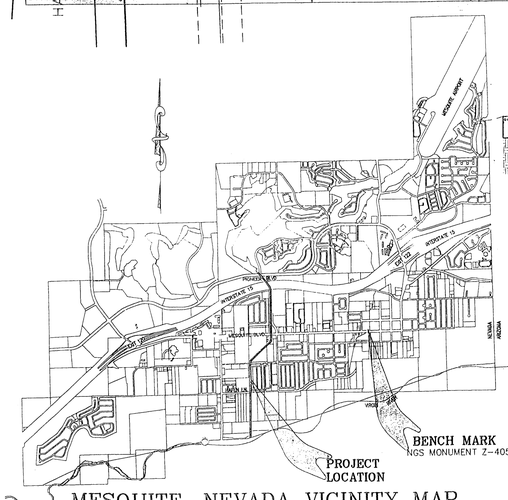
GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

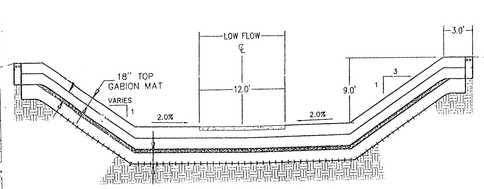
LEGEND

- = PROPERTY LINE
- = TRACT LINE
- = EXISTING RIGHT/LEFT TOP OF BANK
- = ABBOTT WASH EASEMENT
- = CHANNEL CENTERLINE
- = CROSS SECTION
- = BOX CULVERT
- = SHARED USE PATH PER DESIGN
- = FLOOD PLAIN
- = TRACT CORNER PER RECORD OF SURVEY FOR CLARK COUNTY FILE 31, PAGE 65 OF SURVEYS
- FL OF BOX 1547.00 = SPOT ELEVATIONS
- = EXISTING STORM DRAIN
- Q=3520 cfs = FLOW INCREASED

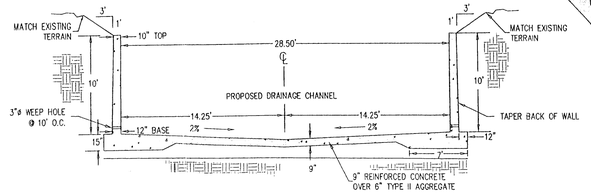


MESQUITE, NEVADA VICINITY MAP

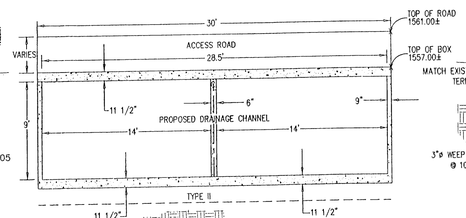
NO SCALE
BENCH MARK BASED ON NGVD 1929, NGS MONUMENT Z-405
ELEV. = 1595.65
TOP OF STAINLESS STEEL ROD IN CASING SET BELOW GROUND AT SOUTHEAST CORNER OF LDS CHURCH PROPERTY, NORTH SIDE OF MESQUITE BOULEVARD, WEST SIDE OF TOWN WASH.



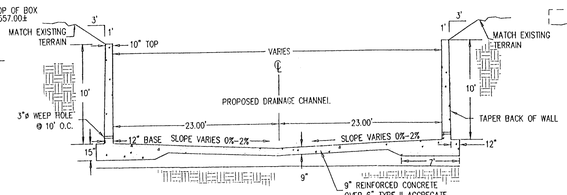
SECTION A-A
NOT TO SCALE



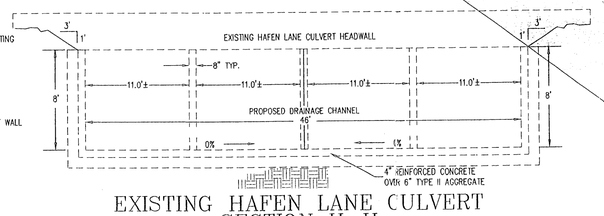
SECTION B-B
NOT TO SCALE



DUAL 14' WIDE BY 9' TALL BOX CULVERT
SECTION C-C
NOT TO SCALE



SECTION D-D
NOT TO SCALE



EXISTING HAFEN LANE CULVERT
SECTION H-H
NOT TO SCALE

NO	DESCRIPTION	DATE	BY
	REVISIONS		

BULLOCH BROTHERS ENGINEERING INC.
-CIVIL ENGINEERS-LAND SURVEYORS-
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P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586-9592

ABBOTT WASH CONVEYANCE PROJECT I-15 TO VIRGIN RIVER
FOR
CITY OF MESQUITE
CCRFCD
MESQUITE, NEVADA

SCALE: 1" = 60'
DRAWN BY: B.C.
CHECKED BY: WAN
PROJECT NO: 1029-190-05
DATE: 12-19-2002
SHEET NO: 1 OF 3

PLOT DATE

F:\1029 (City of Mesquite)\1029-190-05 Abbott Wash Conveyance Improvements\ABBOTTWASH-05-21-02\26-PLAN-EXHIBIT.dwg Thu Dec 19 07:23:57 2002 BURTON

ABBOTT WASH CONVEYANCE PROJECT
I-15 TO VIRGIN RIVER
HYDRAULIC REVIEW OF CHANNEL ALIGNMENT & GEOMETRY

COMPLETED FOR:
THE CITY OF MESQUITE
10 E. MESQUITE BLVD
MESQUITE, NEVADA 89027

IN CONJUNCTION WITH:
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
600 S. GRAND CENTRAL PARKWAY STE. 300
LAS VEGAS, NEVADA 89106-4511

INDEX

SHEET 1	PLAN VIEW/DRAINAGE PLAN	STA:1+00.00 TO 40+50.00
SHEET 2	PLAN VIEW/DRAINAGE PLAN	STA:40+50.00 TO 79+41.06
SHEET 3	PROFILE VIEW	STA:1+00.00 TO 79+41.06

LEGEND

- = PROPERTY LINE
- = TRACT LINE
- = EXISTING RIGHT/LEFT TOP OF BANK
- = ABBOTT WASH EASEMENT
- = CHANNEL CENTERLINE
- = CROSS SECTION
- = BOX CULVERT
- = SHARED USE PATH PER DESIGN
- = FLOOD PLAIN
- = TRACT CORNER PER RECORD OF SURVEY FOR CLARK COUNTY FILE 51, PAGE 65 OF SURVEYS
- = SPOT ELEVATIONS
- = EXISTING STORM DRAIN
- Q=3520 cfs = FLOW INCREASED

GRAPHIC SCALE
60 0 30 60 120 240
(IN FEET)
1 inch = 60 ft.

MATCHLINE STA: 40+50.00 FOR CONTINUATION SEE SHEET 1

POLLOCK PROPERTIES LLC AGRICULTURAL

FLOOD PLAIN (FIRM 32003C0387 D, 1998) (EXTENTS NOT SHOWN)

GLEN ALLEN & MICHELE MAE TOBLER

WEST MESQUITE BLVD. (HIGHWAY 91)

TRACT 43 AP 43-1 | TRACT 42 AP 42-4 | TRACT 39 AP 39-6

IRON LOOM RD

Δ = 45°13'01"
R = 500.00'
T = 209.93'
L = 394.50'

DESERT WINDS, 48 LTD

LOZANO FAM. TRST.
GRIFFITH FAM., TRST.

FLOW INCREASE STA:51+00 Q=4000 cfs

ABBOTT WASH

CHANNEL ACCESS RAMP 1

CUT-OFF WALL
EXISTING CULVERT TO BE REMOVED

TRACT 42 AP 42-5

TRACT 33 AP 39-5

CITY OF MESQUITE

DESERT ROSE SUBDIVISION

Q=3670 cfs

LUCERNE MEADOWS LLC

GRAPEVINE ROAD

LUCERNE MEADOWS LLC
MESQUITE BLUFF APARTMENTS

MATCHLINE STA:60+00 FOR CONTINUATION SEE THIS SHEET

FLOOD PLAIN (FIRM 32003C0387 D, 1998) (EXTENTS NOT SHOWN)

SECTION B-B
NOT TO SCALE

MATCH EXISTING TERRAIN | 10" TOP | 28.50' | PROPOSED DRAINAGE CHANNEL | 14.25' | 2% | 12" BASE | 9" REINFORCED CONCRETE OVER 6" TYPE II AGGREGATE | TAPER BACK OF WALL | 3'ø WEEP HOLE @ 10' O.C.

EXISTING PIONEER BOULEVARD CULVERT AND NDOT EXTENSION SECTION P-P
NOT TO SCALE

PROPOSED DRAINAGE CHANNEL | 43.34' | 8" TYP. | 11 ½" REINFORCED CONCRETE OVER 6" TYPE II AGGREGATE

DUAL 14' WIDE BY 9' TALL BOX CULVERT SECTION I-I
NOT TO SCALE

INTERSTATE 15 AND OLD MILL ROAD | 28.5' | PROPOSED DRAINAGE CHANNEL | EXISTING 12' X 8' BOX CULVERT | PEDESTRIAN ACCESS | TYPE II | STA:7+08.20 TO STA:73+58.36

DUAL 14' WIDE BY 9' TALL BOX CULVERT SECTION M-M
NOT TO SCALE

MESQUITE BOULEVARD | 28.5' | PEDESTRIAN ACCESS | 24" TYPE II @ 95%

NOTES:
1) FINAL IMPROVEMENTS SHALL IDENTIFY EXISTING DRAINAGE STRUCTURES, SIZE, SHAPE AND LOCATION DIRECTED INTO ABBOTT WASH.
2) REFER TO FIGURE 710 IN SECTION 700 OF CCRFCD MANUAL FOR TYPICAL CHANNEL ACCESS RAMP.
3) HEC-RAS STATIONS CORRESPOND TO STATIONS SHOWN ON PLAN AND PROFILE.

PIONEER BLVD.

BEGIN TRANSITION | END PROJECT | 200' CULVERT EXTENSION BY NDOT | NDOT ROW | IRON LOOM RD | EXISTING CULVERT | CUT OFF WALL | END TRANSITION | PROJECT TIE

TRACT 41 AP 41-2 | TRACT 41 AP 41-1 | TRACT LINE

FLOOD PLAIN (FIRM 32003C0387 D, 1998) (EXTENTS NOT SHOWN)

OLD MILL ROAD | NORTH INTERSTATE 15 | SOUTH INTERSTATE 15 | NDOT ROW

CITY OF MESQUITE | DESERT ROSE SUBDIVISION | IRRIGATION CROSSING AND DITCHES HAVE BEEN REMOVED | CUT OFF WALL | ABBOTT WASH | Q=3520 cfs | MATCHLINE STA:60+00 FOR CONTINUATION SEE THIS SHEET

LUCERNE MEADOWS LLC AGRICULTURAL

TRACT 42 AP 42-1 | TRACT 41 AP 41-4 | TRACT 39 AP 39-4 | TRACT 41 AP 41-3

GRAPHIC SCALE
60 0 30 60 120 240
(IN FEET)
1 inch = 60 ft.

MESQUITE, NEVADA VICINITY MAP

PROJECT LOCATION | BENCH MARK NGS MONUMENT Z-405

NO SCALE
BENCH MARK BASED ON NGVD 1929, NGS MONUMENT Z-405
ELEV. = 1595.65
TOP OF STAINLESS STEEL ROD IN CASING SET BELOW GROUND AT SOUTHEAST CORNER OF LDS CHURCH PROPERTY, NORTH SIDE OF MESQUITE BOULEVARD, WEST SIDE OF TOWN WASH.

REVISIONS		
NO	DESCRIPTION	DATE	BY

THESE PLANS ARE THE PROPERTY OF BULLOCH BROTHERS ENGINEERING INC. AND ARE NOT TO BE USED IN WHOLE OR IN PART FOR ANY PROJECT OTHER THAN THE ONE FOR WHICH THEY WERE PREPARED. ANY REUSE WITHOUT WRITTEN PERMISSION AND ADJUSTMENT BY BULLOCH BROTHERS ENGINEERING INC. FOR THE SPECIFIC PURPOSE INTENDED WILL BE AT THE USER'S SOLE RISK AND WITHOUT LIABILITY TO BULLOCH BROTHERS ENGINEERING INC. THE USER AGREES TO DEFEND, INDEMNIFY AND HOLD BULLOCH BROTHERS ENGINEERING INC. HARMLESS FROM ALL CLAIMS, DAMAGES AND EXPENSES ARISING OUT OF SUCH REUSE BY THE USER OR BY PERSONS OR ENTITIES ACQUIRING THE PLANS FROM THE USER.

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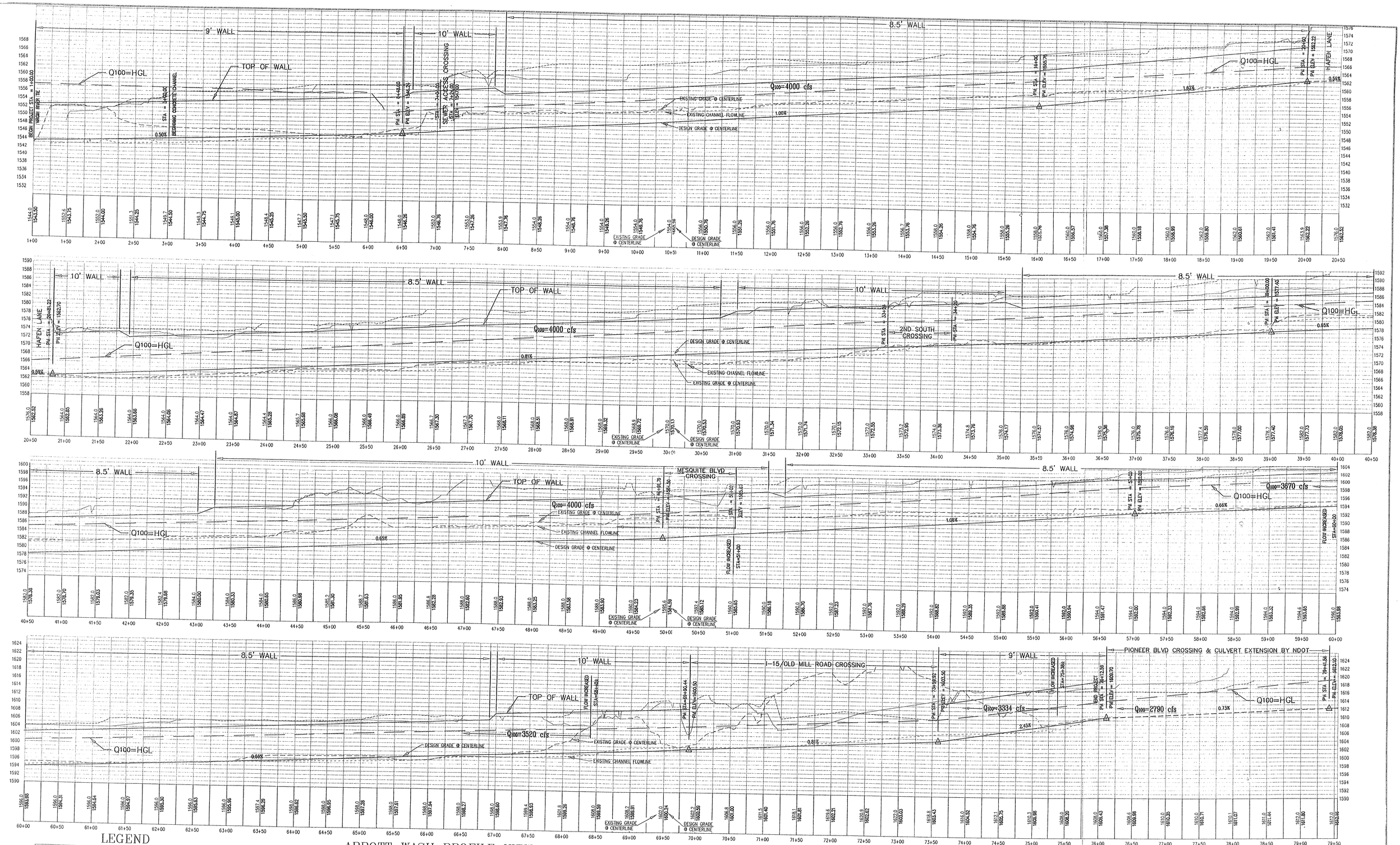
ST. GEORGE, UTAH 84770
(435) 628-4700
P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586-9592

ESTON L. WHITNEY
12-19-02
Exp. 12-31-03

ABBOTT WASH CONVEYANCE
PROJECT - I-15 TO VIRGIN RIVER
FOR
CITY OF MESQUITE
CCRFCD
MESQUITE, NEVADA

SCALE	DRAWN BY	CHECKED BY
1" = 60'	B.C.	W.N.
PROJECT NO.	DATE	SHEET NO.
1029-190-05	12-19-2002	2 OF 3

F:\1029 (City of Mesquite)\1029-190-05 Abbott Wash Conveyance Improvements\ABBOTWASH-05-21-02\05-PLAN-EXHIBIT.dwg Thu Dec 19 07:32:50 2002 BURTON



LEGEND

- EXISTING CHANNEL FLOWLINE
- EXISTING GRADE @ CENTERLINE
- DESIGN GRADE @ CENTERLINE
- EXISTING TOP OF BANK - LEFT
- EXISTING TOP OF BANK - RIGHT

INDEX

SHEET 1	PLAN VIEW/DRAINAGE PLAN	STA: 1+00.00 TO 40+50.00
SHEET 2	PLAN VIEW/DRAINAGE PLAN	STA: 40+50.00 TO 79+41.06
SHEET 3	PROFILE VIEW	STA: 1+00.00 TO 79+41.06

12/19/2002

ABBOTT WASH PROFILE VIEW

STA: 1+00.00 TO 79+41.56
SCALE HOR: 1"=60'
SCALE VER: 1"=10'

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

ABBOTT WASH CONVEYANCE PROJECT
I-15 TO VIRGIN RIVER
HYDRAULIC REVIEW OF CHANNEL ALIGNMENT & GEOMETRY
PROFILE VIEW: SHEET 3

COMPLETED FOR:
THE CITY OF MESQUITE
10 E. MESQUITE BLVD
MESQUITE, NEVADA 89027

IN CONJUNCTION WITH:
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
600 S. GRAND CENTRAL PARKWAY STE. 300
LAS VEGAS, NEVADA 89106-4511

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS—LAND SURVEYORS—
LAND PLANNERS

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(435) 628-4700

561 W MESQUITE BLVD, STE 4
MESQUITE, NEVADA 89027
(702) 346-5101

12-19-02
Exp 12-31-03

Last Saved by: Administrator (10:23:10 AM) Added: 10:23:10 AM Thu Dec 19 09:37:41 2002 BURTON

ABBOTT WASH SCOUR ANALYSIS

Bulloch Brothers Engineering, Inc.

Scour / Geomorphic Discussion:

Proposed channel includes continuously reinforced lining, Reinforced Box Culverts, and Gabions. This type of channel construction acts as a countermeasure against scour. Scour Calculations are typically required for unlined or natural channels. However, some local scour calculations have been included for information. The continuously reinforced lining has been designed per CCRFCD criteria. Calculations are included in Appendix E. According to District criteria, a 3-foot cut-off wall is required at all expansion joints. These have been provided. Please refer to the Improvement Plans.

The concrete lining for the proposed channel ends approximately 125-ft. north of the Virgin River. Gabions were utilized in this stretch to protect against scour. We believe the Gabions will conform to long term Geomorphic changes. Sheet 3 of 24 of the Improvement Plans indicate how the Gabions are designed to prevent Geomorphic changes at the Abbott Wash / Virgin River confluence. A scour apron extends into the Virgin River to protect the natural river from scour due to Abbott Wash runoff.

A study completed by the U.S. Department of Interior, U.S. Geological Survey, was completed for the stretch of the Virgin River. The title of this report is "*Estimates of Bridge Scour at Two Sites on the Virgin River, Southeastern Nevada, Using a Sediment-Transport Model and Historical Geomorphic Data*" (Water-Resources Investigation Report 97-4073). This report studies scour effect of the Virgin River at the Mesquite bridge crossing, and the Riverside bridge crossing. The Virgin River is a natural channel, and the bridges crossing the river have piers which extend into the river bottom. Total scour depths at these bridges were calculated to be 1.5 meters (Approx. 5.0-feet) This type of scour is consistent with scour calculations included with this report.

Total Scour $\Rightarrow Z_t = Z_{lt} + \frac{1}{2}Z_a + Z_{bs} + Z_{cs} + Z_s$

* $Z_{lt} \rightarrow$ N/A, concrete Lined channel. (Degradation)

$Z_a \rightarrow$ N/A, Concrete Lined Channel

$Z_{bs} \rightarrow$ N/A, Concrete lined channel,

Design Radius $\geq 500'$ @ ℄ of channel ∴

$R_c/T \geq 10 \Rightarrow 500/28.5 = 17 \geq 10$ ∴ $Z_{bs} = 0$

$Z_{cs} \rightarrow$ N/A, Concrete lined Channel.

$Z_s \rightarrow$ N/A, Concrete lined Channel, However

Local Scour Calculations included For Information

* Local Scour Countered by Concrete Lining + 3-foot Cut-off below channel Lining

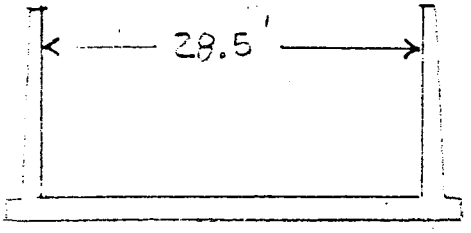
LOCAL SCOUR COMPUTATION LOCATIONS:

	Upstream sta. / Downstream sta.
I-15 / Old Mill Rd.	73+58.36 / 69+88.71
Mesquite Blvd.	51+00 / 49+91.79
2nd South	34+20 / 33+24
Hafen Lane	20+81.22 / 20+00
sewer Crossing	7+24 / 7+04

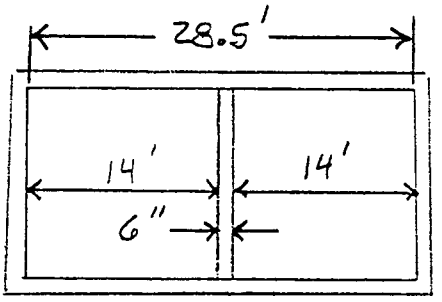
- Local Scour At Abutments

According to FHWA Publication No. FHWA NHI 01-001, May 2001, Hydraulic Engineering Circular No 18, L' = the Portion of the Abutment blocking the Live Flow. Since the Proposed Channel Width matches the Culvert Width and the Flow is Completely Channelized. $\therefore L' = 0$

See Following Pages.



Proposed Channel



Proposed Culverts @ I-15, Mesq. Blvd, 2nd South And Sewer Crossing

Froehlich Equation used to determine local Scour @ Abutments since $L'/Y_1 = 0$ (CCRFCD Manual, pg. 724)

$$Z_{s_{Abutment}} = 2.27(K_1)(K_2)(L')^{0.43}(Y_a)^{0.57}(F_r)^{0.61} + Y_a \leftarrow \text{Eq. 718 CCRFCD}$$

Since $L' = 0$, $Z_{s_{Abutment}} = Y_a$

$\therefore$ Local Scour For Abutments $\underline{\underline{Z_s = Y_a}}$

Y_a = Avg. Depth of Flow @ Approach Section.

Ref. 8 Hydraulic Engineering Circular No. 18, May 200, FHWA

Recent research sponsored by the National Cooperative Highway Research Program of the Transportation Research Board has developed an equation to determine abutment scour that includes the discharge intercepted by an abutment and its approach rather than abutment and approach length.[75] The equation and method are presented in Appendix E. In addition, Maryland State Highway Administration has developed a method to determine scour depths at abutments, which is presented in Appendix F.[41,76] Both methods are under development and show promise of improving abutment scour calculations. They should be used with caution, and use of engineering judgment is needed for application at this time.

Abutment foundations should be designed to be safe from long-term degradation, lateral migration, and contraction scour; and protected from local horizontal and wake vortex scour with riprap and/or guidebanks, dikes, or revetments protected with riprap. The two equations provided in this chapter should be used as guides in the design.

7.2.2 Abutment Scour Parameter Determination

Many of the abutment scour prediction equations presented in the literature use the length of an abutment (embankment) projected normal to flow as an independent variable. In practice, the length of embankment projected normal to flow that is used in these relationships is determined from the results of 1-dimensional hydraulic models such as WSPRO[15] or HEC-RAS.[16,17] These models assume an average velocity over the entire cross section (Figure 7.3a). In reality, conveyance and associated velocity and flow depth at the outer extremes of a floodplain are much less, particularly in wide and shallow heavily vegetated floodplains (Figure 7.3b). This flow is typically referred to as "ineffective" flow. When applying abutment scour equations that use the length of embankment projected normal to flow, it is imperative that the length used be the length of embankment blocking "live" flow.

The length of embankment blocking "live" flow can be determined from a graph of conveyance versus distance across a representative cross-section upstream of the bridge (Figure 7.4). If a relatively large portion of a cross-section is required to convey a known amount of discharge in the floodplain, then the length of embankment blocking this flow should probably not be included when determining the length of embankment for use in the abutment scour prediction relationship. Alternately, if the flow in a significant portion of the cross-section has low velocity and/or is shallow, then the length of embankment blocking this flow should probably not be used either. Both WSPRO[15] and HEC-RAS[16,17] can easily compute conveyance versus distance across a cross section.

For example, Figure 7.4 shows the plan view of an embankment blocking three equal conveyance tubes on the right floodplain at a bridge. Since the right conveyance tube occupies the majority of floodplain but conveys only one-third of the floodplain flow, it should not be included in the "live" flow area for determining L′. In this case the length of embankment, L′, blocking the "live" flow is approximately the length of the two inner conveyance tubes. In the event that the conveyance versus distance graph does not show a conclusive break point between "live" flow and ineffective flow, an alternative procedure is to estimate L′ as the width of the conveyance tube directly upstream of the abutment times the total number of conveyance tubes (including fractional portions) obstructed by the embankment. This length is more representative of the uniform flow conditions in the laboratory experiments used to develop abutment scour equations.

Ref: Hydraulic Engineering Circular No. 18, May 2001

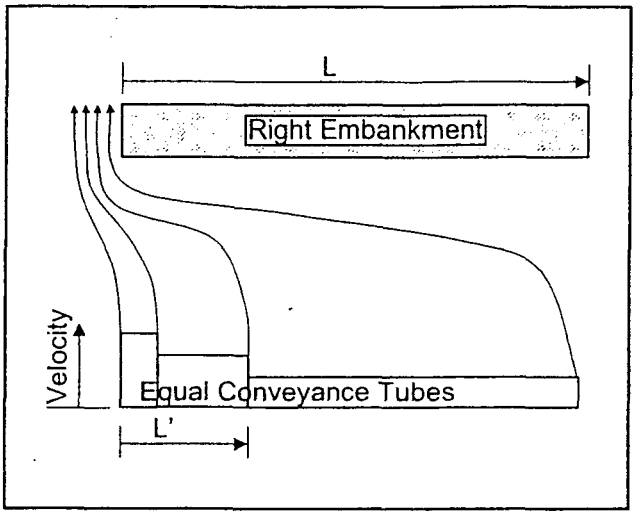


Figure 7.4. Determination of length of embankment blocking live flow for abutment scour estimation.

7.3 ABUTMENT SITE CONDITIONS

Abutments can be set back from the natural stream bank, placed at the bankline or, in some cases, actually set into the channel itself. Common designs include stub abutments placed on spill-through slopes, and vertical wall abutments, with or without wingwalls. Scour at abutments can be live-bed or clear-water scour. The bridge and approach road can cross the stream and floodplain at a skew angle and this will have an effect on flow conditions at the abutment. Finally, there can be varying amounts of overbank flow intercepted by the approaches to the bridge and returned to the stream at the abutment. More severe abutment scour will occur when the majority of overbank flow returns to the bridge opening directly upstream of the bridge crossing. Less severe abutment scour will occur when overbank flows gradually return to the main channel upstream of the bridge crossing.

7.4 ABUTMENT SKEW

The skew angle for an abutment (embankment) is depicted in Figure 7.5. For an abutment angled downstream, the scour depth is decreased, whereas the scour depth is increased for an abutment angled upstream. An equation and guidance for adjusting abutment scour depth for embankment skew are given in Section 7.7.1.

7.5 ABUTMENT SHAPE

There are three general shapes of abutments: (1) spill-through abutments, (2) vertical walls without wing walls, and (3) vertical-wall abutments with wing walls (Figure 7.6). These shapes have varying angles to the flow. As shown in Table 7.1, depth of scour is approximately double for vertical-wall abutments as compared with spill-through abutments. Similarly, scour at vertical wall abutments with wingwalls is reduced to 82 percent of the scour of vertical wall abutments without wingwalls.

REF: FHWA Hydraulic Engineering Circular No. 18, May 2001

In the following sections, two equations are presented for use in estimating scour depths as a guide in designing abutment foundations. The methods can be used for either **clear-water or live-bed** scour.

7.7 LIVE-BED SCOUR AT ABUTMENTS

As a check on the potential depth of scour to aid in the design of the foundation and placement of rock riprap and/or guide banks, Froehlich's[70] live-bed scour equation or the HIRE[22] equation can be used.

7.7.1 Froehlich's Live-Bed Abutment Scour Equation

Froehlich[71] analyzed 170 live-bed scour measurements in laboratory flumes by regression analysis to obtain the following equation:

$$\frac{y_s}{y_a} = 2.27\, K_1\, K_2 \left(\frac{L'}{y_a}\right)^{0.43} Fr^{0.61} + 1 \qquad (7.1)$$

where:

K_1	=	Coefficient for abutment shape (Table 7.1)
K_2	=	Coefficient for angle of embankment to flow
K_2	=	$(\theta/90)^{0.13}$ (see Figure 7.4 for definition of θ) $\theta<90^0$ if embankment points downstream $\theta>90^0$ if embankment points upstream
L'	=	Length of active flow obstructed by the embankment, m (ft)
A_e	=	Flow area of the approach cross section obstructed by the embankment, m^2 (ft^2)
Fr	=	Froude Number of approach flow upstream of the abutment
	=	$V_e/(gy_a)^{1/2}$
V_e	=	Q_e/A_e, m/s (ft/s)
Q_e	=	Flow obstructed by the abutment and approach embankment, m^3/s (ft^3/s)
y_a	=	Average depth of flow on the floodplain (A_e/L), m (ft)
L	=	Length of embankment projected normal to the flow, m (ft)
y_s	=	Scour depth, m (ft)

It should be noted that Equation 7.1 is not consistent with the fact that as L′ tends to 0, y_s also tends to 0. The 1 was added to the equation so as to envelope 98 percent of the data. See Section 7.2.2 and Figure 7.4 for guidance on estimating L′.

7.7.2 HIRE Live-Bed Abutment Scour Equation

An equation based on field data of scour at the end of spurs in the Mississippi River (obtained by the USACE) can also be used for estimating abutment scour.[22] This field situation closely resembles the laboratory experiments for abutment scour in that the discharge intercepted by the spurs was a function of the spur length. The modified equation, referred to herein as the HIRE equation, is applicable when the ratio of projected abutment length (L) to the

Local Scour @ Pier

Utilize Pier Scour Eq. developed By David Froehlich

$$Z_{s\ pier} = 0.32\,\phi\,(a')^{0.62}\,(Y_1)^{0.47}\,(Fr_1)^{0.22}\,d_{50}^{-0.09} + a$$

(Equation 723 in CCRFCD Manual.

According To CCRFCD Manual, "The Pier Scour from This equation is limited To a maximum in the Same Manner as the CSU equation." $Z_s \leq 3.0$ Times pier Width When $Fr_1 > 0.8$

Pier Width = 0.50' $\therefore Z_{s\ pier\ Max} = 3 \times 0.50 = 1.50'$

* $Fr > 1.13$ For entire channel included in design.

Use local Scour Condition which requires most Protection

See table on Following page.

Location	STATION	Abutment Scour (ft.) Z_s Abutment	ϕ	a' (ft)	Y_1 (ft.)	Fr_1	d_{50} (ft.)	Pier Scour (ft) Z_s Pier	Max Pier Scour (ft)	Controlling Scour (ft)
I-15/old Mill Rd (U)	73+58.36	5.28	1.3	0.50	5.28	1.70	0.000853	1.76	1.50	5.28
(D)	69+88.71	5.76			5.76	1.49		1.77	1.50	5.76
Mesquite Blvd. (U)	51+00	5.83			5.83	1.76		1.82	1.50	5.83
(D)	49+91.79	5.93			5.93	1.71		1.83	1.50	5.93
2nd South (U)	34+20	6.06			6.06	1.66		1.83	1.50	6.06
(D)	33+24	6.24			6.24	1.59		1.84	1.50	6.24
Hafen Lane (U)	20+81.22	3.29			3.29	2.57		1.60	1.50	3.29
(D)	20+00	3.61			3.61	2.23		1.62	1.50	3.61
Sewer Access (U)	7+24	5.56			5.56	1.89		1.82	1.50	5.56
(D)	7+04	5.59			5.59	1.87		1.82	1.50	5.59
Upstream	76+11	3.86			3.86	1.50		1.55.	1.50	3.86
Downstream	3+00	**			11.84	0.26		1.71	1.50	**

(U) = Upstream station

(D) = Downstream station

$Y_a = d$ = Avg. depth of Flow at Approach

Z_s pier = Eq. 723 CCRFCD manual

$$= 0.32 \phi (a')^{0.62} (Y_1)^{0.47} (Fr_1)^{0.22} (d_{50})^{-0.09} + a$$

$\phi = 1.3$

$a' = 0.50$

$d_{50} = 0.000853$

* Y_a, Y_1, Fr_1 Ref. From Hec-Ras output.

** Abutment Scour For sta: 3+00 next page.

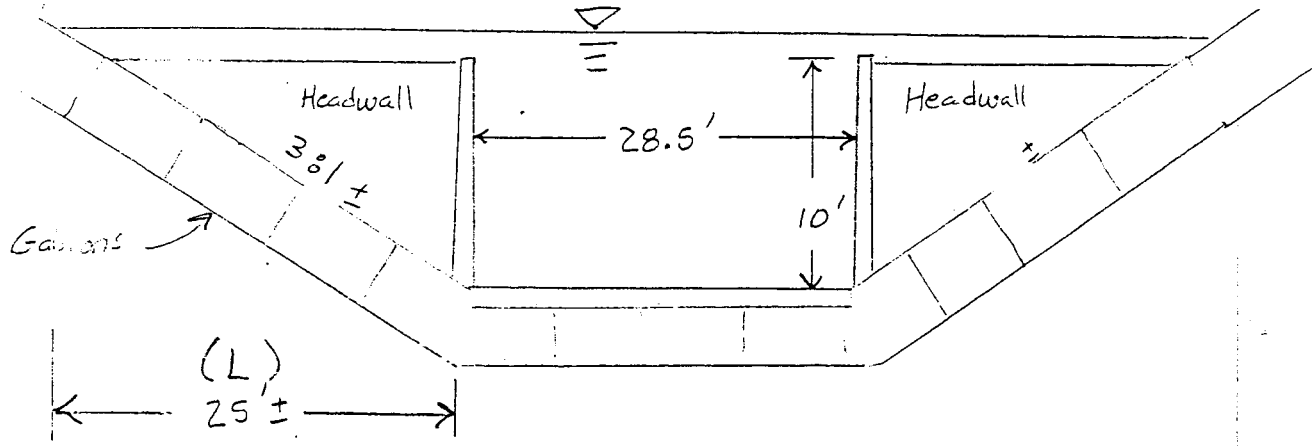
D127

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

Local Scour @ sta: 3+00 End of Concrete Channel.

End of Concrete Channel is located in Floodplain

- Abutment Scour For backwater effect due To Virgin River Floodplain.



$L' = 25/3 = 8.33' \pm$; $8.33/11.84 = 2.53 < 25$ use Froehlich Eq.

$$Z_s = 2.27(K_1)(K_2)(L')^{0.43}(Y_a)^{0.57}(F_r)^{0.61} + Y_a$$

$K_1 = 1.1$ $\quad L' = 8.33' \pm$ $\quad F_r = 0.41$

$K_2 = 1.0$

$Y_a = \frac{Ae}{L}$; $Ae = \frac{1}{2}(25)(10') = 125\ ft^2$

$Y_a = \frac{125}{25} = 5'$

$$Z_s = 2.27(1.1)(1.0)(8.33)^{0.43}(5)^{0.57}(0.41)^{0.61} + 5 = \underline{14.0\ ft.}$$

- Check Abutment Scour with no Virgin River Backwater.

★ depth = 7.22 ft. ; $L = 18' \pm$; $Ae = 64.9$; $Y_a = 65/18 = 3.6$

★ $F_r = 1.30 \pm$ $\quad L' = 18/3 = 6 \pm$

$$Z_s = 2.27(1.1)(1.0)(6)^{0.43}(3.6)^{0.57}(1.3)^{0.61} + 3.6 = \underline{16.74'}$$

★ Haestads Flowmaster output on Following pg.

★★ Gabions used as Countermeasure downstream of Concrete channel. Gabion's Designed To Resist Scour.

D178

Worksheet
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\abbottwa.fm2
Worksheet	28.5' Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.005000	ft/ft
Elevation range: 0.00 ft to 10.28 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	10.28	0.00	28.50	0.015
0.00	0.28			
14.25	0.00			
28.50	0.28			
28.50	10.28			

Discharge	4,000.00	cfs

Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	7.22	ft
Flow Area	201.79	ft²
Wetted Perimeter	42.39	ft
Top Width	28.50	ft
Height	7.22	ft
Critical Depth	8.63	ft
Critical Slope	0.002973	ft/ft
Velocity	19.82	ft/s
Velocity Head	6.11	ft
Specific Energy	13.33	ft
Froude Number	1.31	
Flow is supercritical.		

Local Scour @ Tie To Virgin River.

At Wash Channel Tie To The Virgin River, End of Channel approximately same as Water Surface EL. in Virgin River.

Calculate Z_{sd} for Condition where drop is submerged.

$$Z_{sd} = 0.581 q^{0.667} (h/Y)^{0.411} [1 - (h/Y)]^{-0.118}$$ Eq. 726 CCRFCD

q = 4000 cfs / 28.5 ft ± = 140.35 cfs = 140 cfs ±

h = drop Height ~ 1'

Y = Downstream Depth of Flow = 15' ±

$$Z_{sd} = 0.581 (140)^{0.667} (1/15)^{0.411} [1 - (1/15)]^{-0.118} = 5.20 \text{ ft.}$$

Calculate Extent of Scour Hole

$$X_s = (6)(Z_{sd}) = 6(5.20) = 31.18 \text{ ft.}$$

$$L_s = 12(Z_{sd}) = 12(5.20) = 62.4 \text{ ft.}$$

Estimates of Bridge Scour at Two Sites on the Virgin River, Southeastern Nevada, Using a Sediment-Transport Model and Historical Geomorphic Data

By Marsha M. Hilmes and J.E. Vaill

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 97-4073

Prepared in cooperation with the
NEVADA DEPARTMENT OF TRANSPORTATION

Carson City, Nevada
1997

D131

from the Riverside gaging station. Initial water-surface altitudes at the most downstream cross section for each discharge value selected in each channel reach modeled were determined by a slope-conveyance computation at the cross section.

Magnitudes of the 100- and 500-year floods were computed from a log-Pearson Type III analysis (Interagency Advisory Committee on Water Data, 1982) of 64 years of record at the Littlefield gaging station (1930-94) that excluded the 1989 Quail Creek Dam failure flood. No log-Pearson Type III analysis was made for the Riverside gaging station due to the short period of record (less than the 10 years recommended by the Interagency Advisory Committee on Water Data, 1982). The flood-frequency curve for the Littlefield gaging station is shown in figure 3.

The magnitude of the 100-year flood at the Littlefield gaging station was determined to be 969 m^3/s and the 500-year flood was 1,597 m^3/s. On the basis of the flood-frequency analysis for the Mesquite bridge, the December 1966 flood (997 m^3/s) was approximately equal to the 100-year flood. The 1989 Quail Creek

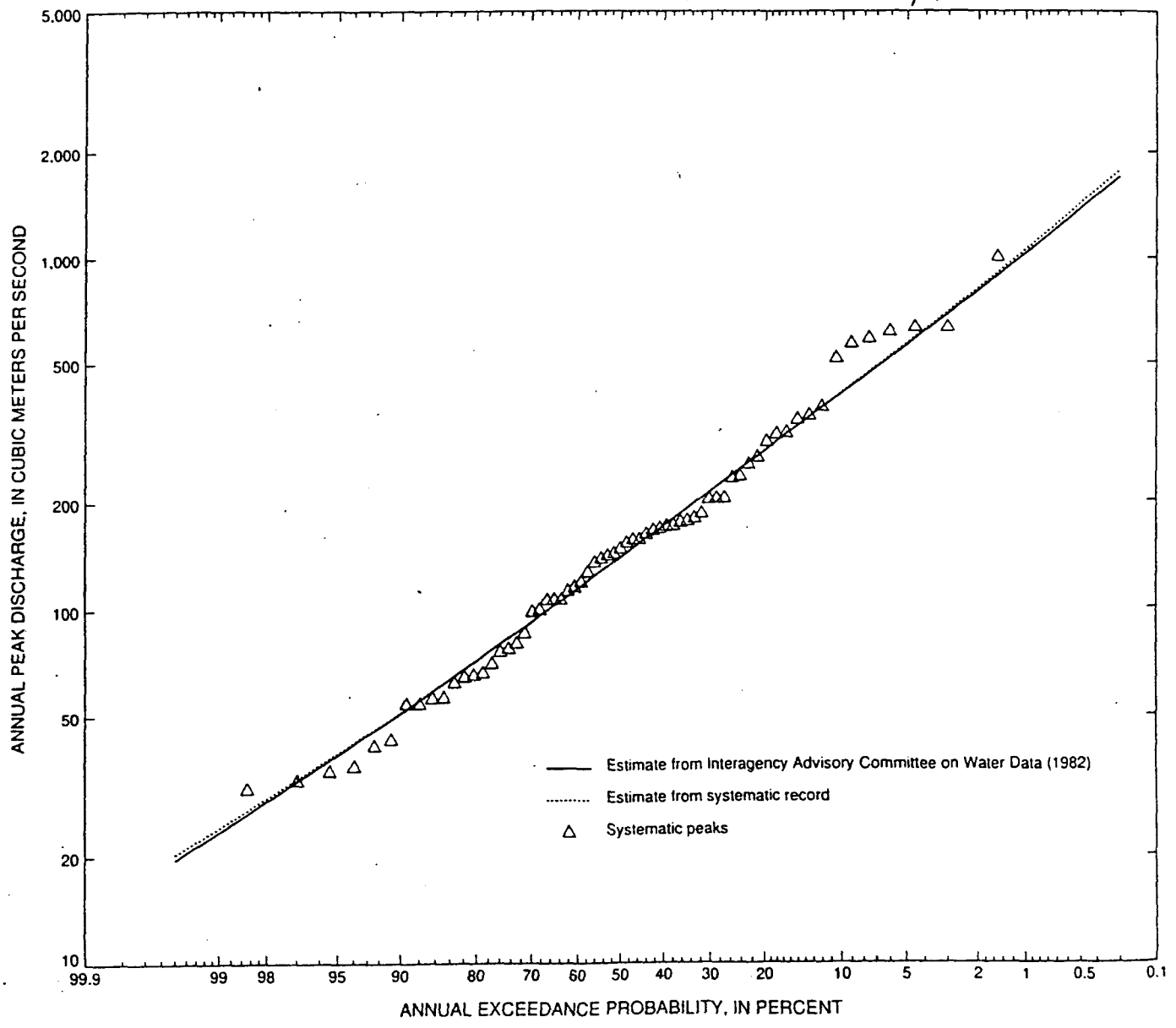


Figure 3. Flood-frequency curve for Virgin River at Littlefield, Ariz. (gaging station 09415000).

Dam failure flood (1,730 m^3/s) was approximately equal to the 500-year flood. Therefore, the 1966 and 1989 flood magnitudes only were used to represent the magnitudes of the 100- and 500-year floods, respectively, in the hydrograph synthesis.

Attenuation of peaks between the Littlefield and Riverside gaging stations was found to be approximately 30 percent on the basis of comparison of concurrent recorded hydrographs at the two gaging stations. For the Riverside bridge, the 1972 flood peak recorded at the Riverside gage was approximately equal to the 100-year flood when the 30 percent attenuation is applied to the flood frequency curve (fig. 3) for the Littlefield gaging station.

Synthesized hydrographs were developed for the 100- and 500-year floods by applying a ratio to the recorded March flood hydrographs. The value used to increase the recorded March hydrographs was computed as the ratio of the design-flood magnitude (100- and 500-year) and the magnitude of the peak on March 11-12. The ratios used at the Mesquite bridge were 1.72 for the 100-year flood hydrograph and 2.98 for the 500-year flood hydrograph. The ratios used for the Riverside bridge were 1.71 for the 100-year flood hydrograph and 2.96 for the 500-year flood hydrograph. This approach was used to simulate flood peaks that are representative of an actual storm and of antecedent conditions common to the time of year when most flooding takes place. These synthesized flood hydrographs are shown in figure 2.

The synthesized flood hydrographs described above were compared to flood hydrographs developed using a method described by Eychaner (1976). This method is based on analysis of 364 floods from 18 continuous gaging stations in the Colorado River Basin of southern Utah. The drainage area for the Littlefield gage is considerably greater than the range of drainage areas used to develop the Eychaner method (13-777 km^2) and may be a limitation of using this method. The shape and duration of the synthetic hydrographs developed using the method described by Eychaner (1976) were evaluated by comparison with the hydrographs for the peak flows of record at the Littlefield gaging station in water years 1967 (997 m^3/s) and 1989 (1,730 m^3/s). In general, the hydrographs developed using the method from Eychaner (1976) resulted in a shorter duration of the peak flow than recorded by hydrographs for naturally occurring floods. Therefore, on the basis of this analysis, the synthetic 100- and 500-year flood hydrographs developed by applying a ratio to the March 11-12 flood hydrograph were used in the model.

Sediment Hydrographs

Bridge scour is limited by the availability of bed material and the capacity of the stream to transport eroded material. The sediment-inflow hydrograph at the most upstream cross section in a study reach can be supplied from sediment-discharge data, or the model can develop a sediment-inflow hydrograph based on the sediment-transport equation. If a sediment-inflow hydrograph is available, BRI-STARS requires it to be supplied in the form of discretized sediment discharges. If the model develops a sediment-inflow hydrograph, BRI-STARS uses a specified sediment-transport equation from the model and the bed-material-size data to produce a sediment-inflow hydrograph at the most upstream cross section. Current options in the model for selection of a sediment-transport equation have been defined by Chang (1988) and are (1) the 1973 Yang method, (2) the Acker and White method, (3) the Engelund and Hansen method, and (4) the Meyer-Peter Mueller method. A fifth option is to supply a generic equation of a given form. The equations from the different methods are applicable to particle sizes of 0.0625 mm and greater.

No previously determined sediment-transport equations were available for the study sites. On the basis of a calibration analysis of the equations available for use in the model, the 1973 Yang method was selected for the Mesquite bridge study reach where the predominant bed-material size was sand and the Meyer-Peter Mueller method was selected for the Riverside bridge where the predominant bed-material sizes were relatively coarse sand. The methods used in this study were chosen for the model because of their accuracy and the short computational times associated with them. The calibration analysis was done by determining which equation resulted in the best comparison of the 1995 data with the model results. BRI-STARS was allowed to develop sediment-inflow hydrographs at both sites using the specified equations and the available bed-material data.

Roughness Coefficients and Water Temperature

Roughness coefficients were selected by visual observation in the field during the 1996 survey of the bridge sites. The coefficients were modified slightly after inspection of numerous photographs taken during the field surveys. Roughness coefficients used in the model ranged from 0.035 to 0.038 in the main channel and from 0.060 to 0.070 for the flood plain in the

D133

decreasing the flow length between cross sections and decreasing the amount of sediment transport during each time step of the model.

Separate input files were made for each bridge according to the limitations imposed by WSPRO. The geometry for the approach and exit cross sections was determined from 0.61-m contour maps provided by NDOT and from data of an indirect discharge measurement at the Mesquite bridge in January 1989. Field-surveyed data from May 1996 were used for the bridge section.

Model Calibration

To calibrate the BRI-STARS model for use on the study reaches of the Virgin River, the hydrograph for the period of the March 12, 1995, flood was routed through the study reaches using the surveyed 1994 cross-section data as model input. The resulting cross sections were then compared with the surveyed 1995 cross sections to determine how well the model would simulate the observed changes.

Several computational options, which include selection of a sediment-transport equation, the time step, the number of sediment computations for each time step, the number of streamtubes used, and the thickness of the active layer, were evaluated to obtain the optimal combination. The optimal combination showed the best correspondence of the resulting model cross sections to the 1995 surveyed data. The sediment-transport equations selected for each bridge reach (see section "Sediment Hydrographs") are not the equations that might be chosen on the basis of bed-material size distributions in the bridge reaches; however, the best results were obtained using these selected equations. Specifying one sediment computation for each time step was sufficient due to the relatively short time steps (1.5 and 2 hours) selected. Increasing the number of sediment computations for each time step did not improve the comparison of the resulting model cross sections with the 1995 surveyed data and also greatly increased the computational time of the model. Two streamtubes were selected for each bridge reach. Increasing the number of streamtubes did not improve the comparison of the model results with the surveyed data. The thickness of the active layer was adjusted to correspond to conditions observed during the field surveys and during the collection of bed-material samples.

Thalweg altitudes of the resulting model cross sections and of the 1995 surveyed cross sections, and the differences between them, are given in table 2. Plots of the 1995 cross sections in relation to the resulting model cross sections are shown in appendix A. The thalweg altitudes for the resulting model cross sections as compared to the thalweg altitudes for the 1995 cross sections were ±1 m at all cross sections (table 2, appendix A) except cross section 3-3, which is immediately downstream from the drop structure at the Bunkerville diversion. For this cross section, the difference between model-simulated and documented (1995) scour was greater than ±1 m. This difference is because of the "unnatural" features (concrete blocks, old cars) in the channel at this cross section that reduce velocity and protect the channel bed that cannot be accounted for in the model. Although the thalweg altitudes compared reasonably well, the model results did not indicate the widening and lateral shifting of the channel that was observed in 1995 at many of the cross sections, especially in reaches 5 and 6 near the Riverside bridge. This difference is because the model does not include a mass-wasting routine and cannot account for the complex channel avulsion[1] that occurred in these reaches. In summary, the comparison between the calibration results and the observed channel changes between 1994 and 1995 indicates that the model provides a good overall estimate of aggradation or degradation at the bridges.

Scour Calculations for 100- and 500-Year Floods

After the model was calibrated, contraction, channel, pier, and total scour were calculated for the 100- and 500-year floods at each of the bridge sites (table 3). Bridge cross sections at the initial channel-bed altitude (from 1994) and at the peak of the 100- and 500-year floods are shown in figure 4. The simulated scour for the 100- and 500-year floods was less than anticipated at the bridges, especially at the cross sections, on the basis of scour simulated for the lower magnitude flood of March 1995 used in the calibration process. The resulting low scour may be due to the large amount of sediment that is transported during the

[1]Avulsion is the process where the river cuts a new channel by shifting laterally in a rapid, somewhat random manner. Gradual lateral migration of the river is not considered avulsion.

D134

Table 3. Simulated maximum contraction, channel, pier, and total scour or fill at the Mesquite and Riverside, Nev., bridges for 100- and 500-year floods

[+, channel fill; -, channel scour]

Bridge	Maximum scour or fill (meters)		
	Contraction and channel	Pier	Total
	100-year flood		
Mesquite, Nev.	+0.20	-1.50	-1.30
Riverside, Nev.	-0.41	-1.49	-1.90
	500-year flood		
Mesquite, Nev.	+0.22	-1.54	-1.32
Riverside, Nev.	-0.47	-1.54	-2.01

time step in which the peak flow occurs and then is deposited in the next downstream cross section during the following time step on the hydrograph recession. Sediment in transport at high flows will not be moved any further downstream than the next downstream cross section by design of the model.

ASSESSMENT OF GENERAL SCOUR

The BRI-STARS model does not have a component to compute general scour. Therefore, other methods were used to estimate long-term aggradation or degradation of the channel. Estimation is often difficult because of the lack of long-term data. Additionally, the processes responsible for the degradation or aggradation are important to understand so they can be incorporated when designing new bridges.

Stage and Discharge Relations

One method for determining long-term degradation or aggradation is to evaluate changes in gage height through time for a given discharge. On the lower Virgin River, the Littlefield gaging station has a long period of record (1929-95). However, approximately 20 years of the gage-height data were not available. Although this gage is upstream from the bridge sites, it is the closest and has the longest period for which data are available. However, two large diversion drop structures are between the gaging station and the bridge sites. How these structures may influence general scour estimates made upstream and applied to the bridge sites is unknown.

Relations of stage, mean annual discharge, and peak discharge with time for the Littlefield gaging station are shown in figure 5. A low-flow discharge of 5.66 m^3/s was chosen for this analysis[1] because this flow would be confined within the channel. This analysis was repeated for a slightly higher discharge (11.33 m^3/s) with similar results. Figure 5 shows no general, long-term trend of aggradation or degradation;[2] however, several cycles of aggradation and degradation occurred during 1929-95. The periods of aggradation are generally associated with periods of lower discharge; the periods of degradation are generally associated with periods of higher discharge, except for a high peak flow in 1967 that resulted in aggradation. On the basis of rating curves[3] in use on October 1 of each year of record (1929-95), which have been adjusted to a common datum, the difference between highest and lowest stage for the chosen low flow (5.66 m^3/s) is 0.87 m. This value (0.87 m) is the best estimate of general scour.

As shown in figure 5, approximately 20 years of gage-height data are unavailable for use in the stage-discharge analysis. However, some interpretations about what may have occurred during the period of missing data can be inferred from the streamflow statistics. A series of aggradation and degradation cycles during this period probably resulted in the 0.51 m of degradation between 1937 and 1959. The first major period of degradation probably was associated with the high annual mean discharge during the 1941 water year. A period of gradual aggradation probably followed during the relatively dry period of the 1940's and early 1950's. According to the data, the highest gage height may have been in about 1950. Another period of degradation probably occurred during water year 1952 when the annual mean discharge was above average. This may have been followed by a few years of relative stability and then another period of degradation associated with higher streamflows in 1958.

---

[1]The metric value of 5.66 m^3/s is equivalent to 200 cubic feet per second.

[2]NDOT compared bridge-construction plans and the approximate current flowline and determined that the river bed has lowered more than 2 m at the bridge sites (Paul Frost, NDOT, written commun., 1996). The estimated 2 m of scour at the bridges as reported by NDOT is due in part to contraction and local scour and, therefore, is not representative of general scour.

[3]Rating curves graphically relate gage height to water discharge.

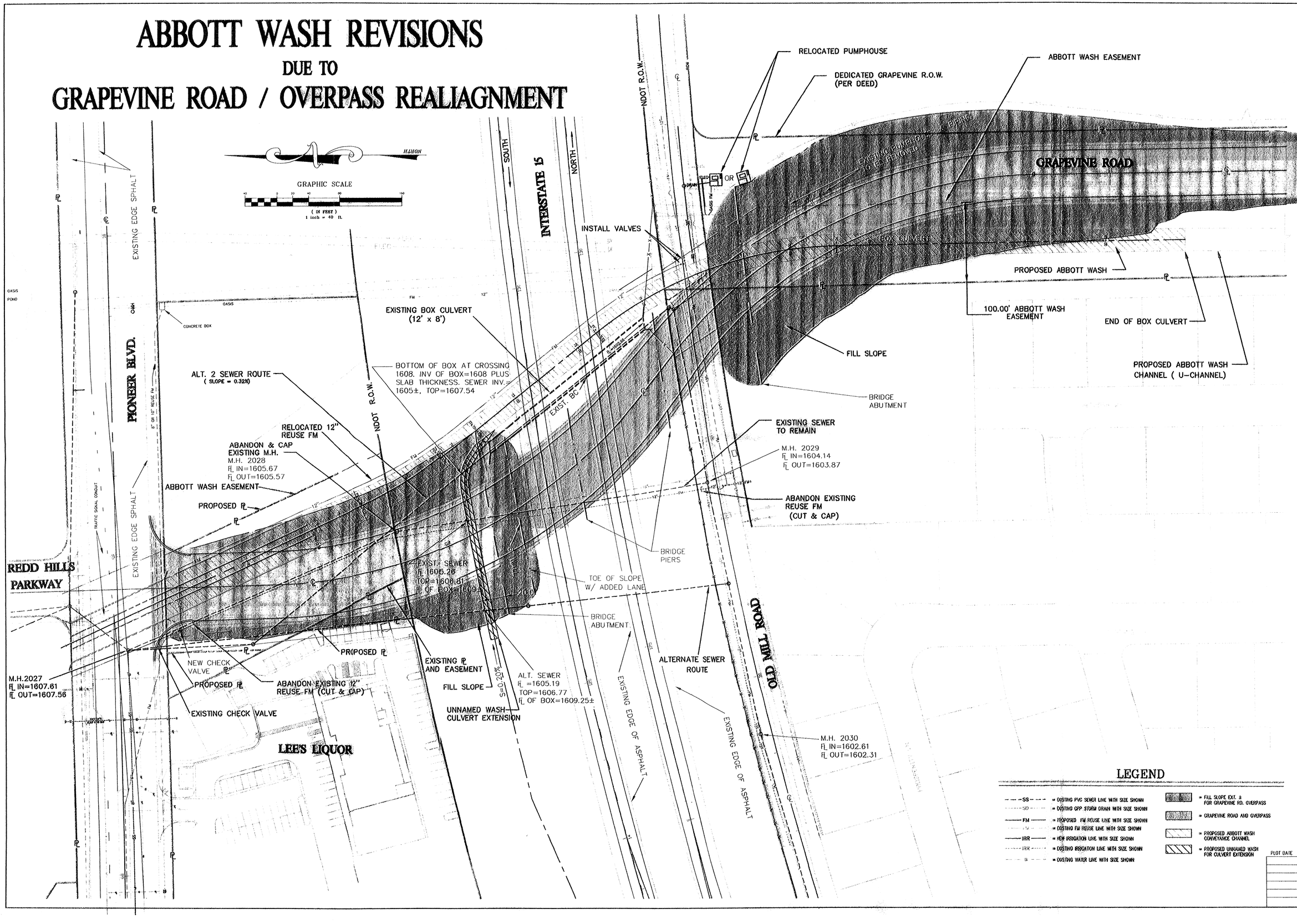
APPENDIX E

Design Plans

ABBOTT WASH CHANNEL IMPROVEMENT PLANS

Bulloch Brothers Engineering, Inc.

ABBOTT WASH REVISIONS
DUE TO
GRAPEVINE ROAD / OVERPASS REALIAGNMENT



REVISIONS

NO	DESCRIPTION	DATE	BY

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586-9592
163 WEST 1600 SOUTH, UNIT 5
ST. GEORGE, UTAH 84770
(435) 628-4700
561 W MESQUITE BLVD, STE 4
MESQUITE, NEVADA 89027
(702) 346-5101

ABBOTT WASH CONVEYANCE
ABBOTT WASH REVISIONS
FOR
THE CITY OF MESQUITE
MESQUITE, NEVADA
CLARK COUNTY, NEVADA

PROJECT NO: 1029-190-05	SCALE: 1"= 50'	DRAWN BY: JRH	CHECKED BY: G.B.
DATE: JUNE 2003			
SHEET NO: 1 OF 1			

INTERSTATE-15 IMPROVEMENTS

Nevada Department of Transportation

APPENDIX F

Electronic Data CD

RESPONSE TO COMMENTS
ABBOTT WASH CONVEYANCE SYSTEM
REQUEST FOR
CONDITIONAL LETTER OF MAP REVISION

Case No.: 05-09-0588R
Communities: City of Mesquite & Clark County, Nevada
Community Nos.: 320035 & 320003

Prepared for:

Clark County Regional Flood Control District
500 South Grand Central Parkway
Las Vegas, NV 89155

Prepared by:

PBS&J
2270 Corporate Circle, Suite 100
Henderson, Nevada 89074

Reference Number: 511606.00
March, 2005

March 8, 2005

Ms. Sheila M. Norlin
National LOMC Manager
Michael Baker Jr., Inc.
3601 Eisenhower Avenue
Alexandria, Virginia 22304-6425

RE: CASE NO.: 05-09-0588R
COMMUNITIES: CITY OF MESQUITE & CLARK COUNTY, NV
COMMUNITY NOS.: 320035 & 320003

Dear Ms. Norlin:

Submitted for your review is the Response to Comments for the Abbott Wash Conveyance System Request for Conditional Letter of Map Revision.

If you have any questions regarding this report, please contact our office at (702) 263-7275.

Sincerely,

PBS&J



3/8/05

Brian K. Loffman, CFM
Hydrologist

Matt Baird, P.E., CFM
Sr. Program Manager

The response to comments in a letter dated March 1, 2005 from Michael Baker Jr., Inc. (MBJ) are included below, see Appendix A for a copy of the comment letter.

Comment 1: **Because your request affects the unincorporated areas of Clark County, please provide community acknowledgement in the form of a letter stating that Clark County has reviewed the revision request and understands the effects of the revision on flooding conditions in the community, or Application/Certification Form 1, entitled "Overview & Concurrence Form," (copy enclosed) signed by a Clark County community official.**

Response 1: Please refer to Appendix B for a copy of the MT-2 Overview & Concurrence Form signed by Mr. Dave Betley, Principal Engineer, Clark County Development Services.

Comment 2: **The topographic work maps located in Appendix D of the submitted "Request for Conditional Letter of Map Revision for Abbott Wash Conveyance System", prepared by PBS&J, dated January 2005, do not show the cross sections used to model the Abbott Wash Conveyance System. Please submit a topographic work map, certified by a registered professional engineer or land surveyor, that shows the revised floodplain boundary delineations and the locations and orientations of all cross sections used in the HEC-RAS hydraulic computer model.**

Response 2: In a telephone conversation with Mr. Amine Hafsi (MBJ) on March 8, 2005, PBS&J clarified that the channel stationing shown on the plan & profiles (found in Appendix D) for the proposed channel corresponded to the HEC-RAS stations used in the hydraulic model. Also, it was noted that the stationing for the channel is shown on Figure 5: Work Map. Mr. Hafsi agreed the comment was satisfactorily addressed in the telephone conversation and no further action was required.

Appendix A: Comment Letter

RECEIVED
MAR 0 7 2005
PBS&J

NATIONAL FLOOD INSURANCE PROGRAM

FEMA MAP COORDINATION CONTRACTOR

March 1, 2005

Mr. Kevin Eubanks, P.E., CFM
Assistant General Manager
Clark County Regional Flood Control District
600 Grand Central Parkway
Las Vegas, NV 89106-4511

IN REPLY REFER TO:
Case No.: 05-09-0588R
Communities: City of Mesquite and Clark County, NV
Community Nos.: 320035 and 320003

316-AD

Dear Mr. Eubanks:

This responds to your request dated February 17, 2005, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a conditional revision to the Flood Insurance Rate Map (FIRM) for Clark County, Nevada and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	[redacted]
Flooding Source:	Abbott Wash
FIRM Panel Affected:	32003C0387 E

The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed on the enclosed summary.

Please send the required data directly to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence. If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures, including the flat review and processing fee for requests of this type established by the current fee schedule. A copy of the notice summarizing the current fee schedule, which was published in the *Federal Register,* is enclosed for your information.

If you are unable to meet the 90-day deadline for submittal of required items, and would like us to continue processing your request, you must request an extension of the deadline. This request must be submitted to us in writing and must provide (1) the reason why the data cannot be submitted within the requested time frame, and (2) a new date for the submittal of the data. FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, the fees will be forfeited for any request for which neither the requested data nor a written extension request is received within 90 days.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627). If you

3601 Eisenhower Avenue, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

NATIONAL FLOOD INSURANCE PROGRAM
FEMA MAP COORDINATION CONTRACTOR

Summary of Additional Data Required to Support a
Conditional Letter of Map Revision (CLOMR)

Case No.: 05-09-0588R Requester: Mr. Kevin Eubanks, P.E., CFM

Communities: City of Mesquite and Clark County, NV Community Nos.: 320035 and 320003

The issues listed below must be addressed before we can continue the review of your request.

1. Because your request affects the unincorporated areas of Clark County, please provide community acknowledgment in the form of a letter stating that Clark County has reviewed the revision request and understands the effects of the revision on flooding conditions in the community, or Application/Certification Form 1, entitled "Overview & Concurrence Form," (copy enclosed) signed by a Clark County community official.

2. The topographic work maps located in Appendix D of the submitted "Request for Conditional Letter of Map Revision for Abbott Wash Conveyance System", prepared by PBS&J, and dated January 2005, do not show the cross sections used to model the Abbott Wash Conveyance System. Please submit a topographic work map, certified by a registered professional engineer or land surveyor, that shows the revised floodplain boundary delineations and the locations and orientations of all cross sections used in the HEC-RAS hydraulic computer model.

Please send the required data directly to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence.

3601 Eisenhower Avenue, Alexandria, Virginia 22304-6425 PH: 703.960.8800 FX: 703.960.9125

have specific questions concerning your request, please call the Revisions Coordinator for your State, Mr. Sacha Tohme, CFM, who may be reached at (703) 960-8800, ext. 3028.

Sincerely,

Sheila M. Norlin, CFM
National LOMC Manager
Michael Baker Jr., Inc.

Enclosures

cc: Mr. J. Allen Bell, P.E.
City Engineer
City of Mesquite

Mr. Dave Betley, P.E.
Principal Engineer
Civil Engineering Division
Clark County Department of Development Services

Mr. Mathew S. Baird, P.E., CFM
Senior Program Manager
PBS&J

Appendix B: MT-2 Form 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour 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, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). 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.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☒ CLOMR: A letter from 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 FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

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
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
320003	Clark County	NV	32003C	0387E	09/27/02

2. Flooding Source: Abbott Wash

3. Project Name/Identifier: Request for Conditional Letter of Map Revision for Abbott Wash Conveyance System

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 ☐ 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 types of flooding and structures (check all that apply)

Types of Flooding:	☒ Riverine	☐ Coastal	☐ Shallow Flooding (e.g., Zones AO and AH)
	☐ Alluvial fan	☐ Lakes	☐ Other (Attach Description)
Structures:	☒ Channelization	☐ Levee/Floodwall	☒ Bridge/Culvert
	☐ Dam	☐ Fill	☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $4,000

☒ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/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: Brian K. Loffman, CFM	Company: PBS&J	
Mailing Address: 2270 Corporate Circle Suite 100 Henderson, NV 89074	Daytime Telephone No.: (702) 263-7275	Fax No.: (702) 263-7200
	E-Mail Address: bloffman@pbsj.com	
Signature of Requester (required):		Date: 3/4/05

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 requirement that no fill be 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. 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: Dave Betley, P.E., Principal Engineer, Clark County Development Services		Telephone No.: (702) 455-4808
Community Name: Clark County	Community Official's Signature (required):	Date: 3/17/05

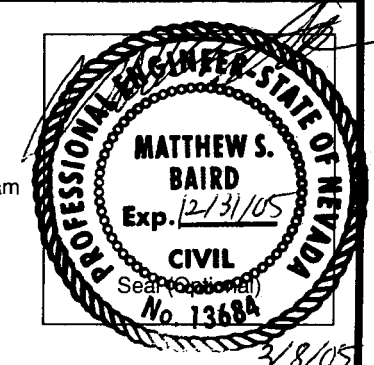
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

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. 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: Mathew S. Baird, P.E., CFM	License No.: NV 13684	Expiration Date: 12/31/06
Company Name: PBS&J	Telephone No.: (702) 263-7275	Fax No.: (702) 263-7200
Signature:		Date: 3/8/05

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



RESPONSE TO COMMENTS
ABBOTT WASH CONVEYANCE SYSTEM
REQUEST FOR
CONDITIONAL LETTER OF MAP REVISION

Case No.: 05-09-0588R
Communities: City of Mesquite & Clark County, Nevada
Community Nos.: 320035 & 320003

Prepared for:

Clark County Regional Flood Control District
500 South Grand Central Parkway
Las Vegas, NV 89155

Prepared by:

PBS&J
2270 Corporate Circle, Suite 100
Henderson, Nevada 89074

Reference Number: 511606.00
June, 2005

June 13, 2005

Ms. Sheila M. Norlin
National LOMC Manager
Michael Baker Jr., Inc.
3601 Eisenhower Avenue
Alexandria, Virginia 22304-6425

RE: CASE NO.: 05-09-0588R
COMMUNITIES: CITY OF MESQUITE & CLARK COUNTY, NV
COMMUNITY NOS.: 320035 & 320003

Dear Ms. Norlin:

This letter report is intended to serve as a formal response to the June 6, 2005 email request by Mr. Amine Hafsi for a revised hydraulic analysis of the proposed Abbott Wash channel. The hydraulic analysis submitted in the original CLOMR request was prepared using HEC-RAS version 3.0.1. Please refer to Appendix B for the detailed input/output of the HEC-RAS model run using version 3.1.3. Also, Appendix B contains a CD of the HEC-RAS model. A table showing the difference in water surface elevations between the two models can be found in Appendix C. The table shows that the largest change in water surface elevation is 0.25' at river station 7611 (plan station 76+11).

If you have any questions regarding this report, please contact our office at (702) 263-7275.

Sincerely,

PBS&J



Brian K. Loffman, CFM
Hydrologist

Matt Baird, P.E., CFM
Sr. Program Manager

Appendix A: Email Correspondence

Loffman, Brian

From: Amine Hafsi [Amine.Hafsi@mapmodteam.com]
Sent: Monday, June 06, 2005 11:08 AM
To: Loffman, Brian
Cc: Sacha Tohme
Subject: Abbott Wash Conveyance System (CLOMR)- 05-09-0588R

Dear Brian,

FEMA is no longer accepting HEC-RAS version 3.0.1 Models. As discussed on our phone conversation of Monday 6, 2005, please rerun the Model using HEC-RAS 3.1.1 or a later version.

Regards,

Hafsi Amine
Michael Baker Corp

Appendix B: HEC-RAS Model and Data CD

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp 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: 1029-190-05 Abbott Wash Conv (8/21/02)
Project File : 5103.prj
Run Date and Time: 6/7/2005 4:53:43 PM

Project in English units

Project Description:
Abbott Wash Conveyance

****

PLAN DATA

Plan Title: AWC5-03
Plan File : l:\PROJECTS\511606-CLOMR's\Abbott Wash\HEC-RAS\5103.p19

Geometry Title: AWC8-02A11 U-PierB-5-03EngD-Outf
Geometry File : l:\PROJECTS\511606-CLOMR's\Abbott Wash\HEC-RAS\5103.g02

Flow Title : AWC-8-21-02-MFR-Use VR BW-Adj Locations
Flow File : l:\PROJECTS\511606-CLOMR's\Abbott Wash\HEC-RAS\5103.f03

Plan Summary Information:
Number of: Cross Sections = 90 Multiple Openings = 0
Culverts = 0 Inline Structures = 2
Bridges = 6 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 only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

****

FLOW DATA

Flow Title: AWC-8-21-02-MFR-Use VR BW-Adj Locations
Flow File : l:\PROJECTS\511606-CLOMR's\Abbott Wash\HEC-RAS\5103.f03

Flow Data (cfs)

River	Reach	RS	PF 1
Abbott Wash	AW	8741.56	2790
Abbott Wash	AW	7537.59	3334
Abbott Wash	AW	6840.4	3520
Abbott Wash	AW	6000	3670
Abbott Wash	AW	5100	4000

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Abbott Wash	AW	PF 1	Normal S = 0.0095	Normal S = 0.0045

Inline Structure Gate Openings
River = Abbott Wash
Reach = AW RS = 238
Gate = Gate #1

# Open	Open Ht
0	0

****

GEOMETRY DATA

Geometry Title: AWC8-02A11 U-PierB-5-03EngD-Outf
Geometry File : l:\PROJECTS\511606-CLOMR's\Abbott Wash\HEC-RAS\5103.g02

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 8741.56

INPUT
Description: Station: 87+41.56 (Eq. Sta: 38+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1628.98	85	1620.58	100	1620.28	115	1620.58	139	1628.98

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	.1	.3

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 8641.56

INPUT
Description: Station: 86+41.56 (Eq. Sta: 37+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1628.03	85	1619.63	100	1619.33	115	1619.63	139	1628.03

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	.1	.3

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 8541.56

INPUT
Description: Station: 85+41.56 (Eq. Sta: 36+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1627.08	85	1618.68	100	1618.38	115	1618.68	139	1627.08

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	.1	.3

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 8441.56

INPUT
Description: Station: 84+41.56 (Eq. Sta: 35+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1626.13	85	1617.73	100	1617.43	115	1617.73	139	1626.13

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	.1	.3

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 8341.56

INPUT
Description: Station: 83+41.56 GB slope=1.10% (Eq. Sta: 34+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1625.18	85	1616.78	100	1616.48	115	1616.78	139	1625.18

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	.1	.3

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 8241.56

INPUT

Description: Station: 82+41.56 (Eq. Sta: 33+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1624.1	85	1615.7	100	1615.39	115	1615.7	139	1624.1

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	100	100	101	.1	.3

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 8141.56

INPUT
Description: Station: 81+41.56 (Eq. Sta: 32+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1623	85	1614.6	100	1614.29	115	1614.6	139	1623

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	50	50	50	.1	.3

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 8091.56

INPUT
Description: Station: 80+91.56 (Eq. Sta: 31+50 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1622.44	85	1614.04	100	1613.74	115	1614.04	139	1622.44

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	50	50	50	.1	.3

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 8041.56

INPUT
Description: Station: 80+41.56 (Begin 100' Transition)(Sta: 31+00 GC Wallace Plans)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1621.9	85	1613.5	100	1613.2	115	1613.5	139	1621.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.028	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	50	50	50	.1	.3

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 7991.56

INPUT
Description: Station: 79+91.56 (50' Upstream of PB Culvert, middle of Transition)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
61	1621.35	85	1612.95	100	1612.65	115	1612.95	139	1621.35

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
61	.03	61	.025	139	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61	139	50	50	50	.1	.3

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 7941.56

```
INPUT
Description: Station: 79+41.56 Begin PB Culvert GB; Slope=0.73%
Station Elevation Data     num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      70  1624.1   78.33  1622.1   78.33  1612.1     100  1612.1  121.67  1612.1
  121.67  1622.1     130  1624.1

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
      70    .015   78.33    .015  121.67    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         78.33  121.67           330.57  330.57  330.57             .1       .3

BRIDGE


RIVER: Abbott Wash
REACH: AW                  RS: 7900

INPUT
Description: Pioneer Blvd Crossing & NDOT Extension
Distance from Upstream XS =       .1
Deck/Roadway Width        =  330.07
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*********************************************
   78.33    1628  1622.1  121.67    1628  1622.1

Upstream Bridge Cross Section Data
Station Elevation Data     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   78.33  1622.1   78.33  1612.1     100  1612.1  121.67  1612.1  121.67  1622.1

Manning's n Values         num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************************************************
   78.33    .015   78.33    .015     100    .015  121.67    .015  121.67    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
         78.33  121.67             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*********************************************
   78.33    1624  1619.7  121.67    1624  1619.7

Downstream Bridge Cross Section Data
Station Elevation Data     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   78.33  1619.7   78.33  1609.7     100  1609.7  121.67  1609.7  121.67  1619.7

Manning's n Values         num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************************************************
   78.33    .015   78.33    .015     100    .015  121.67    .015  121.67    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
         78.33  121.67             .05      .1

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =    1628
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  2

Pier Data
Pier Station     Upstream=   92.66    Downstream=   92.66
Upstream     num=       2
    Width   Elev    Width   Elev
*******************************
      .67    1610     .67    1624
Downstream     num=       2
    Width   Elev    Width   Elev
*******************************
      .67    1608     .67    1622
Debris Width  =     2.67
Debris Height =       10

Pier Data
Pier Station     Upstream=     107    Downstream=     107
Upstream     num=       2
    Width   Elev    Width   Elev
*******************************
      .67    1610     .67    1624
Downstream     num=       2
    Width   Elev    Width   Elev
*******************************
      .67    1608     .67    1622
Debris Width  =     2.67
Debris Height =       10

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
```

```
      Energy
Selected Low Flow Methods = Energy

High Flow Method
      Energy Only

Additional Bridge Parameters
      Do not add Friction component to Momentum
      Do not add Weight component to Momentum
      Class B flow critical depth computations use critical depth
          inside the bridge at the downstream end
      Criteria to check for pressure flow = Upstream water surface

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 7611

INPUT
Description: Station: 76+11 End Culvert Extention by NDOT GB-S=2.45% Begin
             Contraction
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      70  1621.7   78.33  1619.7   78.33  1609.7     100  1609.7  121.67  1609.7
  121.67  1619.7     130  1621.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
      70    .015   78.33    .015  121.67    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         78.33  121.67             73.41   73.41   73.41            .05      .1

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 7537.59

INPUT
Description: Station: 75+37.59  PT of Curve  Contraction Transition
Station:
             74+70.32
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      70 1620.18   81.12 1618.18   81.12 1608.18     100  1607.9  118.88 1608.18
  118.88 1618.18     130 1620.18

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
      70    .015   81.12    .015  118.88    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         81.12  118.88             58.88      61   62.68            .05      .1

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 7476.58

INPUT
Description: Station: 74+76.58 Middle of Curve  Contraction
             Transition
Station: 74+70.32
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      70 1616.68   83.45 1616.68   83.45 1606.68     100  1606.4  116.55 1606.68
  116.55 1616.68     130 1616.68

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
      70    .015   83.45    .015  116.55    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         83.45  116.55             58.87   60.57   62.68            .05      .1

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 7416.02

INPUT
Description: Station: 74+16.02  PC of Curve  End Contraction Transition
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      70  1615.2   85.75  1615.2   85.75  1605.2     100 1604.92  114.25  1605.2
  114.25  1615.2     130  1615.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
      70    .015   85.75    .015  114.25    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         85.75  114.25             57.66   57.66   57.66            .05      .05
```

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 7358.36

INPUT
Description: Station: 73+58.36 Begin Culvert GB Slope=0.81%
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1613.5	85.75	1603.5	100	1603.5	114.25	1603.5	114.25	1613.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	380	369.66	361	.05	.05

BRIDGE

RIVER: Abbott Wash
REACH: AW RS: 7200

INPUT
Description: I-15, Old Mill Road Bridge
Distance from Upstream XS = .1
Deck/Roadway Width = 369
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
85.75	1622.3	1612.5	114.25	1622.3	1612.5

Upstream Bridge Cross Section Data
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1613.5	85.75	1603.5	100	1603.5	114.25	1603.5	114.25	1613.5

Manning's n Values num= 2

Sta	n Val	Sta	n Val
85.75	.015	100	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
85.75	114.25	.05	.05

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
85.75	1613.94	1609.5	114.25	1613.5	1609.5

Downstream Bridge Cross Section Data
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1610.5	85.75	1600.5	100	1600.5	114.25	1600.5	114.25	1610.5

Manning's n Values num= 2

Sta	n Val	Sta	n Val
85.75	.015	100	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
85.75	114.25	.05	.1

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins = 1622.25
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data
Pier Station Upstream= 100 Downstream= 100
Upstream num= 2

Width	Elev	Width	Elev
.67	1602	.67	1614

Downstream num= 2

Width	Elev	Width	Elev
.67	1599	.67	1612

Debris Width = 2.5
Debris Height = 9

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Energy

High Flow Method
Energy Only

Additional Bridge Parameters
Do not add Friction component to Momentum

Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the downstream end
Criteria to check for pressure flow = Upstream water surface

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 6988.71

INPUT
Description: Station: 69+88.71 End Culvert GB; slope=0.66%
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1610.5	85.75	1600.5	100	1600.5	114.25	1600.5	114.25	1610.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	140 148.31	156	.05	.1

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 6840.4

INPUT
Description: Station: 68+40.4 End Curve
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1609.8	85.75	1599.8	100	1599.52	114.25	1599.8	114.25	1609.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	140.4 140.4	140.4	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 6700

INPUT
Description: Station: 67+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1608.88	85.75	1598.88	100	1598.6	114.25	1598.88	114.25	1608.88

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100 100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 6600

INPUT
Description: Station: 66+00
Station: 54+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1608.22	85.75	1598.22	100	1597.94	114.25	1598.22	114.25	1608.22

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100 100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 6500

INPUT
Description: Station: 65+00
Station: 54+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1607.56	85.75	1597.56	100	1597.28	114.25	1597.56	114.25	1607.56

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
**********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25               100     100     100              0        0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 6400

INPUT
Description: Station: 64+00
Station: 54+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
   85.75  1606.9   85.75  1596.9     100 1596.62  114.25  1596.9  114.25  1606.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25               100     100     100              0        0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 6300

INPUT
Description: Station: 63+00
Station: 54+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
   85.75 1606.24   85.75 1596.24     100 1595.96  114.25 1596.24  114.25 1606.24

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25               100     100     100              0        0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 6200

INPUT
Description: Station: 62+00
Station: 54+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
   85.75 1605.58   85.75 1595.58     100  1595.3  114.25 1595.58  114.25 1605.58

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25               100     100     100              0        0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 6100

INPUT
Description: Station: 61+00
Station: 54+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
   85.75 1604.92   85.75 1594.92     100 1594.64  114.25 1594.92  114.25 1604.92

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25               100     100     100              0        0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 6000

INPUT
Description: Station: 60+00
Station: 54+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
```

```
   85.75 1604.26   85.75 1594.26     100 1593.98  114.25 1594.26  114.25 1604.26

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val     Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          85.75  114.25             100     100     100             0       0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 5900

INPUT
Description: Station: 59+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   85.75  1603.6   85.75  1593.6     100 1593.32  114.25  1593.6  114.25  1603.6

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val     Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          85.75  114.25             100     100     100             0       0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 5800

INPUT
Description: Station: 58+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   85.75 1602.94   85.75 1592.94     100 1592.66  114.25 1592.94  114.25 1602.94

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val     Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          85.75  114.25             100     100     100             0       0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 5700

INPUT
Description: Station: 57+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   85.75 1602.28   85.75 1592.28     100    1592  114.25 1592.28  114.25 1602.28

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val     Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          85.75  114.25             100     100     100             0       0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 5600

INPUT
Description: Station: 56+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   85.75 1601.22   85.75 1591.22     100 1590.94  114.25 1591.22  114.25 1601.22

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val     Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          85.75  114.25             100     100     100             0       0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 5500

INPUT
Description: Station: 55+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   85.75 1600.16   85.75 1590.16     100 1589.88  114.25 1590.16  114.25 1600.16
```

```
Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
         85.75  114.25               100     100     100              0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                  RS: 5400

INPUT
Description: Station: 54+00
Station Elevation Data      num=       5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
*************************************************************************************
   85.75  1599.1   85.75  1589.1      100 1588.82  114.25  1589.1  114.25  1599.1

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
         85.75  114.25               100     100     100              0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                  RS: 5300

INPUT
Description: Station: 53+00
Station Elevation Data      num=       5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
*************************************************************************************
   85.75 1598.04   85.75 1588.04      100 1587.76  114.25 1588.04  114.25 1598.04

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
         85.75  114.25               100     100     100              0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                  RS: 5200

INPUT
Description: Station: 52+00
Station Elevation Data      num=       5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
*************************************************************************************
   85.75 1596.98   85.75 1586.98      100  1586.7  114.25 1586.98  114.25 1596.98

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
   85.75    .015   85.75    .015  114.25    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
         85.75  114.25               100     100     100              0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                  RS: 5100

INPUT
Description: Station: 51+00, Upstream End of MB Bridge
Station Elevation Data      num=       5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
*************************************************************************************
   85.75 1595.64   85.75 1585.64      100 1585.64  114.25 1585.64  114.25 1595.64

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
*********************************************
   85.75    .015   85.75    .015  114.25    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.    Expan.
         85.75  114.25            108.21  108.21  108.21            .05        .1

BRIDGE


RIVER: Abbott Wash
REACH: AW                  RS: 5092

INPUT
Description: Mesquite Boulevard Bridge
Distance from Upstream XS =       .1
Deck/Roadway Width        =    108.01
Weir Coefficient          =       2.6
Upstream  Deck/Roadway Coordinates
    num=        2
```

```
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*************************************************
   85.75  1597.6 1594.64  114.25  1597.6 1594.64

Upstream Bridge Cross Section Data
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************
   85.75  1597.6   85.75 1585.64  114.25 1585.64  114.25  1597.6

Manning's n Values        num=       1
     Sta   n Val
****************
   85.75    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
         85.75  114.25            .05       .1

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*************************************************
   85.75  1597.4  1593.5  114.25  1597.4  1593.5

Downstream Bridge Cross Section Data
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************
   85.75  1597.4   85.75  1584.5  114.25  1584.5  114.25  1597.4

Manning's n Values        num=       1
     Sta   n Val
****************
   85.75    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
         85.75  114.25            .05       .1

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =    1598
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  1

Pier Data
Pier Station     Upstream=     100    Downstream=     100
Upstream     num=       2
    Width   Elev    Width   Elev
*********************************
     .67    1584     .67    1597
Downstream     num=       2
    Width   Elev    Width   Elev
*********************************
     .67    1582     .67    1595
Debris Width  =     2.67
Debris Height =        9

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
      Energy
Selected Low Flow Methods = Energy

High Flow Method
       Energy Only

Additional Bridge Parameters
       Do not add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the downstream end
       Criteria to check for pressure flow = Upstream water surface

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                 RS: 4991.79

INPUT
Description: Station 49+91.79 Downstream End of MB Bridge-GB- S=0.65%
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************************
   85.75  1594.5   85.75  1584.5     100  1584.5  114.25  1584.5  114.25  1594.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
***********************************************
   85.75    .015   85.75    .015  114.25    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         85.75  114.25             91.79   91.79   91.79            .05       .1

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                 RS: 4900

INPUT
Description: Station: 49+00
```

```
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
   85.75 1594.12   85.75 1584.12     100  1583.9  114.25 1584.12  114.25 1594.12

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
   85.75    .015   85.75    .015  114.25    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
         85.75  114.25              103     100      97             0        0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 4800

INPUT
Description: Station: 48+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
   85.75 1593.53   85.75 1583.53     100 1583.25  114.25 1583.53  114.25 1593.53

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
   85.75    .015   85.75    .015  114.25    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
         85.75  114.25              103     100      97             0        0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 4700

INPUT
Description: Station: 47+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
   85.75 1592.88   85.75 1582.88     100  1582.6  114.25 1582.88  114.25 1592.88

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
   85.75    .015   85.75    .015  114.25    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
         85.75  114.25              102     100      98             0        0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 4600

INPUT
Description: Station: 46+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
   85.75 1592.23   85.75 1582.23     100 1581.95  114.25 1582.23  114.25 1592.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
   85.75    .015   85.75    .015  114.25    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
         85.75  114.25              103     100      97             0        0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 4500

INPUT
Description: Station: 45+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
   85.75 1591.58   85.75 1581.58     100  1581.3  114.25 1581.58  114.25 1591.58

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
   85.75    .015   85.75    .015  114.25    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
         85.75  114.25              100     100     100             0        0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 4400

INPUT
Description: Station: 44+00
Station Elevation Data    num=       5
```

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1590.93	85.75	1580.93	100	1580.65	114.25	1580.93	114.25	1590.93

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.015	85.75	.015	114.25	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 4300

INPUT
Description: Station: 43+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1590.28	85.75	1580.28	100	1580	114.25	1580.28	114.25	1590.28

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 4200

INPUT
Description: Station: 42+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1589.63	85.75	1579.63	100	1579.35	114.25	1579.63	114.25	1589.63

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 4100

INPUT
Description: Station: 41+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1588.98	85.75	1578.98	100	1578.7	114.25	1578.98	114.25	1588.98

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 4000

INPUT
Description: Station: 40+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1588.33	85.75	1578.33	100	1578.05	114.25	1578.33	114.25	1588.33

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 3900

INPUT
Description: Station: 39+00, GB S=0.81%
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
*******************************************************************************
   85.75 1587.68   85.75 1577.68     100  1577.4  114.25 1577.68  114.25 1587.68

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25              100     100     100              0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                 RS: 3800

INPUT
Description: Station: 38+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
   85.75 1586.87   85.75 1576.87     100 1576.59  114.25 1576.87  114.25 1586.87

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25              100     100     100              0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                 RS: 3700

INPUT
Description: Station: 37+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
   85.75 1586.06   85.75 1576.06     100 1575.78  114.25 1576.06  114.25 1586.06

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25              100     100     100              0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                 RS: 3600

INPUT
Description: Station: 36+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
   85.75 1585.26   85.75 1575.26     100 1574.98  114.25 1575.26  114.25 1585.26

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25           133.48  133.48  133.48              0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                 RS: 3466.52

INPUT
Description: Station: 34+66.52,  Begin Curve
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
   85.75 1584.18   85.75 1574.18     100  1573.9  114.25 1574.18  114.25 1584.18

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25               45   46.52      48              0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                 RS: 3420

INPUT
Description: Station: 34+20,  Begin 2nd South Bridge
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
```

```
   85.75 1583.52   85.75 1573.52     100 1573.52  114.25 1573.52  114.25 1583.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         85.75  114.25               88      96     104            .05       .1

BRIDGE


RIVER: Abbott Wash
REACH: AW                 RS: 3370

INPUT
Description: 2nd South Bridge
Distance from Upstream XS =      .1
Deck/Roadway Width        =     95
Weir Coefficient          =    2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*********************************************
   85.75    1584 1582.52  114.25    1584 1582.52

Upstream Bridge Cross Section Data
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************************
   85.75 1583.52   85.75 1573.52     100 1573.52  114.25 1573.52  114.25 1583.52

Manning's n Values        num=       1
     Sta   n Val
****************
   85.75    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
         85.75  114.25            .05       .1

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*********************************************
   85.75    1584 1581.74  114.25    1584 1581.74

Downstream Bridge Cross Section Data
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************************
   85.75 1582.74   85.75 1572.74     100 1572.74  114.25 1572.74  114.25 1582.74

Manning's n Values        num=       1
     Sta   n Val
****************
   85.75    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
         85.75  114.25            .05       .1

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         = 1584.95
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  1

Pier Data
Pier Station     Upstream=     100    Downstream=     100
Upstream     num=       2
    Width   Elev    Width   Elev
*********************************
     .67    1570     .67    1583
Downstream     num=       2
    Width   Elev    Width   Elev
*********************************
     .67    1570     .67    1583
Debris Width  =     2.67
Debris Height =        9

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Energy

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                 RS: 3324
```

INPUT
Description: Station: 33+24, End of 2nd South Bridge
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1582.74	85.75	1572.74	100	1572.74	114.25	1572.74	114.25	1582.74

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
85.75	114.25	117	122.3	127	.05	.1

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 3201.70

INPUT
Description: Station: 32+01.70, End Curve
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1582.04	85.75	1572.04	100	1571.76	114.25	1572.04	114.25	1582.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
85.75	114.25	101.7	101.7	101.7	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 3100

INPUT
Description: Station: 31+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1581.21	85.75	1571.21	100	1570.93	114.25	1571.21	114.25	1581.21

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 3000

INPUT
Description: Station: 30+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1580.41	85.75	1570.41	100	1570.13	114.25	1570.41	114.25	1580.41

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 2900

INPUT
Description: Station: 29+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1579.6	85.75	1569.6	100	1569.32	114.25	1569.6	114.25	1579.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 2800

INPUT

Description: Station: 28+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1578.79	85.75	1568.79	100	1568.51	114.25	1568.79	114.25	1578.79

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 2700

INPUT
Description: Station: 27+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1577.98	85.75	1567.98	100	1567.7	114.25	1567.98	114.25	1577.98

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 2600

INPUT
Description: Station: 26+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1577.17	85.75	1567.17	100	1566.89	114.25	1567.17	114.25	1577.17

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
85.75	114.25	68.54	68.54	68.54	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 2531.46

INPUT
Description: Station: 25+31.46 Begin Curve
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1576.62	85.75	1566.62	100	1566.34	114.25	1566.62	114.25	1576.62

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
85.75	114.25	114	112.38	109	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 2419.08

INPUT
Description: Station: 24+19.08 End Curve
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1575.71	85.75	1565.71	100	1565.43	114.25	1565.71	114.25	1575.71

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Channel	Right	Coeff Contr.	Expan.
85.75	114.25	119.08	119.08	119.08	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 2300

INPUT
Description: Station: 23+00

Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1574.75	85.75	1564.75	100	1564.47	114.25	1564.75	114.25	1574.75

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	118.78	118.78	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 2181.22

INPUT
Description: Station: 21+81.22 Begin Transition to Hafen Lane Culverts
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1573.79	85.75	1563.79	100	1563.51	114.25	1563.79	114.25	1573.79

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	.05	.1

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 2081.22

INPUT
Description: Station: 20+81.22 Begin Hafen Lane Culverts GB S=0.59%
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
70	1573	77	1570.7	77	1562.7	100	1562.7	123	1562.7
123	1570.7	130	1573						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
70	.025	77	.015	123	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
77	123	81.22	81.22	.05	.1

BRIDGE

RIVER: Abbott Wash
REACH: AW RS: 2080

INPUT
Description: Hafen Lane Culverts
Distance from Upstream XS = .1
Deck/Roadway Width = 81
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
77	1576	1570.7	123	1576	1570.7

Upstream Bridge Cross Section Data
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
77	1570.7	77	1562.7	123	1562.7	123	1570.7

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
77	.015	77	.015	123	.015	123	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
77	123	.05	.1

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
77	1576	1570.22	123	1576	1570.22

Downstream Bridge Cross Section Data
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
77	1570.22	77	1562.22	123	1562.22	123	1570.22

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
77	.015	77	.015	123	.015	123	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
77	123	.05	.1

```
Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =    1576
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  3

Pier Data
Pier Station     Upstream=   88.33    Downstream=   88.33
Upstream     num=       2
    Width   Elev    Width   Elev
*********************************
     .66    1560     .66    1573
Downstream     num=       2
    Width   Elev    Width   Elev
*********************************
     .66    1560     .66    1573
Debris Width  =     2.66
Debris Height =        8

Pier Data
Pier Station     Upstream=     100    Downstream=     100
Upstream     num=       2
    Width   Elev    Width   Elev
*********************************
     .66    1560     .66    1573
Downstream     num=       2
    Width   Elev    Width   Elev
*********************************
     .66    1560     .66    1573
Debris Width  =     2.66
Debris Height =        8

Pier Data
Pier Station     Upstream=  111.67    Downstream=  111.67
Upstream     num=       2
    Width   Elev    Width   Elev
*********************************
     .66    1560     .66    1573
Downstream     num=       2
    Width   Elev    Width   Elev
*********************************
     .66    1560     .66    1573
Debris Width  =     2.66
Debris Height =        8

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Energy

High Flow Method
       Energy Only

Additional Bridge Parameters
       Do not add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream water surface

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 2000

INPUT
Description: Station: 20+00,  End Hafen Lane Culverts  GB S=1.62%
Station Elevation Data    num=       7
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*************************************************************************************
       70     1573       77 1570.22       77 1562.22      100 1562.22      123 1562.22
      123 1570.22      130     1573

Manning's n Values        num=       3
     Sta    n Val      Sta    n Val      Sta    n Val
*************************************************
       70     .025       77     .015      123     .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             77     123                58      58      58            .05      .1

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 1942

INPUT
Description: Station: 19+42 Begin Contraction Transition
Station:  19+00
Station Elevation Data    num=       5
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
*************************************************************************************
       77 1571.56       77 1561.56      100 1561.28      123 1561.56      123 1571.56

Manning's n Values        num=       3
     Sta    n Val      Sta    n Val      Sta    n Val
*************************************************
       77     .025       77     .015      123     .025
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
            77     123              242     242     242            .05       .1

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 1700

INPUT
Description: Station: 17+00  End Contraction Transition
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   85.75 1567.66   85.75 1557.66     100 1557.38  114.25 1557.66  114.25 1567.66

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25             100     100     100               0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 1600

INPUT
Description: Station: 16+00  GB S=1.0%
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   85.75 1566.04   85.75 1556.04     100 1555.76  114.25 1556.04  114.25 1566.04

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25             100     100     100               0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 1500

INPUT
Description: Station: 15+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   85.75 1565.04   85.75 1555.04     100 1554.76  114.25 1555.04  114.25 1565.04

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25             100     100     100               0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 1400

INPUT
Description: Station: 14+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   85.75 1564.04   85.75 1554.04     100 1553.76  114.25 1554.04  114.25 1564.04

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
          85.75  114.25             100     100     100               0         0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                RS: 1300

INPUT
Description: Station: 13+00
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
   85.75 1563.04   85.75 1553.04     100 1552.76  114.25 1553.04  114.25 1563.04

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
   85.75    .025   85.75    .015  114.25    .025
```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
85.75 114.25 100 100 100 0 0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 1200

INPUT
Description: Station: 12+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1562.04	85.75	1552.04	100	1551.76	114.25	1552.04	114.25	1562.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
85.75 114.25 100 100 100 0 0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 1100

INPUT
Description: Station: 11+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1561.04	85.75	1551.04	100	1550.76	114.25	1551.04	114.25	1561.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
85.75 114.25 100 100 100 0 0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 1000

INPUT
Description: Station: 10+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1560.04	85.75	1550.04	100	1549.76	114.25	1550.04	114.25	1560.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.025	85.75	.015	114.25	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
85.75 114.25 100 100 100 0 0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 900

INPUT
Description: Station: 9+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1559.04	85.75	1549.04	100	1548.76	114.25	1549.04	114.25	1559.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.035	85.75	.015	114.25	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
85.75 114.25 100 100 100 0 0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 800

INPUT
Description: Station: 8+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
85.75	1558.04	85.75	1548.04	100	1547.76	114.25	1548.04	114.25	1558.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
85.75	.035	85.75	.015	114.25	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

```
        85.75  114.25                76      76      76              0        0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                  RS: 724

INPUT
Description: Station: 7+24 Begin Sewer Crossing
Station Elevation Data     num=        7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      80    1560   85.75  1559.8   85.75    1547     100    1547  114.25    1547
  114.25  1559.8     120    1560

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
      80    .035   85.75    .015  114.25    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         85.75  114.25                20      20      20            .05       .1

BRIDGE


RIVER: Abbott Wash
REACH: AW                  RS: 718

INPUT
Description: Sewer Crossing
Distance from Upstream XS =       .1
Deck/Roadway Width        =      19
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*************************************************
   85.75  1559.8    1556  114.25  1559.8    1556

Upstream Bridge Cross Section Data
Station Elevation Data     num=        7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      80    1560   85.75  1559.8   85.75    1547     100    1547  114.25    1547
  114.25  1559.8     120    1560

Manning's n Values         num=        4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
*****************************************************************
      80    .035   85.75    .015  114.25    .015  114.25    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
         85.75  114.25            .05       .1

Downstream  Deck/Roadway Coordinates
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*************************************************
   85.75  1559.8  1555.8  114.25  1559.8  1555.8

Downstream Bridge Cross Section Data
Station Elevation Data     num=        7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      80    1560   85.75  1559.8   85.75  1546.8     100  1546.8  114.25  1546.8
  114.25  1559.8     120    1560

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
      80    .035   85.75    .015  114.25    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
         85.75  114.25            .05       .1

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         = 1560.75
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  1

Pier Data
Pier Station     Upstream=     100    Downstream=     100
Upstream     num=        2
    Width   Elev    Width   Elev
*********************************
     .67    1545      .67    1558
Downstream     num=        2
    Width   Elev    Width   Elev
*********************************
     .67    1545      .67    1558
Debris Width  =     2.67
Debris Height =        9

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
      Energy
Selected Low Flow Methods = Energy
```

High Flow Method
Energy Only

Additional Bridge Parameters
Do not add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream water surface

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 704

INPUT
Description: Station: 7+04 End Sewer Crossing
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1560	85.75	1559.8	85.75	1546.8	100	1546.8	114.25	1546.8
114.25	1559.8	125	1560						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	56	56	.05	.1

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 648

INPUT
Description: Station: 6+48 GB: Slope = 0.50%
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76.75	1560	85.75	1556.52	85.75	1546.52	100	1546.24	114.25	1546.52
114.25	1556.52	123.25	1560						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76.75	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	48	48	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 600

INPUT
Description: Station: 6+00
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
74	1556.4	85.75	1556.28	85.75	1546.28	100	1546	114.25	1546.28
114.25	1556.28	126	1556.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
74	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 500

INPUT
Description: Station: 5+00
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
80	1555.9	85.75	1555.78	85.75	1545.78	100	1545.5	114.25	1545.78
114.25	1555.78	120	1556.04						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
80	.035	85.75	.015	114.25	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
85.75	114.25	100	100	0	0

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 400

INPUT
Description: Station: 4+00

```
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      80  1555.4   85.75 1555.28   85.75 1545.28     100    1545  114.25 1545.28
  114.25 1555.28     120 1555.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
***********************************************
      80    .035   85.75    .015  114.25    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         85.75  114.25               100     100     100              0       0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                 RS: 300

INPUT
Description: Station: 3+00
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      80 1554.92   85.75 1554.78   85.75 1544.78     100  1544.5  114.25 1544.78
  114.25 1554.78     120 1555.06

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
***********************************************
      80    .035   85.75    .015  114.25    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         85.75  114.25                75      75      75              0       0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                 RS: 225

INPUT
Description: Station: 2+25  End of Concrete Channel
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      80 1554.52   85.75  1554.4   85.75  1544.4     100 1544.12  114.25  1544.4
  114.25  1554.4     120 1554.66

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
***********************************************
      80    .035   85.75    .015  114.25    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         85.75  114.25                10      10      10              0       0

CROSS SECTION


RIVER: Abbott Wash
REACH: AW                 RS: 215

INPUT
Description: Station: 2+15
Station Elevation Data    num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      44    1553      73 1544.03     100 1544.03     127 1544.03     158    1554

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
***********************************************
      44    .045      44     .02     158    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          44     158                13      13      13              .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
      44      81    1553          F
     119     158    1553          F

INLINE STRUCTURE


RIVER: Abbott Wash
REACH: AW                 RS: 214

INPUT
Description: First Row of Engergy Dissipator Blocks
Distance from Upstream XS =       1
Deck/Roadway Width        =       2
Weir Coefficient          =       3
 Weir Embankment Coordinates    num =      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
      73    1544      88    1544      88 1545.53      97 1545.53      97    1544
     103    1544     103 1545.53     112 1545.53     112    1544     127    1544

Upstream Embankment side slope             =       0 horiz. to 1.0 vertical
Downstream Embankment side slope           =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins        =
Weir crest shape                           = Broad Crested
```

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 202

INPUT
Description: Station: 2+02
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1553	73	1543.92	100	1543.92	127	1543.92	158	1554

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.045	44	.02	158	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
44	158	3	3	.3	.5

INLINE STRUCTURE

RIVER: Abbott Wash
REACH: AW RS: 201

INPUT
Description: Second Row of Energy Dissipator Blocks
Second Row of Energy
Dissipator Blocks
Distance from Upstream XS = 1
Deck/Roadway Width = 2
Weir Coefficient = 3
Weir Embankment Coordinates num = 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
73	1543.85	80	1543.85	80	1545.42	89	1545.42	89	1543.85
95.5	1543.85	95.5	1545.42	104.5	1545.42	104.5	1543.85	111	1543.85
111	1545.42	120	1545.42	120	1543.85	127	1543.85		

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Weir crest shape = Broad Crested

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 199

INPUT
Description: Station: 1+99 (Grade Break, End of Energy Dissipator Blocks)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1553	73	1543.89	100	1543.89	127	1543.89	158	1554

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.045	44	.02	158	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
44	158	36	36	.3	.5

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 163

INPUT
Description: Station: 1+63 (End of 4:1 Flow Expansion)
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1553	73	1543.73	100	1543.73	127	1543.73	158	1554

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.045	44	.025	158	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
44	158	50	50	.3	.5

CROSS SECTION

RIVER: Abbott Wash
REACH: AW RS: 113

INPUT
Description: Station: 1+13 End of Improvements, Tie to Virgin River
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1553	73	1543.5	100	1543.5	127	1543.5	156	1553

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
*************************************************
      44    .045      44    .035     156    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            44     156                0       0       0              .3       .5

*******************************************************************************
```

SUMMARY OF MANNING'S N VALUES

River:Abbott Wash

Reach	River Sta.	n1	n2	n3
AW	8741.56	.03	.028	.03
AW	8641.56	.03	.028	.03
AW	8541.56	.03	.028	.03
AW	8441.56	.03	.028	.03
AW	8341.56	.03	.028	.03
AW	8241.56	.03	.028	.03
AW	8141.56	.03	.028	.03
AW	8091.56	.03	.028	.03
AW	8041.56	.03	.028	.03
AW	7991.56	.03	.025	.03
AW	7941.56	.015	.015	.015
AW	7900	Bridge		
AW	7611	.015	.015	.015
AW	7537.59	.015	.015	.015
AW	7476.58	.015	.015	.015
AW	7416.02	.015	.015	.015
AW	7358.36	.015	.015	.015
AW	7200	Bridge		
AW	6988.71	.015	.015	.015
AW	6840.4	.015	.015	.015
AW	6700	.025	.015	.025
AW	6600	.025	.015	.025
AW	6500	.025	.015	.025
AW	6400	.025	.015	.025
AW	6300	.025	.015	.025
AW	6200	.025	.015	.025
AW	6100	.025	.015	.025
AW	6000	.025	.015	.025
AW	5900	.025	.015	.025
AW	5800	.025	.015	.025
AW	5700	.025	.015	.025
AW	5600	.025	.015	.025
AW	5500	.025	.015	.025
AW	5400	.025	.015	.025
AW	5300	.025	.015	.025
AW	5200	.015	.015	.015
AW	5100	.015	.015	.015
AW	5092	Bridge		
AW	4991.79	.015	.015	.015
AW	4900	.015	.015	.015
AW	4800	.015	.015	.015
AW	4700	.015	.015	.015
AW	4600	.015	.015	.015
AW	4500	.015	.015	.015
AW	4400	.015	.015	.015
AW	4300	.025	.015	.025
AW	4200	.025	.015	.025
AW	4100	.025	.015	.025
AW	4000	.025	.015	.025
AW	3900	.025	.015	.025
AW	3800	.025	.015	.025
AW	3700	.025	.015	.025
AW	3600	.025	.015	.025
AW	3466.52	.025	.015	.025
AW	3420	.025	.015	.025
AW	3370	Bridge		
AW	3324	.025	.015	.025
AW	3201.70	.025	.015	.025
AW	3100	.025	.015	.025
AW	3000	.025	.015	.025
AW	2900	.025	.015	.025
AW	2800	.025	.015	.025
AW	2700	.025	.015	.025
AW	2600	.025	.015	.025
AW	2531.46	.025	.015	.025
AW	2419.08	.025	.015	.025
AW	2300	.025	.015	.025
AW	2181.22	.025	.015	.025
AW	2081.22	.025	.015	.025
AW	2080	Bridge		
AW	2000	.025	.015	.025
AW	1942	.025	.015	.025
AW	1700	.025	.015	.025
AW	1600	.025	.015	.025
AW	1500	.025	.015	.025
AW	1400	.025	.015	.025
AW	1300	.025	.015	.025
AW	1200	.025	.015	.025
AW	1100	.025	.015	.025
AW	1000	.025	.015	.025
AW	900	.035	.015	.035
AW	800	.035	.015	.035
AW	724	.035	.015	.035
AW	718	Bridge		
AW	704	.035	.015	.035
AW	648	.035	.015	.035
AW	600	.035	.015	.035
AW	500	.035	.015	.035
AW	400	.035	.015	.035
AW	300	.035	.015	.035
AW	225	.035	.015	.035
AW	215	.045	.02	.045

*AW	*	214	*Inl Struct*	*	*
*AW	*	202	* .045*	.02*	.045*
*AW	*	201	*Inl Struct*	*	*
*AW	*	199	* .045*	.02*	.045*
*AW	*	163	* .045*	.025*	.045*
*AW	*	113	* .045*	.035*	.045*

SUMMARY OF REACH LENGTHS

River: Abbott Wash

Reach	River Sta.	Left	Channel	Right
*AW	8741.56	100*	100*	100*
*AW	8641.56	100*	100*	100*
*AW	8541.56	100*	100*	100*
*AW	8441.56	100*	100*	100*
*AW	8341.56	100*	100*	100*
*AW	8241.56	100*	100*	101*
*AW	8141.56	50*	50*	50*
*AW	8091.56	50*	50*	50*
*AW	8041.56	50*	50*	50*
*AW	7991.56	50*	50*	50*
*AW	7941.56	330.57*	330.57*	330.57*
*AW	7900	*Bridge *	*	*
*AW	7611	73.41*	73.41*	73.41*
*AW	7537.59	58.88*	61*	62.68*
*AW	7476.58	58.87*	60.57*	62.68*
*AW	7416.02	57.66*	57.66*	57.66*
*AW	7358.36	380*	369.66*	361*
*AW	7200	*Bridge *	*	*
*AW	6988.71	140*	148.31*	156*
*AW	6840.4	140.4*	140.4*	140.4*
*AW	6700	100*	100*	100*
*AW	6600	100*	100*	100*
*AW	6500	100*	100*	100*
*AW	6400	100*	100*	100*
*AW	6300	100*	100*	100*
*AW	6200	100*	100*	100*
*AW	6100	100*	100*	100*
*AW	6000	100*	100*	100*
*AW	5900	100*	100*	100*
*AW	5800	100*	100*	100*
*AW	5700	100*	100*	100*
*AW	5600	100*	100*	100*
*AW	5500	100*	100*	100*
*AW	5400	100*	100*	100*
*AW	5300	100*	100*	100*
*AW	5200	100*	100*	100*
*AW	5100	108.21*	108.21*	108.21*
*AW	5092	*Bridge *	*	*
*AW	4991.79	91.79*	91.79*	91.79*
*AW	4900	103*	100*	97*
*AW	4800	103*	100*	97*
*AW	4700	102*	100*	98*
*AW	4600	103*	100*	97*
*AW	4500	100*	100*	100*
*AW	4400	100*	100*	100*
*AW	4300	100*	100*	100*
*AW	4200	100*	100*	100*
*AW	4100	100*	100*	100*
*AW	4000	100*	100*	100*
*AW	3900	100*	100*	100*
*AW	3800	100*	100*	100*
*AW	3700	100*	100*	100*
*AW	3600	133.48*	133.48*	133.48*
*AW	3466.52	45*	46.52*	48*
*AW	3420	88*	96*	104*
*AW	3370	*Bridge *	*	*
*AW	3324	117*	122.3*	127*
*AW	3201.70	101.7*	101.7*	101.7*
*AW	3100	100*	100*	100*
*AW	3000	100*	100*	100*
*AW	2900	100*	100*	100*
*AW	2800	100*	100*	100*
*AW	2700	100*	100*	100*
*AW	2600	68.54*	68.54*	68.54*
*AW	2531.46	114*	112.38*	109*
*AW	2419.08	119.08*	119.08*	119.08*
*AW	2300	118.78*	118.78*	118.78*
*AW	2181.22	100*	100*	100*
*AW	2081.22	81.22*	81.22*	81.22*
*AW	2080	*Bridge *	*	*
*AW	2000	58*	58*	58*
*AW	1942	242*	242*	242*
*AW	1700	100*	100*	100*
*AW	1600	100*	100*	100*
*AW	1500	100*	100*	100*
*AW	1400	100*	100*	100*
*AW	1300	100*	100*	100*
*AW	1200	100*	100*	100*
*AW	1100	100*	100*	100*
*AW	1000	100*	100*	100*
*AW	900	100*	100*	100*
*AW	800	76*	76*	76*
*AW	724	20*	20*	20*
*AW	718	*Bridge *	*	*
*AW	704	56*	56*	56*
*AW	648	48*	48*	48*
*AW	600	100*	100*	100*
*AW	500	100*	100*	100*
*AW	400	100*	100*	100*
*AW	300	75*	75*	75*

*AW	*	225	*	10*	10*	10*
*AW	*	215	*	13*	13*	13*
*AW	*	214	*Inl Struct*		*	*
*AW	*	202	*	3*	3*	3*
*AW	*	201	*Inl Struct*		*	*
*AW	*	199	*	36*	36*	36*
*AW	*	163	*	50*	50*	50*
*AW	*	113	*	0*	0*	0*

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Abbott Wash

Reach	River Sta.	Contr.	Expan.
*AW	8741.56	.1	.3
*AW	8641.56	.1	.3
*AW	8541.56	.1	.3
*AW	8441.56	.1	.3
*AW	8341.56	.1	.3
*AW	8241.56	.1	.3
*AW	8141.56	.1	.3
*AW	8091.56	.1	.3
*AW	8041.56	.1	.3
*AW	7991.56	.1	.3
*AW	7941.56	.1	.3
*AW	7900	Bridge	
*AW	7611	.05	.1
*AW	7537.59	.05	.1
*AW	7476.58	.05	.1
*AW	7416.02	.05	.05
*AW	7358.36	.05	.05
*AW	7200	Bridge	
*AW	6988.71	.05	.1
*AW	6840.4	0	0
*AW	6700	0	0
*AW	6600	0	0
*AW	6500	0	0
*AW	6400	0	0
*AW	6300	0	0
*AW	6200	0	0
*AW	6100	0	0
*AW	6000	0	0
*AW	5900	0	0
*AW	5800	0	0
*AW	5700	0	0
*AW	5600	0	0
*AW	5500	0	0
*AW	5400	0	0
*AW	5300	0	0
*AW	5200	0	0
*AW	5100	.05	.1
*AW	5092	Bridge	
*AW	4991.79	.05	.1
*AW	4900	0	0
*AW	4800	0	0
*AW	4700	0	0
*AW	4600	0	0
*AW	4500	0	0
*AW	4400	0	0
*AW	4300	0	0
*AW	4200	0	0
*AW	4100	0	0
*AW	4000	0	0
*AW	3900	0	0
*AW	3800	0	0
*AW	3700	0	0
*AW	3600	0	0
*AW	3466.52	0	0
*AW	3420	.05	.1
*AW	3370	Bridge	
*AW	3324	.05	.1
*AW	3201.70	0	0
*AW	3100	0	0
*AW	3000	0	0
*AW	2900	0	0
*AW	2800	0	0
*AW	2700	0	0
*AW	2600	0	0
*AW	2531.46	0	0
*AW	2419.08	0	0
*AW	2300	0	0
*AW	2181.22	.05	.1
*AW	2081.22	.05	.1
*AW	2080	Bridge	
*AW	2000	.05	.1
*AW	1942	.05	.1
*AW	1700	0	0
*AW	1600	0	0
*AW	1500	0	0
*AW	1400	0	0
*AW	1300	0	0
*AW	1200	0	0
*AW	1100	0	0
*AW	1000	0	0
*AW	900	0	0
*AW	800	0	0
*AW	724	.05	.1
*AW	718	Bridge	
*AW	704	.05	.1
*AW	648	0	0
*AW	600	0	0
*AW	500	0	0

*AW	*	400	*	0* 0*
*AW	*	300	*	0* 0*
*AW	*	225	*	0* 0*
*AW	*	215	*	.3* .5*
*AW	*	214	*Inl Struct*	*
*AW	*	202	*	.3* .5*
*AW	*	201	*Inl Struct*	*
*AW	*	199	*	.3* .5*
*AW	*	163	*	.3* .5*
*AW	*	113	*	.3* .5*

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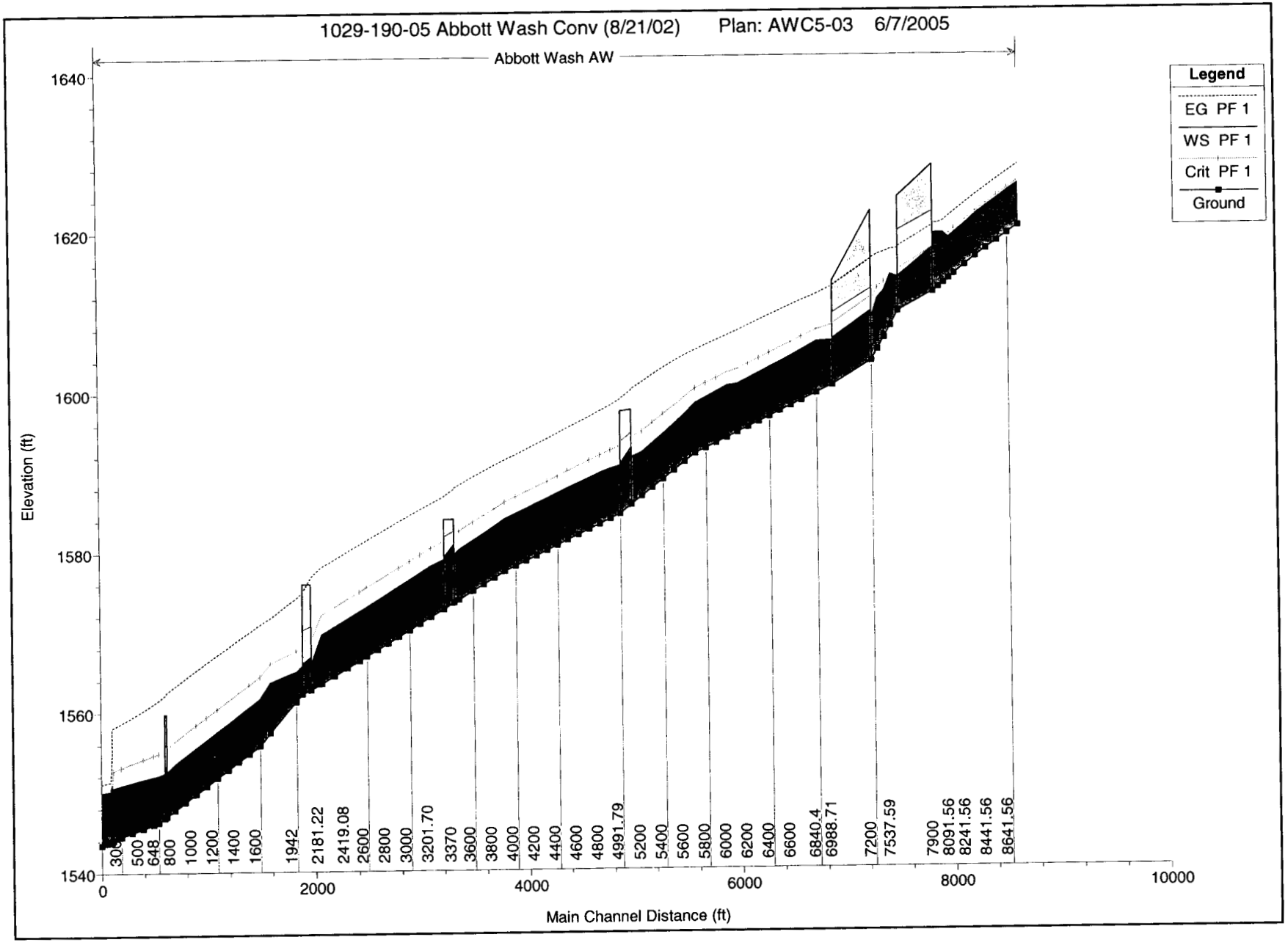
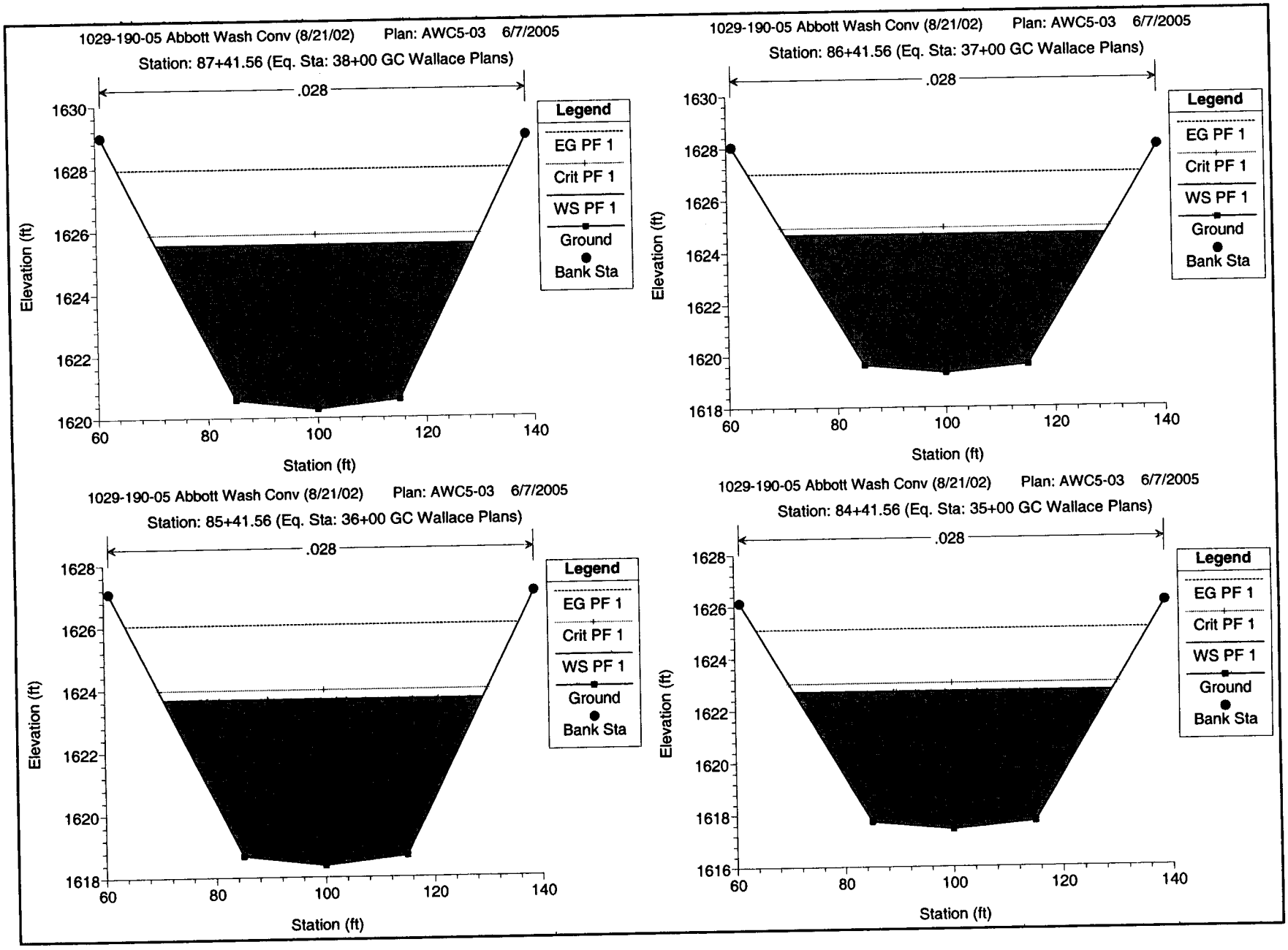

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Abbott Wash AW
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
1640
1620
1600
1580
1560
1540
0
2000
4000
6000
8000
10000
Main Channel Distance (ft)
300
500
648
800
1000
1200
1400
1600
1942
2181.22
2419.08
2600
2800
3000
3201.70
3370
3600
3800
4000
4200
4400
4600
4800
4991.79
5200
5400
5600
5800
6000
6200
6400
6600
6840.4
6988.71
7200
7537.59
7900
8091.56
8241.56
8441.56
8641.56

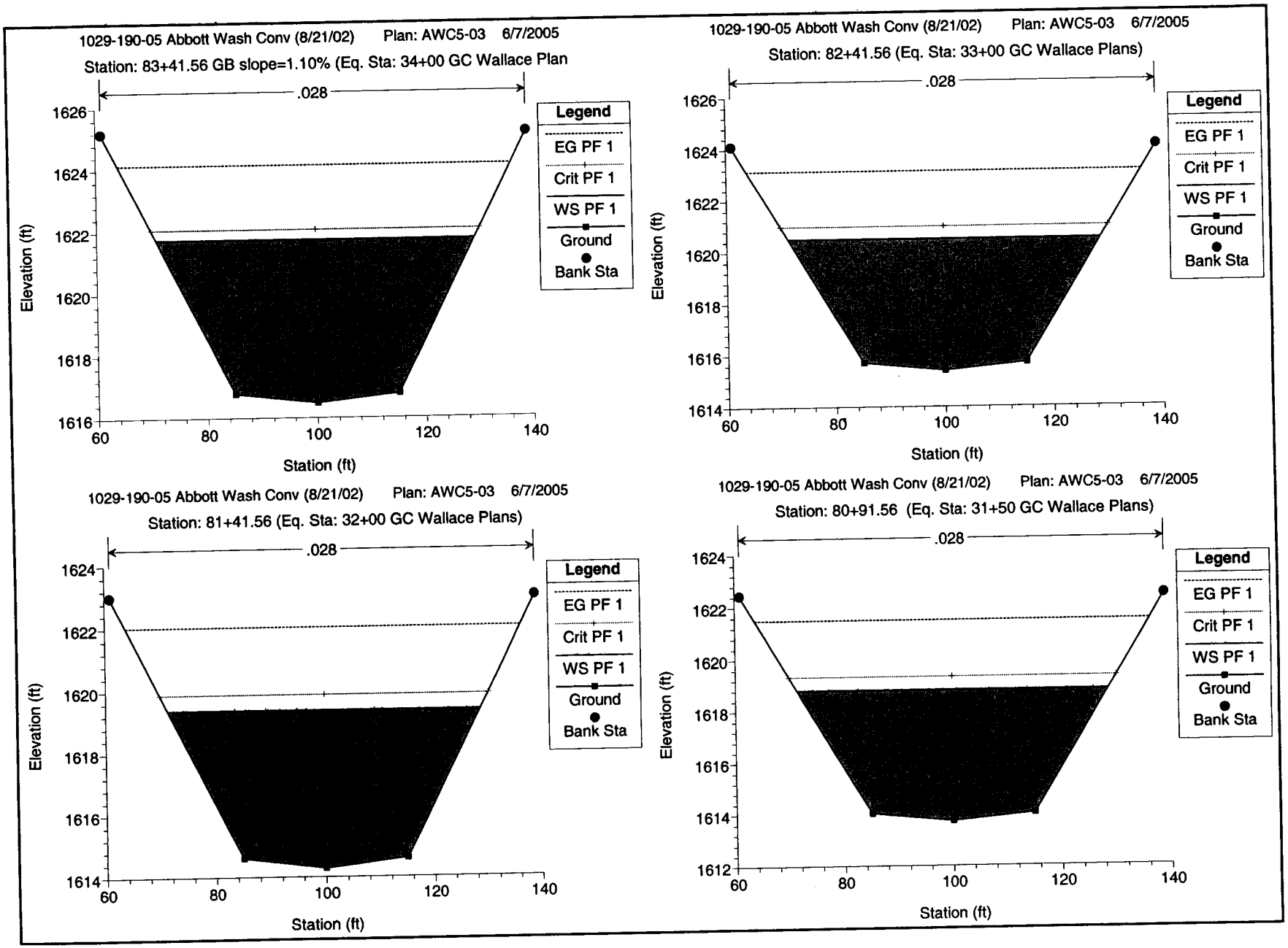
HEC-RAS Plan: AWC5-03 River: Abbott Wash Reach: AW Profile: PF 1

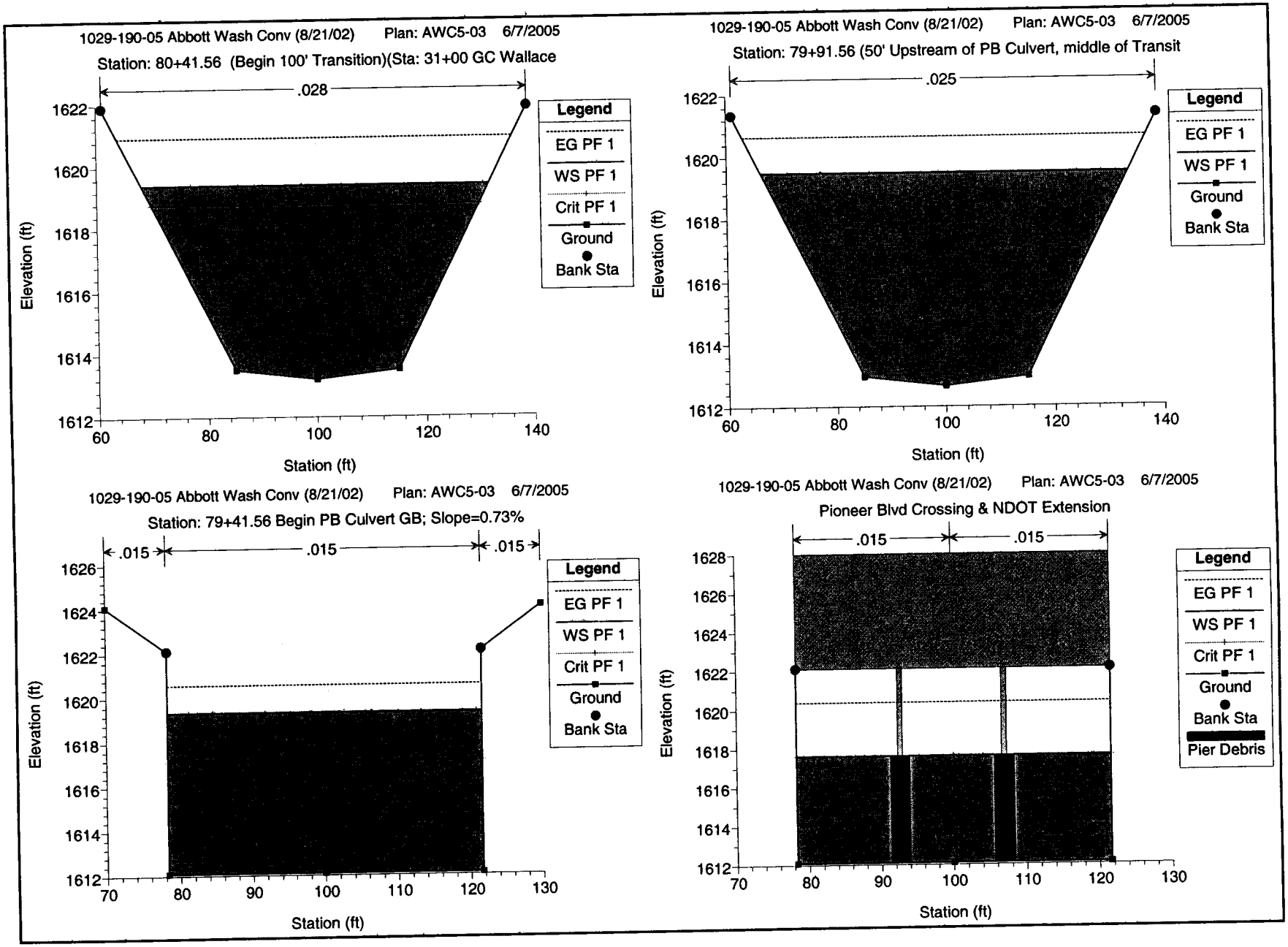
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
AW	8741.56	PF 1	2790.00	1620.28	1625.55	1625.87	1627.96	0.009507	12.45	224.17	58.40	1.12
AW	8641.56	PF 1	2790.00	1619.33	1624.65	1624.92	1626.99	0.009159	12.28	227.16	58.69	1.10
AW	8541.56	PF 1	2790.00	1618.38	1623.66	1623.97	1626.05	0.009428	12.41	224.84	58.47	1.12
AW	8441.56	PF 1	2790.00	1617.43	1622.70	1623.02	1625.11	0.009523	12.45	224.04	58.39	1.12
AW	8341.56	PF 1	2790.00	1616.48	1621.75	1622.07	1624.16	0.009505	12.44	224.19	58.40	1.12
AW	8241.56	PF 1	2790.00	1615.39	1620.50	1620.99	1623.13	0.010792	13.02	214.29	57.41	1.19
AW	8141.56	PF 1	2790.00	1614.29	1619.39	1619.89	1622.03	0.010893	13.06	213.59	57.34	1.19
AW	8091.56	PF 1	2790.00	1613.74	1618.81	1619.33	1621.49	0.011055	13.13	212.50	57.25	1.20
AW	8041.56	PF 1	2790.00	1613.20	1619.42	1618.79	1620.94	0.004996	9.89	281.98	63.81	0.83
AW	7991.56	PF 1	2790.00	1612.65	1619.49		1620.65	0.002737	8.65	322.63	67.35	0.70
AW	7941.56	PF 1	2790.00	1612.10	1619.34	1617.15	1620.57	0.000843	8.89	313.97	43.34	0.58
AW	7900		Bridge									
AW	7611	PF 1	2790.00	1609.70	1613.95	1614.73	1617.51	0.004319	15.15	184.11	43.34	1.30
AW	7537.59	PF 1	3334.00	1607.90	1614.25	1614.25	1617.39	0.002614	14.21	234.60	37.76	1.00
AW	7476.58	PF 1	3334.00	1606.40	1612.24	1613.34	1617.09	0.004593	17.66	188.76	33.10	1.30
AW	7416.02	PF 1	3334.00	1604.92	1611.28	1612.57	1616.77	0.005054	18.80	177.37	28.50	1.33
AW	7358.36	PF 1	3334.00	1603.50	1608.83	1611.01	1616.31	0.008044	21.94	151.97	28.50	1.67
AW	7200		Bridge									
AW	6988.71	PF 1	3334.00	1600.50	1606.11	1608.01	1612.87	0.006938	20.87	159.75	28.50	1.55
AW	6840.4	PF 1	3520.00	1599.52	1606.01	1607.46	1611.89	0.005319	19.46	180.88	28.50	1.36
AW	6700	PF 1	3520.00	1598.60	1604.93	1606.53	1611.11	0.005724	19.95	176.40	28.50	1.41
AW	6600	PF 1	3520.00	1597.94	1604.20	1605.87	1610.53	0.005919	20.18	174.40	28.50	1.44
AW	6500	PF 1	3520.00	1597.28	1603.49	1605.21	1609.92	0.006073	20.36	172.88	28.50	1.46
AW	6400	PF 1	3520.00	1596.62	1602.79	1604.55	1609.31	0.006192	20.50	171.73	28.50	1.47
AW	6300	PF 1	3520.00	1595.96	1602.09	1603.89	1608.69	0.006301	20.62	170.71	28.50	1.48
AW	6200	PF 1	3520.00	1595.30	1601.41	1603.23	1608.06	0.006377	20.70	170.02	28.50	1.49
AW	6100	PF 1	3520.00	1594.64	1600.73	1602.57	1607.42	0.006432	20.76	169.52	28.50	1.50
AW	6000	PF 1	3670.00	1593.98	1600.50	1602.13	1606.82	0.005684	20.17	181.95	28.50	1.41
AW	5900	PF 1	3670.00	1593.32	1599.77	1601.47	1606.24	0.005892	20.42	179.73	28.50	1.43
AW	5800	PF 1	3670.00	1592.66	1599.05	1600.81	1605.64	0.006048	20.60	178.12	28.50	1.45
AW	5700	PF 1	3670.00	1592.00	1598.35	1600.15	1605.03	0.006170	20.74	176.91	28.50	1.47
AW	5600	PF 1	3670.00	1590.94	1596.99	1599.09	1604.37	0.007135	21.80	168.36	28.50	1.58
AW	5500	PF 1	3670.00	1589.88	1595.73	1598.03	1603.62	0.007874	22.54	162.82	28.50	1.66
AW	5400	PF 1	3670.00	1588.82	1594.54	1596.97	1602.81	0.008437	23.07	159.05	28.50	1.72
AW	5300	PF 1	3670.00	1587.76	1593.39	1595.91	1601.94	0.008868	23.47	156.40	28.50	1.77
AW	5200	PF 1	3670.00	1586.70	1592.26	1594.85	1601.03	0.009216	23.77	154.38	28.50	1.80
AW	5100	PF 1	4000.00	1585.64	1591.63	1594.13	1600.17	0.008232	23.45	170.57	28.50	1.69
AW	5092		Bridge									
AW	4991.79	PF 1	4000.00	1584.50	1590.56	1592.98	1598.89	0.007945	23.17	172.64	28.50	1.66
AW	4900	PF 1	4000.00	1583.90	1590.22	1592.49	1598.15	0.007339	22.61	176.95	28.50	1.60
AW	4800	PF 1	4000.00	1583.25	1589.67	1591.87	1597.43	0.007100	22.37	178.84	28.50	1.57
AW	4700	PF 1	4000.00	1582.60	1589.05	1591.22	1596.73	0.006983	22.24	179.87	28.50	1.56
AW	4600	PF 1	4000.00	1581.95	1588.43	1590.57	1596.04	0.006887	22.13	180.72	28.50	1.55
AW	4500	PF 1	4000.00	1581.30	1587.81	1589.92	1595.35	0.006810	22.05	181.42	28.50	1.54
AW	4400	PF 1	4000.00	1580.65	1587.18	1589.27	1594.68	0.006747	21.98	182.00	28.50	1.53
AW	4300	PF 1	4000.00	1580.00	1586.54	1588.62	1594.01	0.006697	21.92	182.46	28.50	1.53
AW	4200	PF 1	4000.00	1579.35	1585.91	1587.97	1593.34	0.006657	21.88	182.84	28.50	1.52
AW	4100	PF 1	4000.00	1578.70	1585.27	1587.32	1592.67	0.006625	21.84	183.14	28.50	1.52
AW	4000	PF 1	4000.00	1578.05	1584.63	1586.67	1592.01	0.006599	21.81	183.39	28.50	1.52
AW	3900	PF 1	4000.00	1577.40	1583.98	1586.02	1591.35	0.006579	21.79	183.58	28.50	1.51
AW	3800	PF 1	4000.00	1576.59	1583.07	1585.21	1590.68	0.006891	22.14	180.69	28.50	1.55
AW	3700	PF 1	4000.00	1575.78	1582.19	1584.40	1589.98	0.007135	22.40	178.54	28.50	1.58
AW	3600	PF 1	4000.00	1574.98	1581.34	1583.60	1589.25	0.007300	22.58	177.15	28.50	1.60
AW	3486.52	PF 1	4000.00	1573.90	1580.20	1582.51	1588.26	0.007490	22.78	175.61	28.50	1.62
AW	3420	PF 1	4000.00	1573.52	1579.59	1581.99	1587.90	0.007914	23.14	172.87	28.50	1.66
AW	3370		Bridge									
AW	3324	PF 1	4000.00	1572.74	1578.99	1581.22	1586.82	0.007237	22.44	178.22	28.50	1.58
AW	3201.70	PF 1	4000.00	1571.76	1578.18	1580.38	1585.93	0.007078	22.34	179.03	28.50	1.57
AW	3100	PF 1	4000.00	1570.93	1577.29	1579.55	1585.20	0.007288	22.57	177.26	28.50	1.59
AW	3000	PF 1	4000.00	1570.13	1576.45	1578.75	1584.46	0.007425	22.71	176.13	28.50	1.61
AW	2900	PF 1	4000.00	1569.32	1575.60	1577.94	1583.71	0.007556	22.85	175.08	28.50	1.62
AW	2800	PF 1	4000.00	1568.51	1574.76	1577.13	1582.95	0.007661	22.95	174.26	28.50	1.64
AW	2700	PF 1	4000.00	1567.70	1573.93	1576.32	1582.18	0.007765	23.06	173.46	28.50	1.65
AW	2600	PF 1	4000.00	1566.89	1573.10	1575.51	1581.41	0.007842	23.14	172.88	28.50	1.66
AW	2531.46	PF 1	4000.00	1566.34	1572.54	1574.96	1580.87	0.007869	23.17	172.67	28.50	1.66
AW	2419.08	PF 1	4000.00	1565.43	1571.61	1574.05	1579.99	0.007924	23.22	172.26	28.50	1.66
AW	2300	PF 1	4000.00	1564.47	1570.65	1573.09	1579.04	0.007958	23.25	172.01	28.50	1.67
AW	2181.22	PF 1	4000.00	1563.51	1569.68	1572.13	1578.10	0.007988	23.28	171.79	28.50	1.67
AW	2081.22	PF 1	4000.00	1562.70	1565.99	1568.85	1576.84	0.017388	26.43	151.34	46.00	2.57
AW	2080		Bridge									
AW	2000	PF 1	4000.00	1562.22	1565.81	1568.39	1574.93	0.013218	24.23	165.05	46.00	2.25
AW	1942	PF 1	4000.00	1561.28	1565.00	1567.58	1574.16	0.013209	24.28	164.73	46.00	2.26
AW	1700	PF 1	4000.00	1557.38	1563.71	1566.00	1571.70	0.007401	22.69	176.33	28.50	1.61
AW	1600	PF 1	4000.00	1555.76	1561.66	1564.38	1570.88	0.009135	24.37	164.13	28.50	1.79
AW	1500	PF 1	4000.00	1554.76	1560.62	1563.38	1569.96	0.009300	24.52	163.13	28.50	1.81
AW	1400	PF 1	4000.00	1553.76	1559.60	1562.38	1569.02	0.009428	24.63	162.38	28.50	1.82

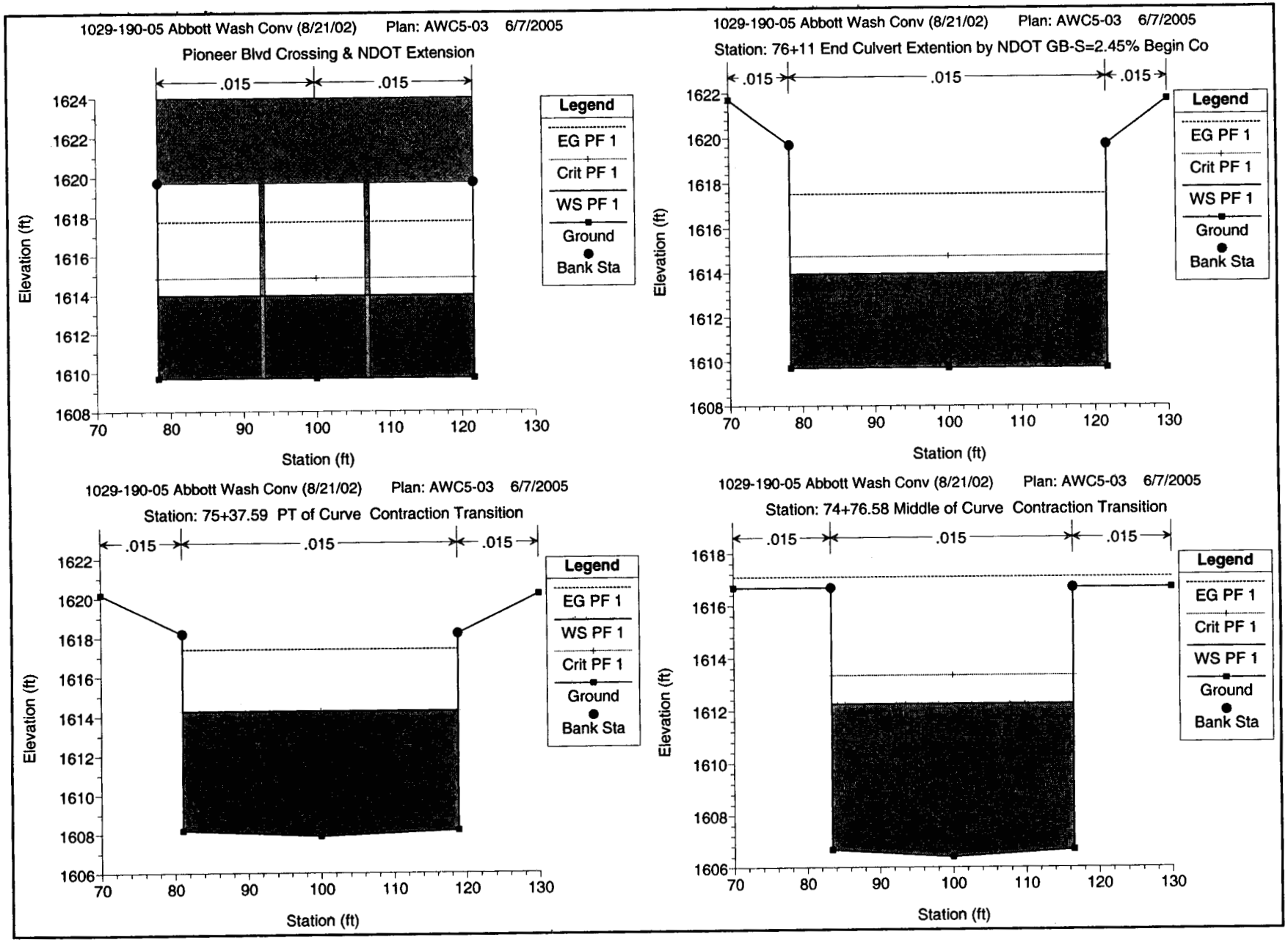
HEC-RAS Plan: AWC5-03 River: Abbott Wash Reach: AW Profile: PF 1 (Continued)

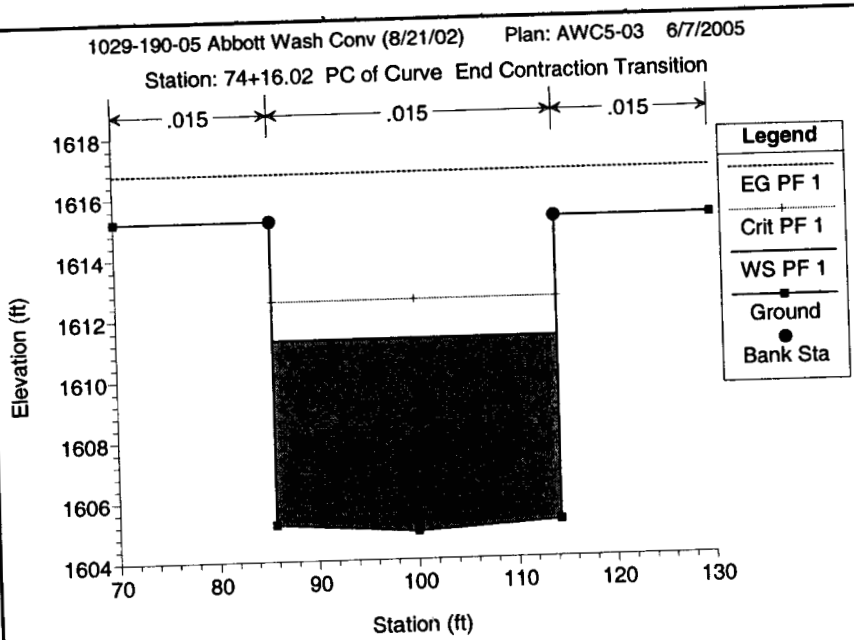
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
AW	1300	PF 1	4000.00	1552.76	1558.58	1561.38	1568.07	0.009535	24.73	161.76	28.50	1.83
AW	1200	PF 1	4000.00	1551.76	1557.56	1560.38	1567.11	0.009622	24.80	161.27	28.50	1.84
AW	1100	PF 1	4000.00	1550.76	1556.54	1559.38	1566.15	0.009711	24.88	160.76	28.50	1.85
AW	1000	PF 1	4000.00	1549.76	1555.53	1558.38	1565.19	0.009776	24.94	160.40	28.50	1.85
AW	900	PF 1	4000.00	1548.76	1554.52	1557.38	1564.21	0.009825	24.98	160.13	28.50	1.86
AW	800	PF 1	4000.00	1547.76	1553.51	1556.36	1563.23	0.009862	25.01	159.92	28.50	1.86
AW	724	PF 1	4000.00	1547.00	1552.56	1555.47	1562.46	0.010243	25.26	158.38	28.50	1.89
AW	718		Bridge									
AW	704	PF 1	4000.00	1546.80	1552.44	1555.26	1562.06	0.009819	24.90	160.66	28.50	1.85
AW	648	PF 1	4000.00	1546.24	1552.08	1554.86	1561.50	0.009437	24.64	162.33	28.50	1.82
AW	600	PF 1	4000.00	1546.00	1551.93	1554.62	1561.06	0.009011	24.26	164.89	28.50	1.78
AW	500	PF 1	4000.00	1545.50	1551.60	1554.12	1560.21	0.008256	23.55	169.87	28.50	1.70
AW	400	PF 1	4000.00	1545.00	1551.26	1553.62	1559.42	0.007631	22.92	174.49	28.50	1.63
AW	300	PF 1	4000.00	1544.50	1550.91	1553.13	1558.69	0.007115	22.38	178.72	28.50	1.58
AW	225	PF 1	4000.00	1544.12	1550.63	1552.75	1558.17	0.006797	22.03	181.54	28.50	1.54
AW	215	PF 1	4000.00	1544.03	1548.21	1551.01	1558.06	0.017088	25.19	158.77	80.50	2.17
AW	214		Inl Struct									
AW	202	PF 1	4000.00	1543.92	1550.63	1548.92	1551.61	0.001296	7.95	503.07	96.04	0.61
AW	201		Inl Struct									
AW	199	PF 1	4000.00	1543.89	1550.19		1551.34	0.001631	8.62	464.10	93.36	0.68
AW	163	PF 1	4000.00	1543.73	1550.14		1551.25	0.002405	8.47	472.44	93.40	0.66
AW	113	PF 1	4000.00	1543.50	1550.00	1548.50	1551.08	0.004500	8.34	479.66	93.66	0.65

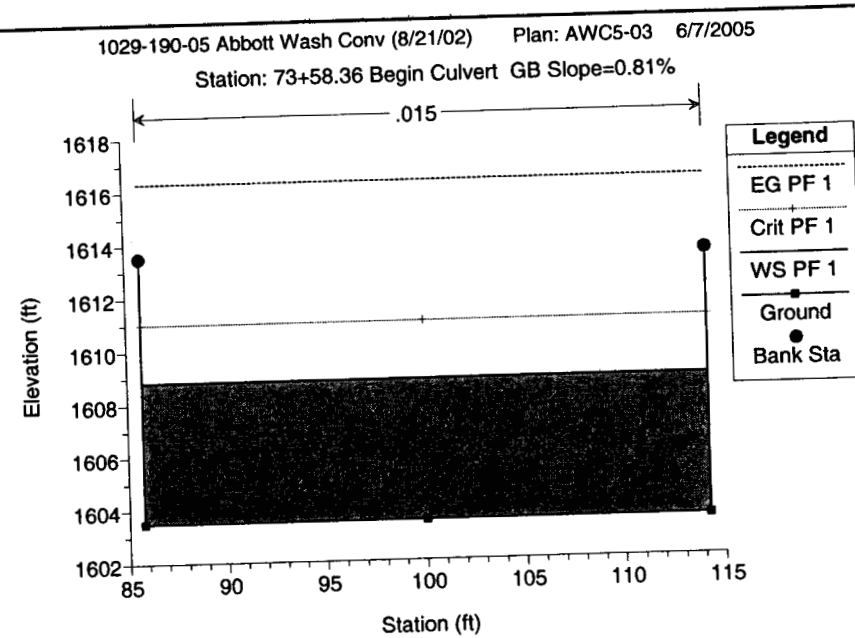

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 87+41.56 (Eq. Sta: 38+00 GC Wallace Plans)
.028
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 86+41.56 (Eq. Sta: 37+00 GC Wallace Plans)
.028
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 85+41.56 (Eq. Sta: 36+00 GC Wallace Plans)
.028
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 84+41.56 (Eq. Sta: 35+00 GC Wallace Plans)
.028
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

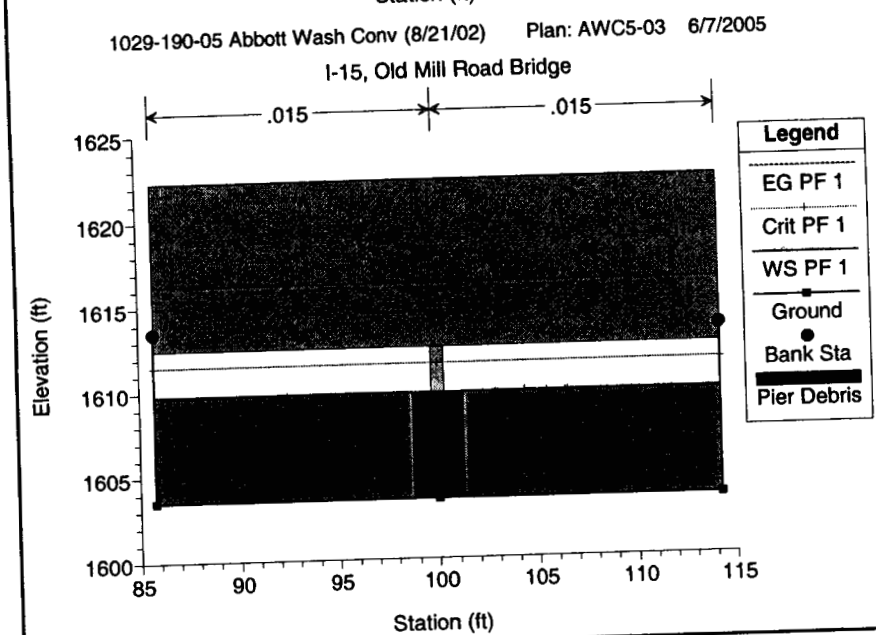

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 83+41.56 GB slope=1.10% (Eq. Sta: 34+00 GC Wallace Plan
.028
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 82+41.56 (Eq. Sta: 33+00 GC Wallace Plans)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 81+41.56 (Eq. Sta: 32+00 GC Wallace Plans)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 80+91.56 (Eq. Sta: 31+50 GC Wallace Plans)

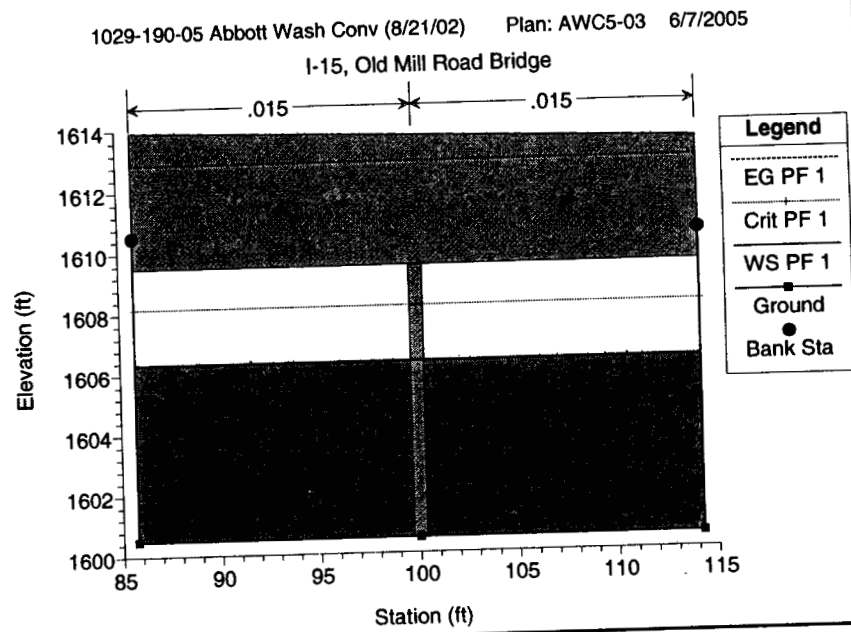

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 80+41.56 (Begin 100' Transition)(Sta: 31+00 GC Wallace
.028
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 79+91.56 (50' Upstream of PB Culvert, middle of Transit
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 79+41.56 Begin PB Culvert GB; Slope=0.73%
.015
.015
.015
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Pioneer Blvd Crossing & NDOT Extension
.015
.015
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)

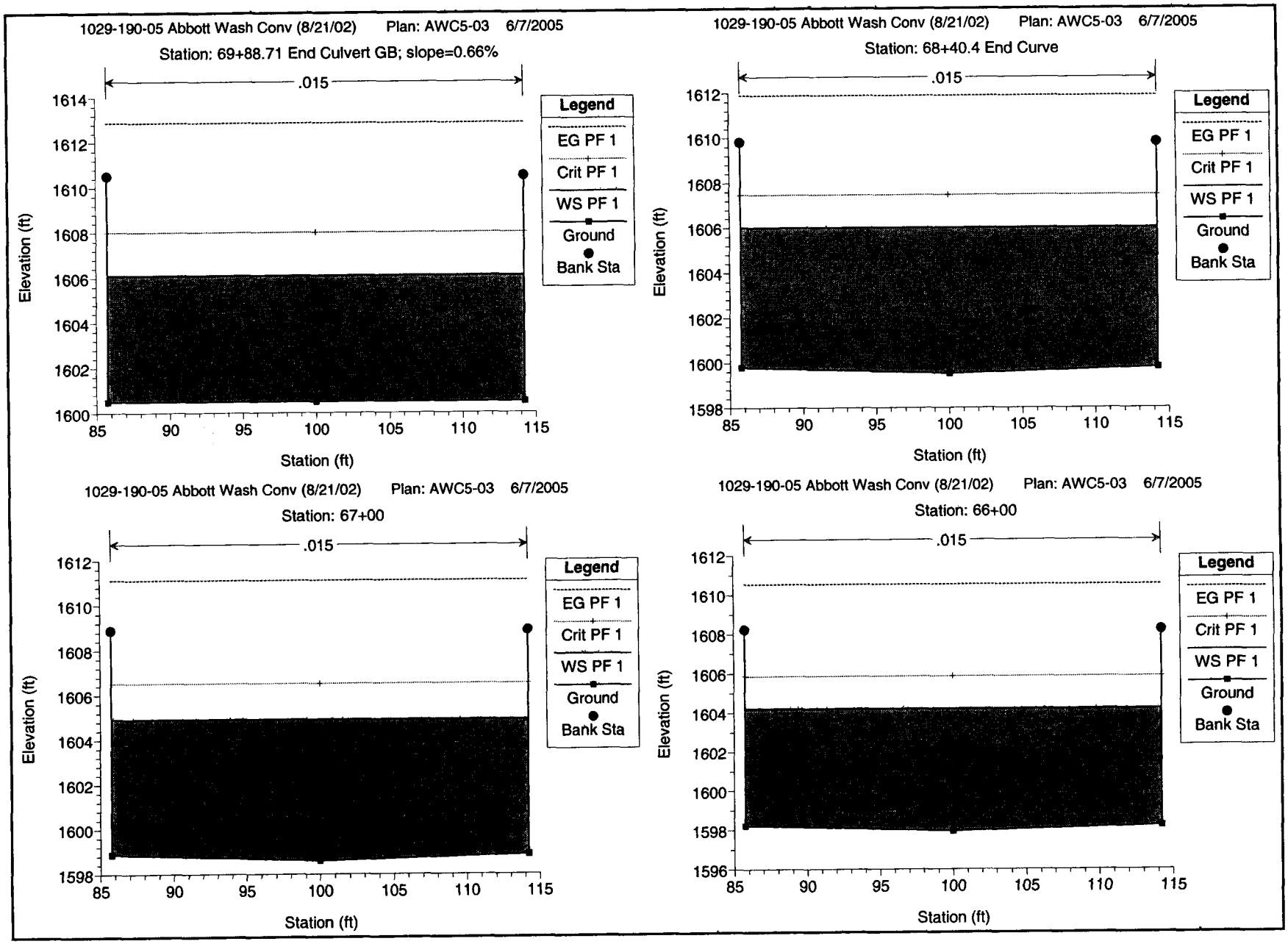

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Pioneer Blvd Crossing & NDOT Extension
.015
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1624
1622
1620
1618
1616
1614
1612
1610
1608
70
80
90
100
110
120
130
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 76+11 End Culvert Extention by NDOT GB-S=2.45% Begin Co
.015
.015
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1622
1620
1618
1616
1614
1612
1610
1608
70
80
90
100
110
120
130
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 75+37.59 PT of Curve Contraction Transition
.015
.015
.015
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1622
1620
1618
1616
1614
1612
1610
1608
1606
70
80
90
100
110
120
130
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 74+76.58 Middle of Curve Contraction Transition
.015
.015
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1618
1616
1614
1612
1610
1608
1606
70
80
90
100
110
120
130

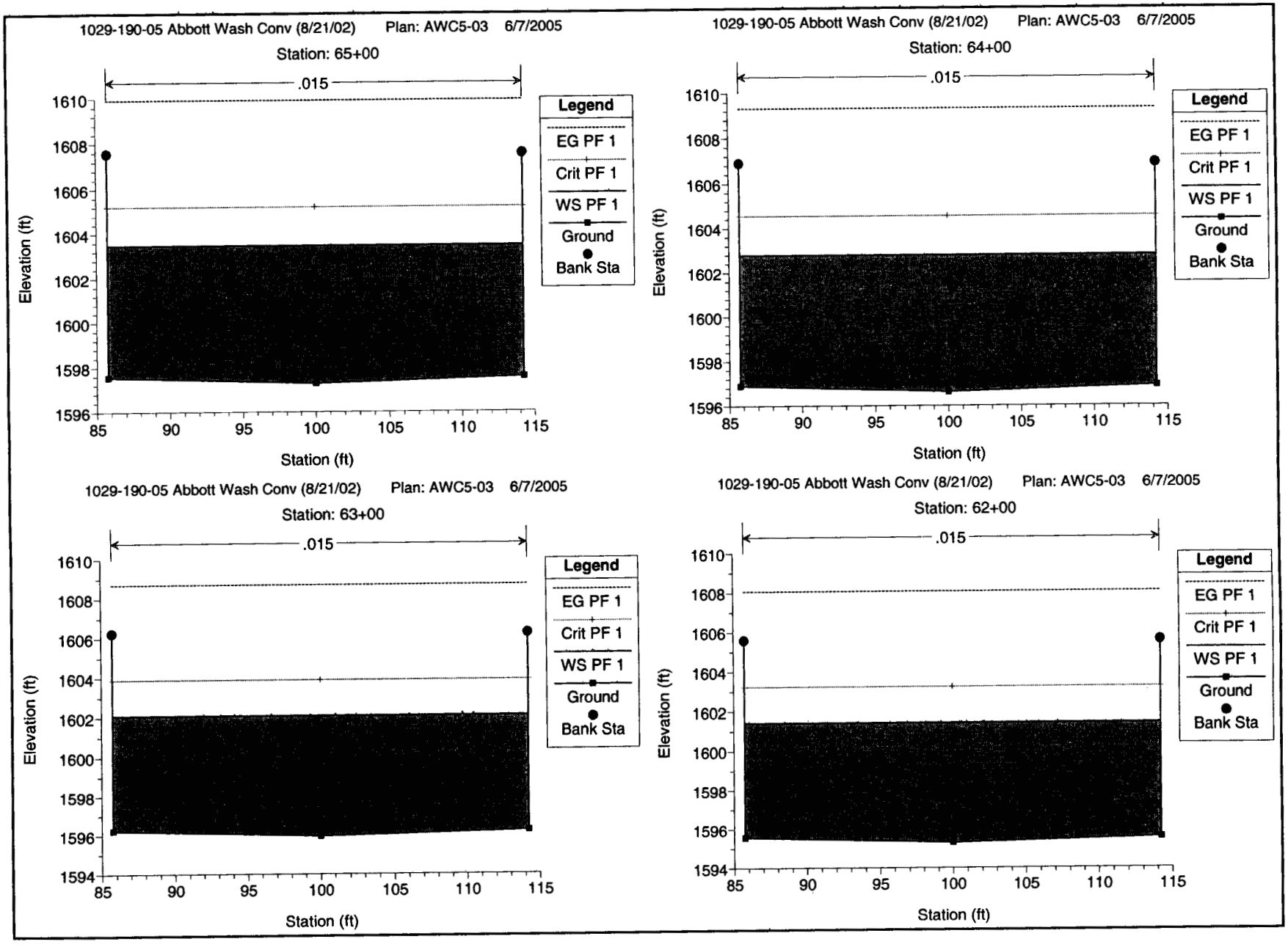

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 74+16.02 PC of Curve End Contraction Transition
.015
.015
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

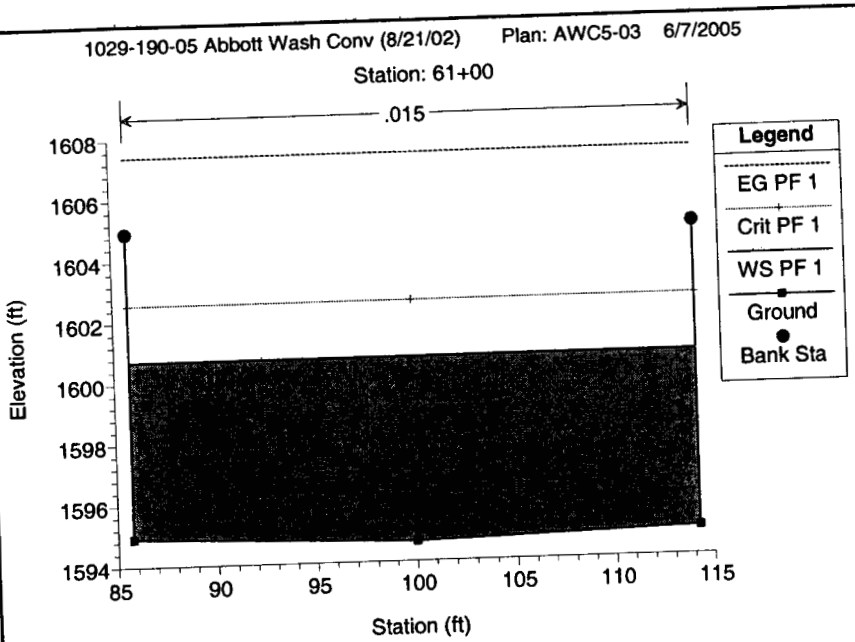

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 73+58.36 Begin Culvert GB Slope=0.81%
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

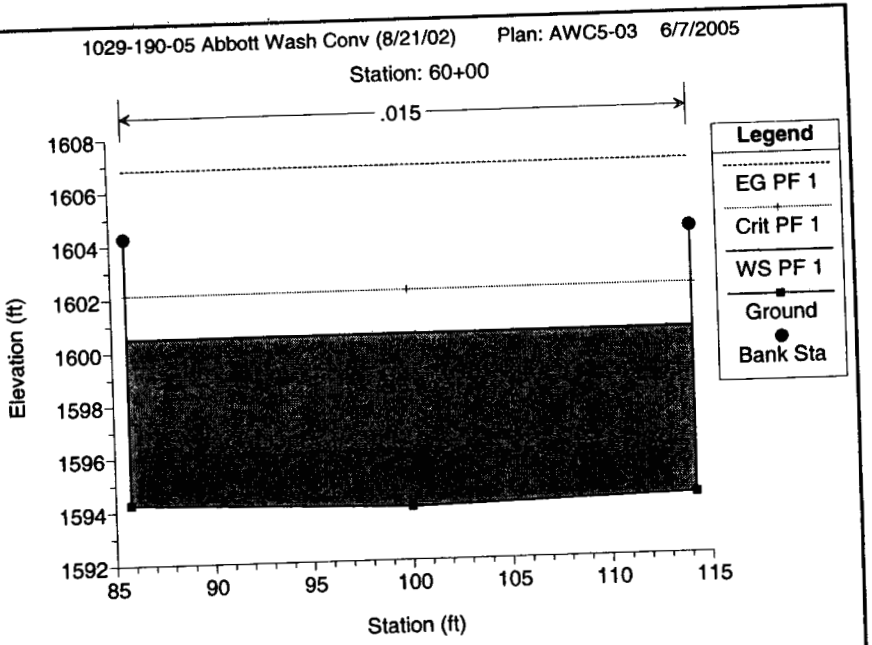

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
I-15, Old Mill Road Bridge
.015
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)

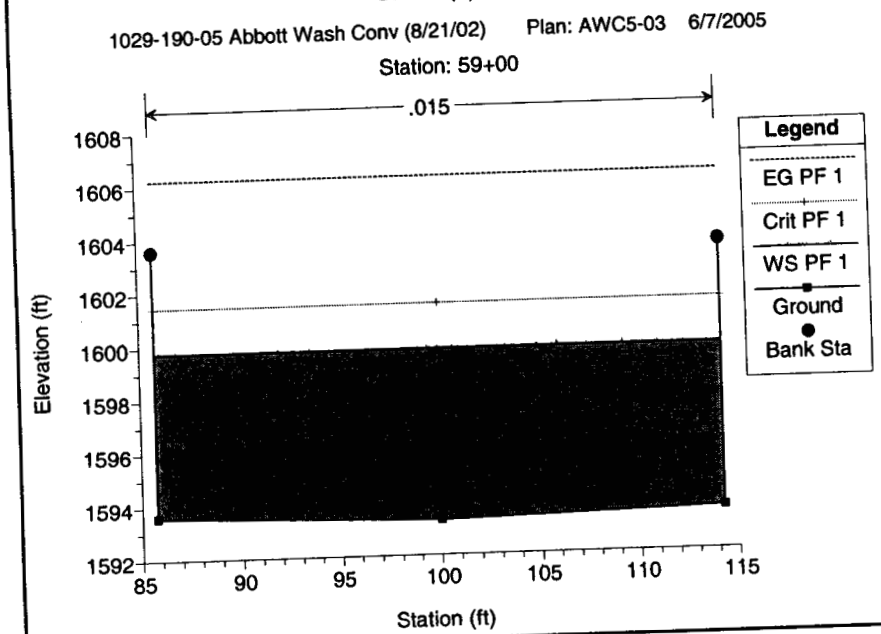

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
I-15, Old Mill Road Bridge
.015
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

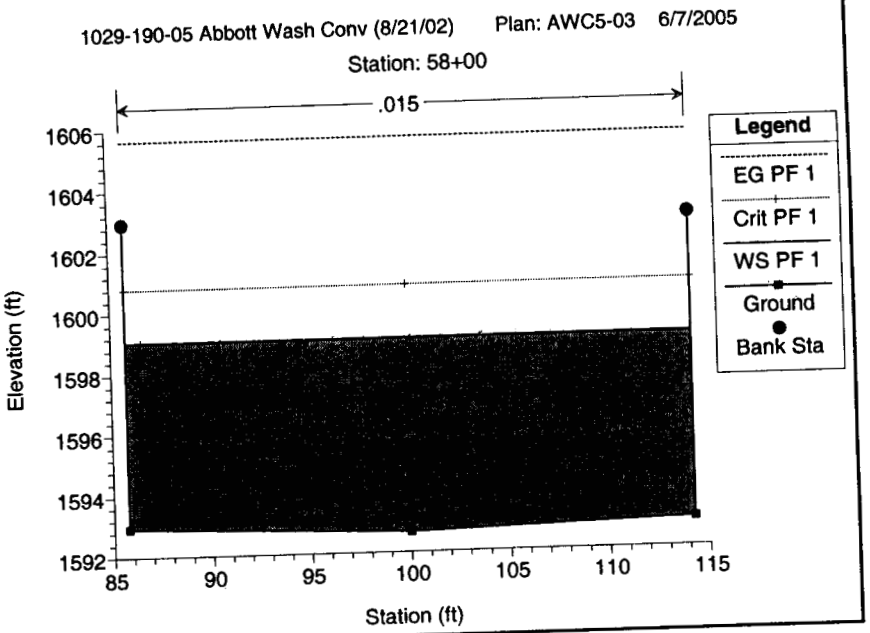

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 69+88.71 End Culvert GB; slope=0.66%
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 68+40.4 End Curve
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 67+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 66+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

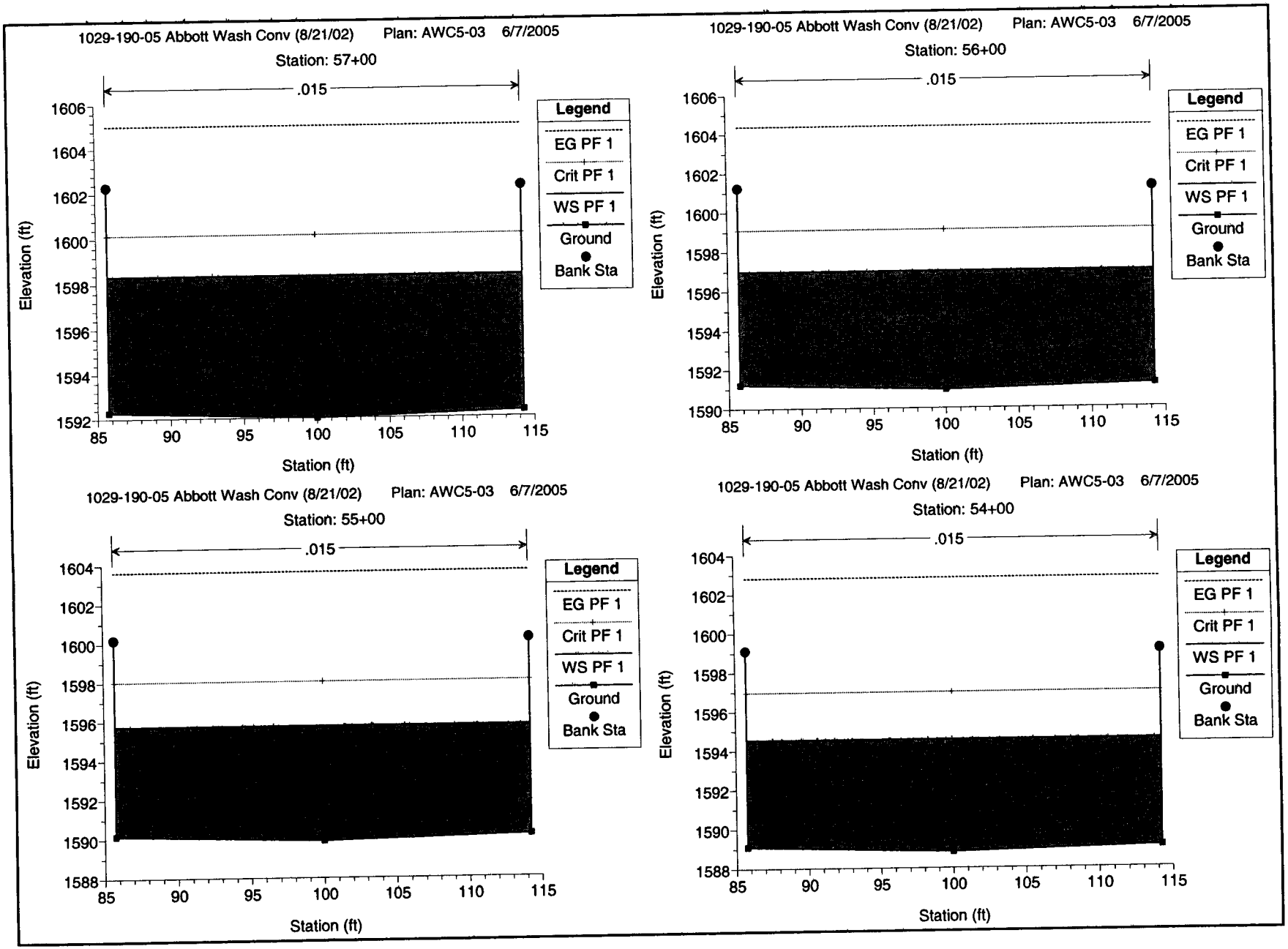

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 65+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 64+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 63+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 62+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

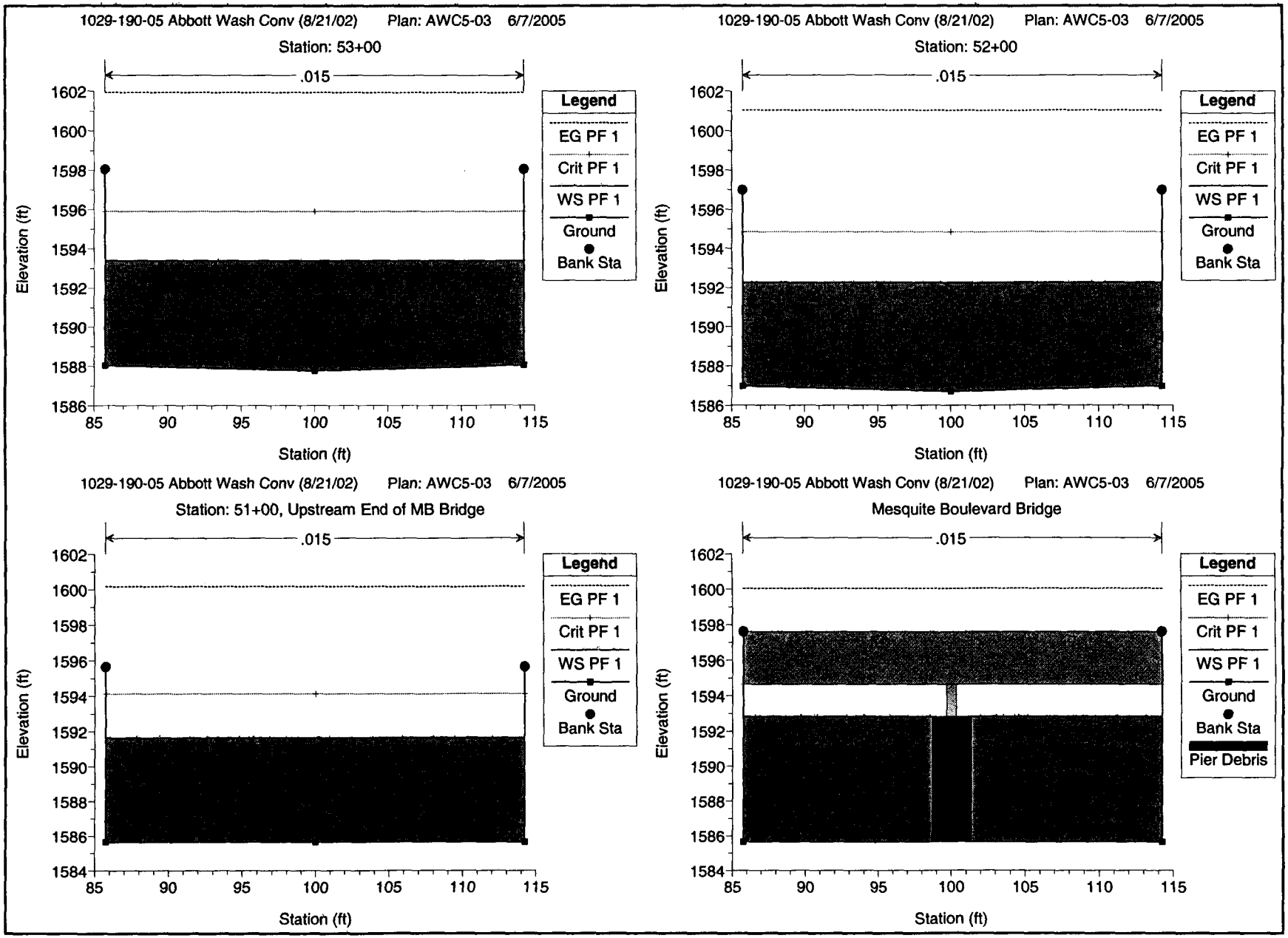

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 61+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

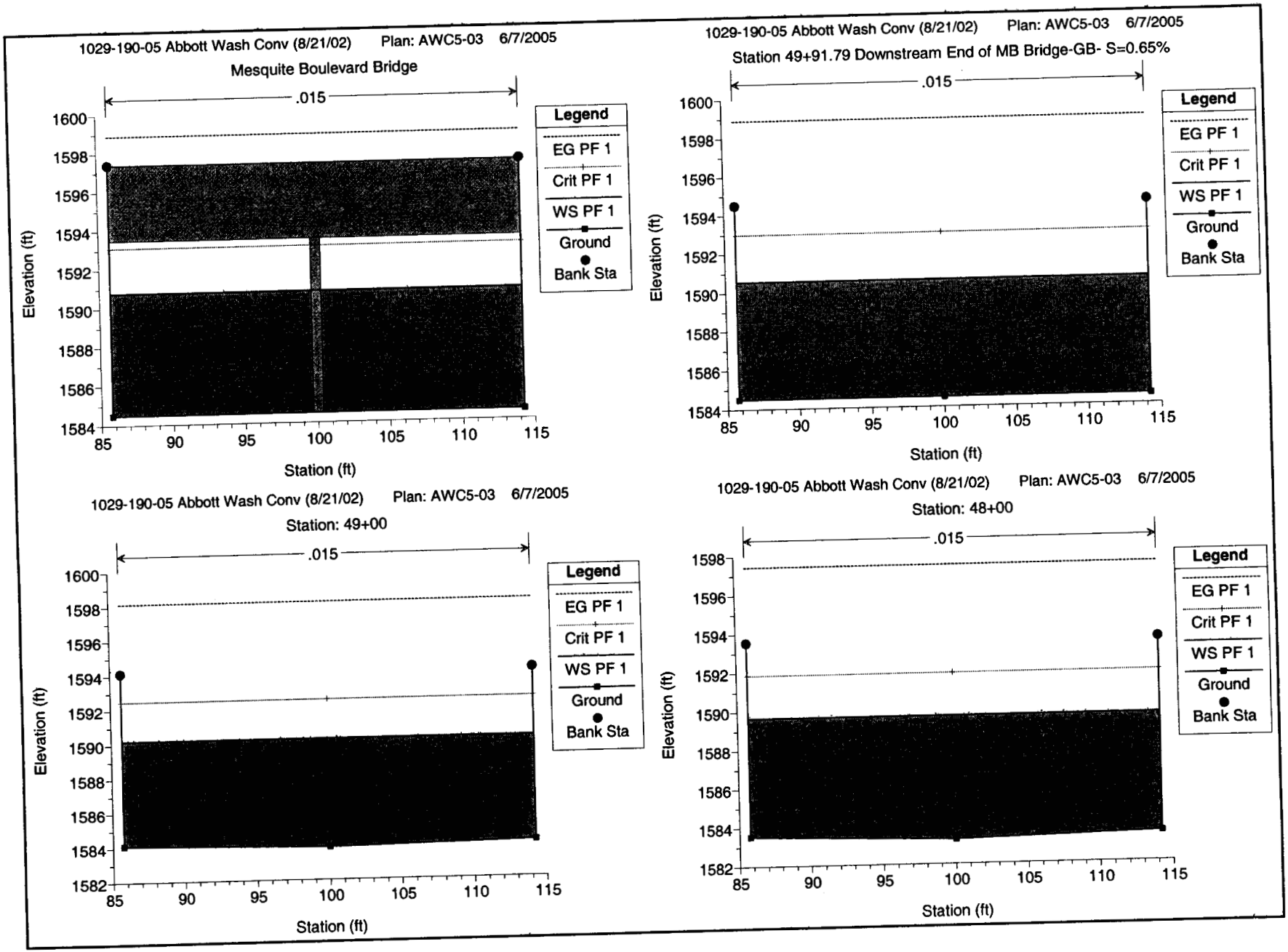

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 60+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

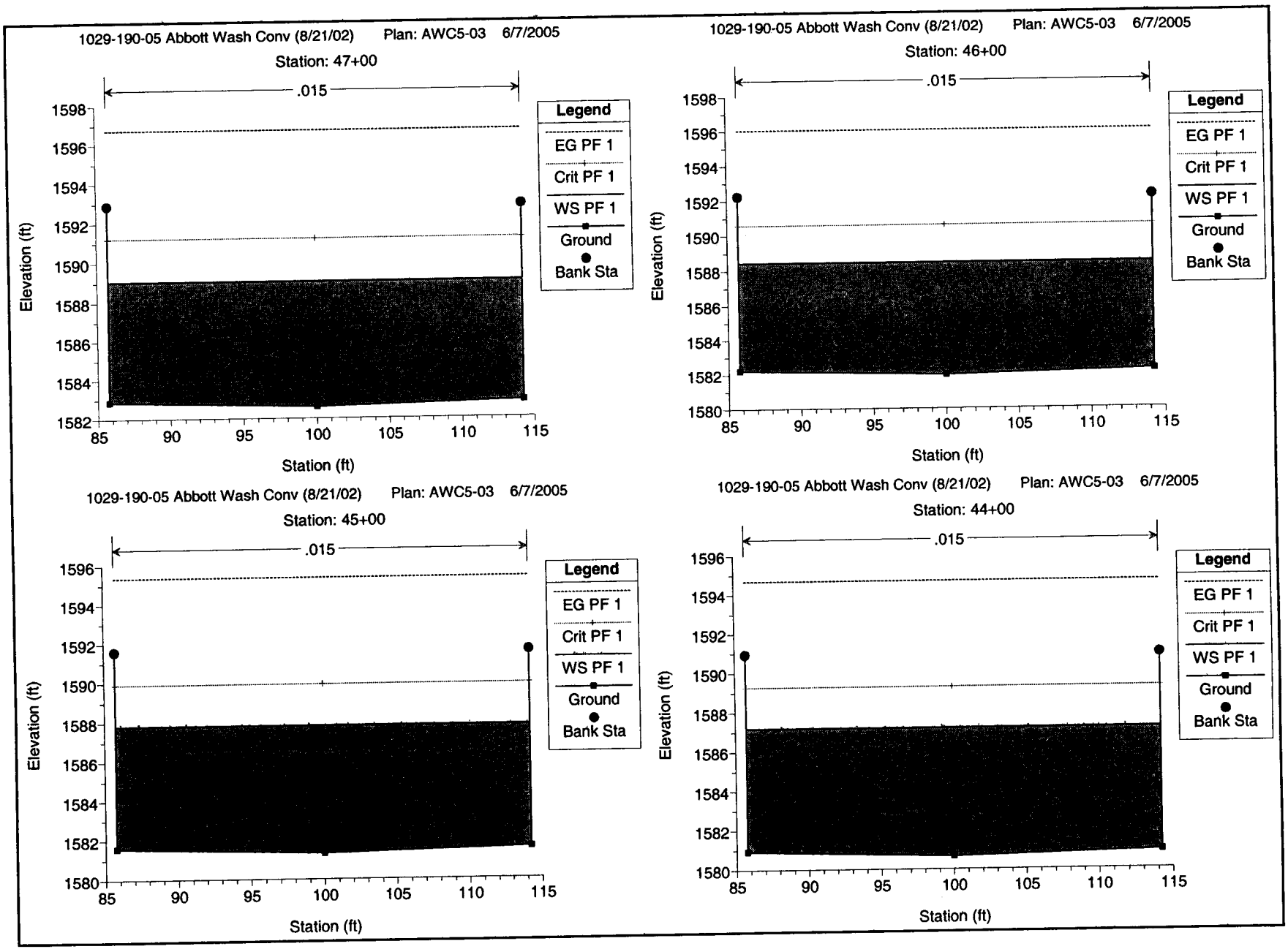

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 59+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

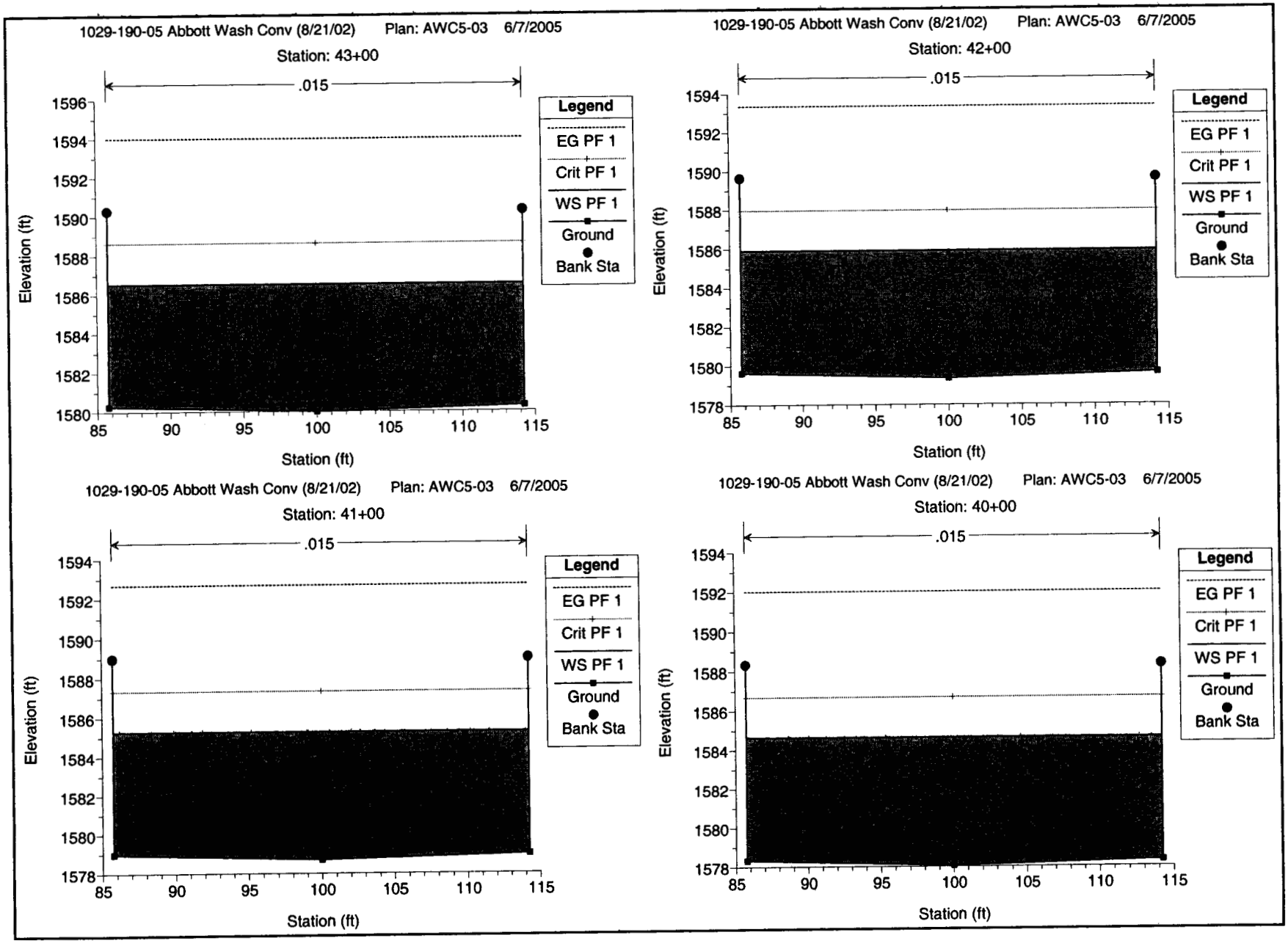

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 58+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

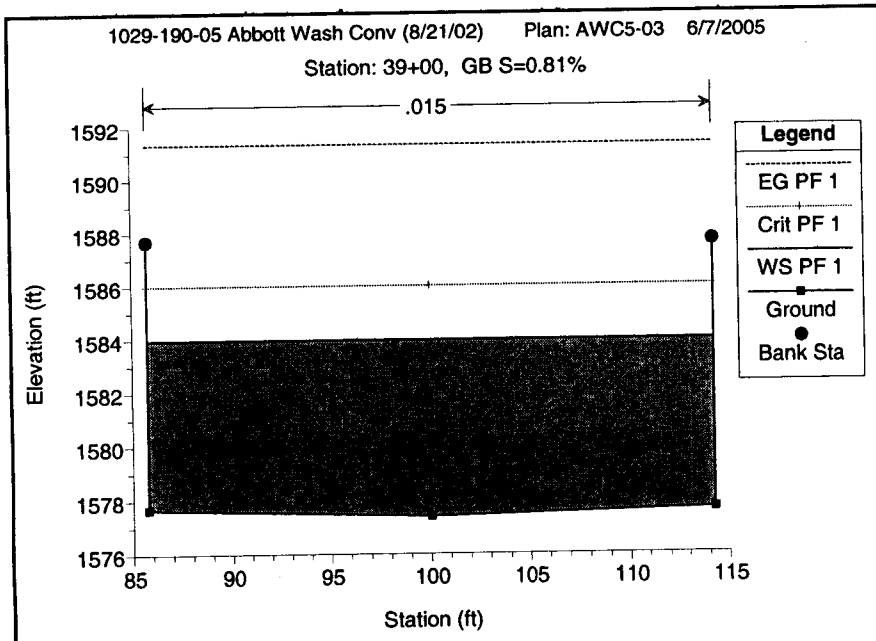

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 57+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 56+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 55+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 54+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

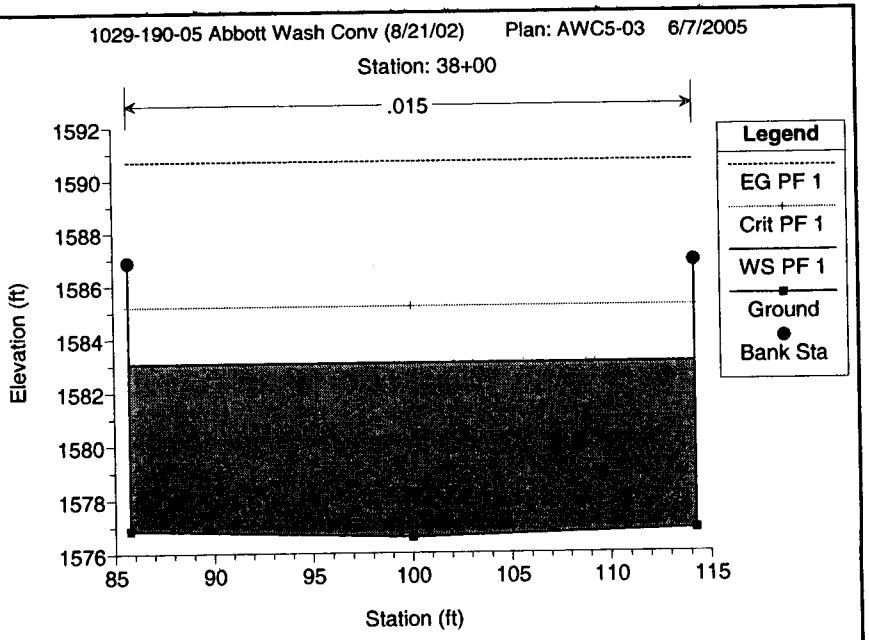

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 53+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 52+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 51+00, Upstream End of MB Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Mesquite Boulevard Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)

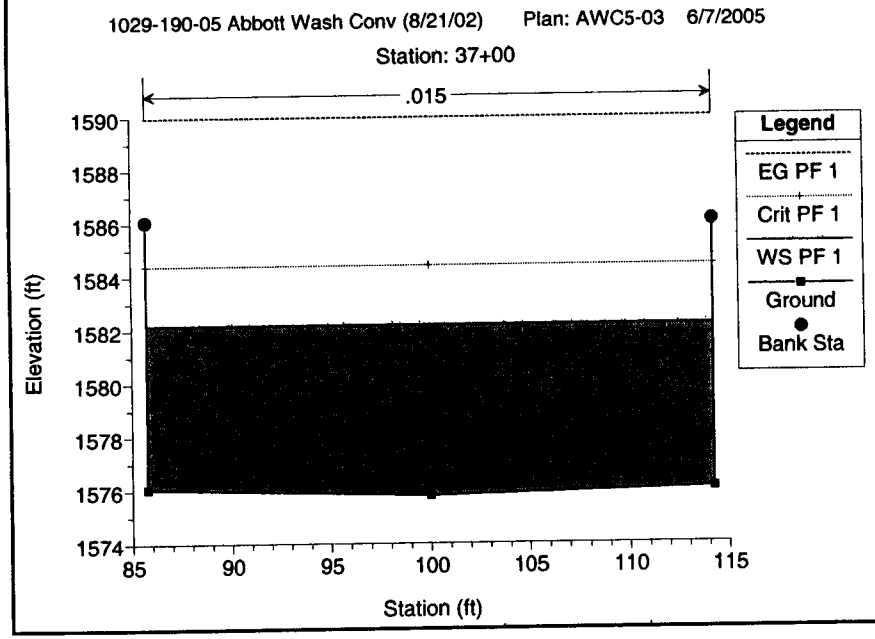

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Mesquite Boulevard Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station 49+91.79 Downstream End of MB Bridge-GB- S=0.65%
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 49+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 48+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

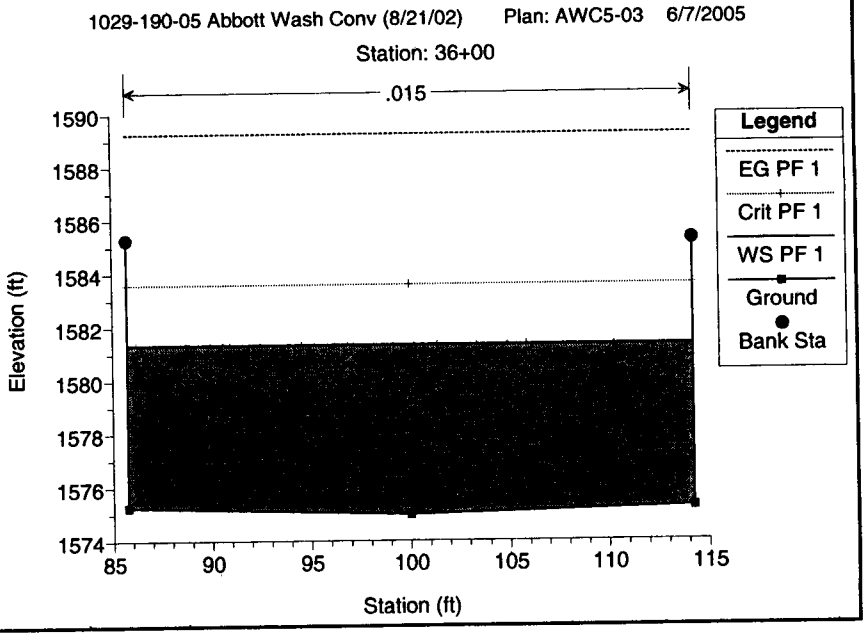

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 47+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 46+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 45+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 44+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

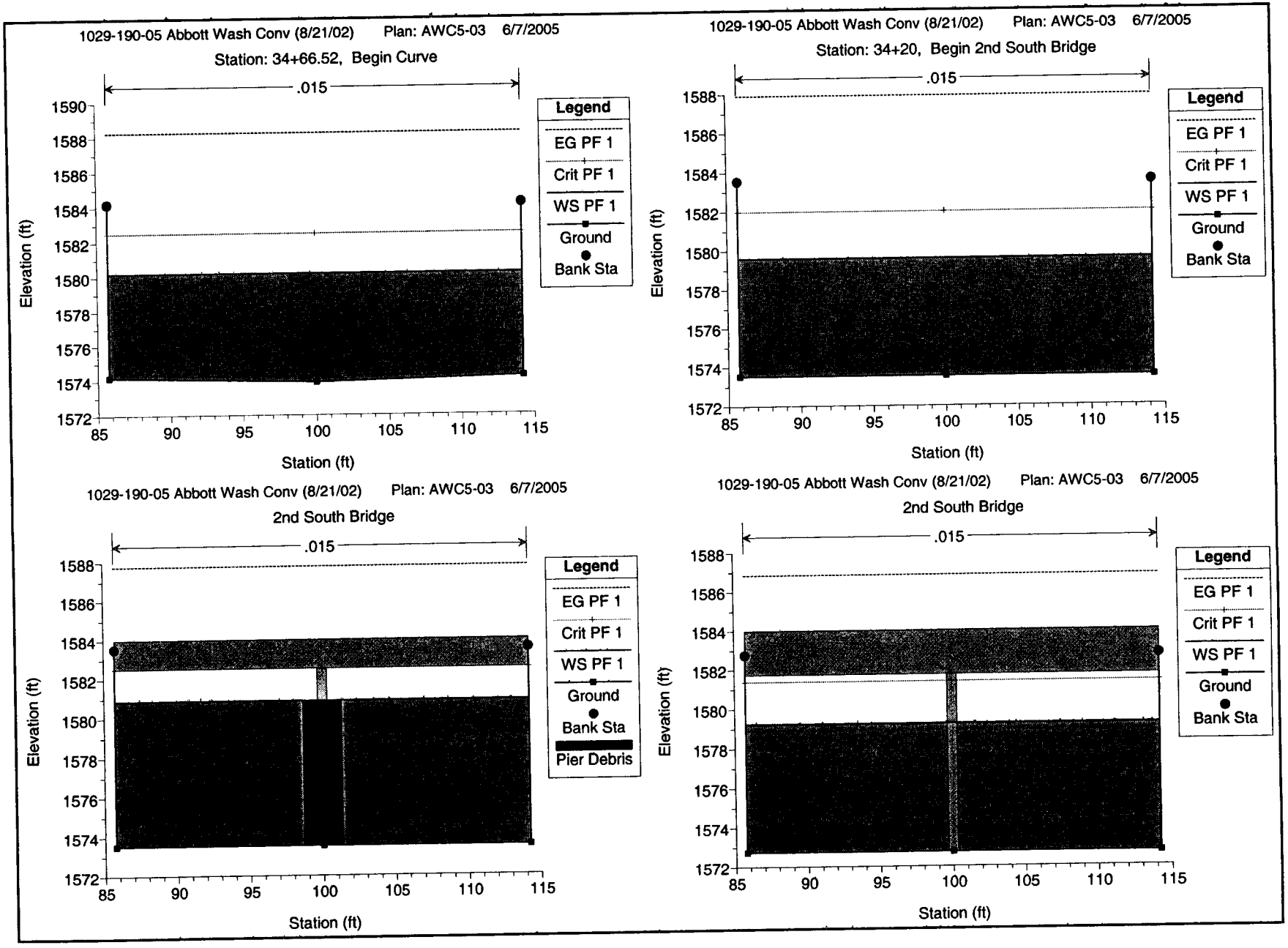

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 43+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 42+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 41+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 40+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

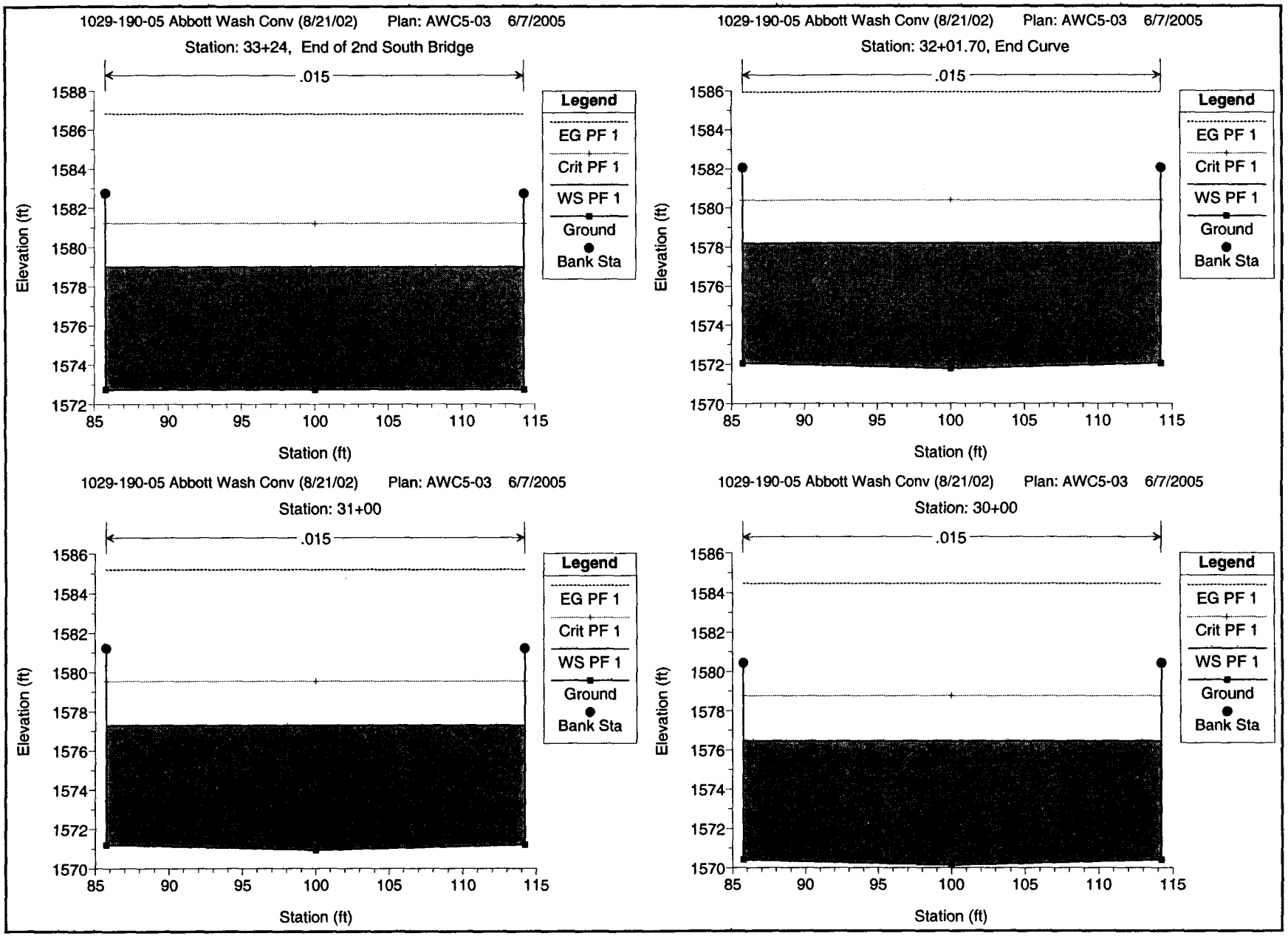

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 39+00, GB S=0.81%
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

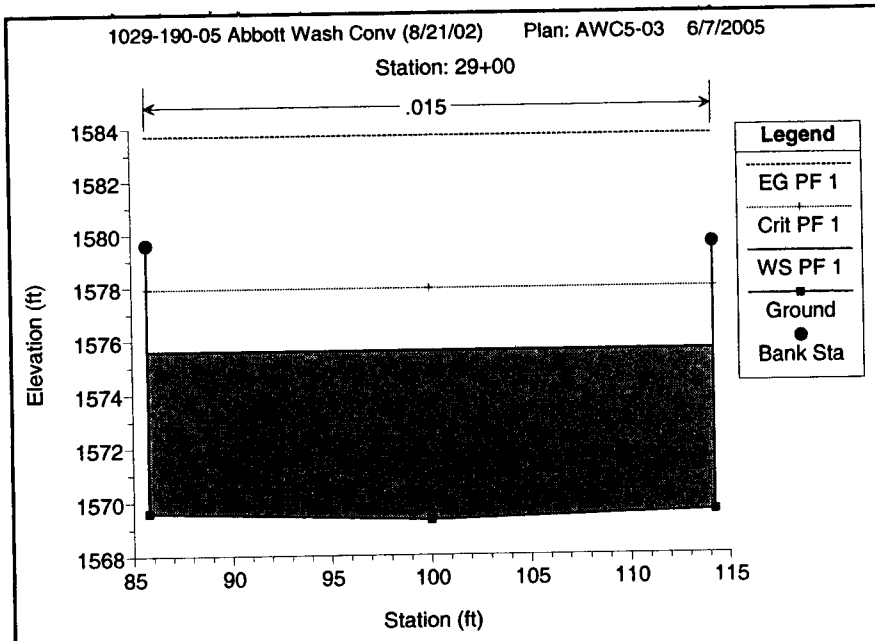

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 38+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

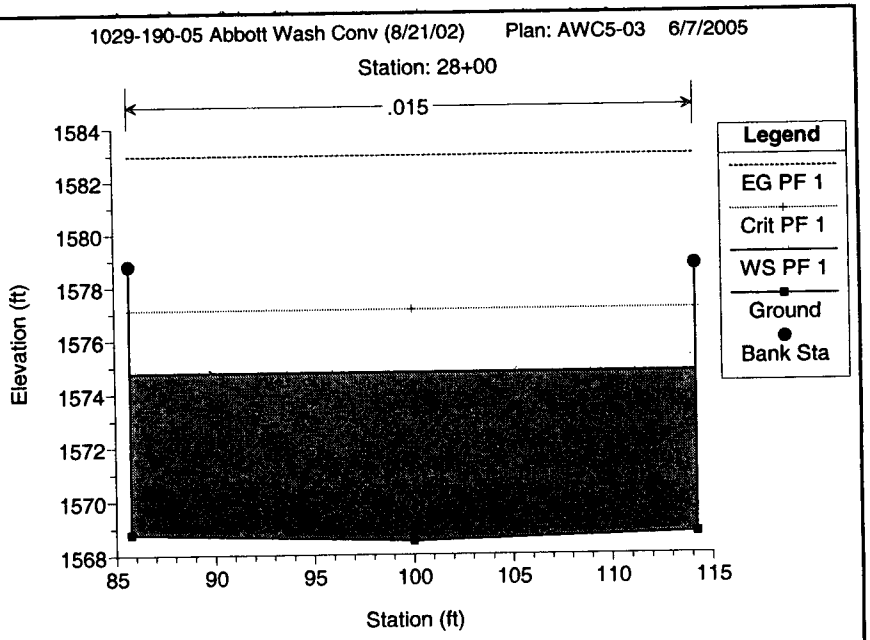

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 37+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

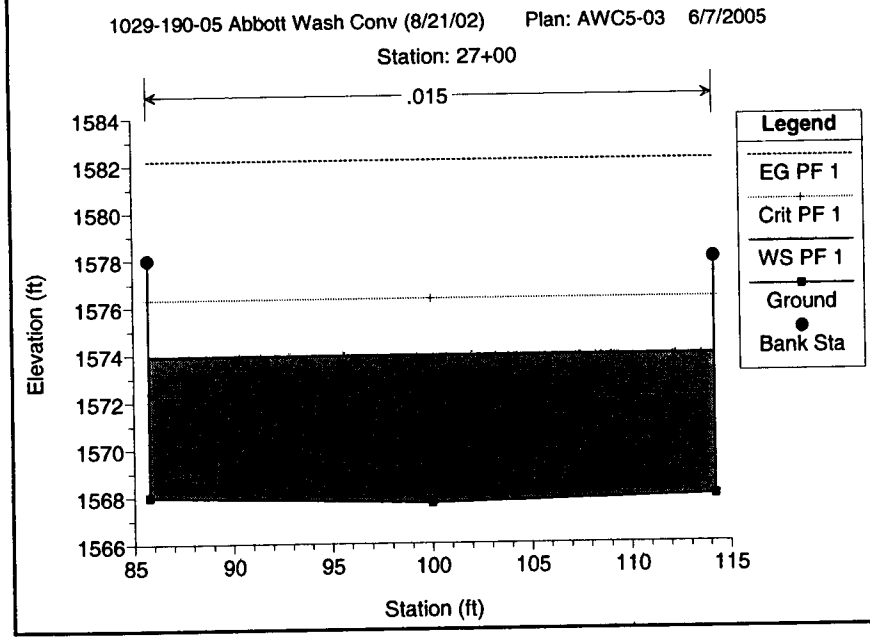

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 36+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

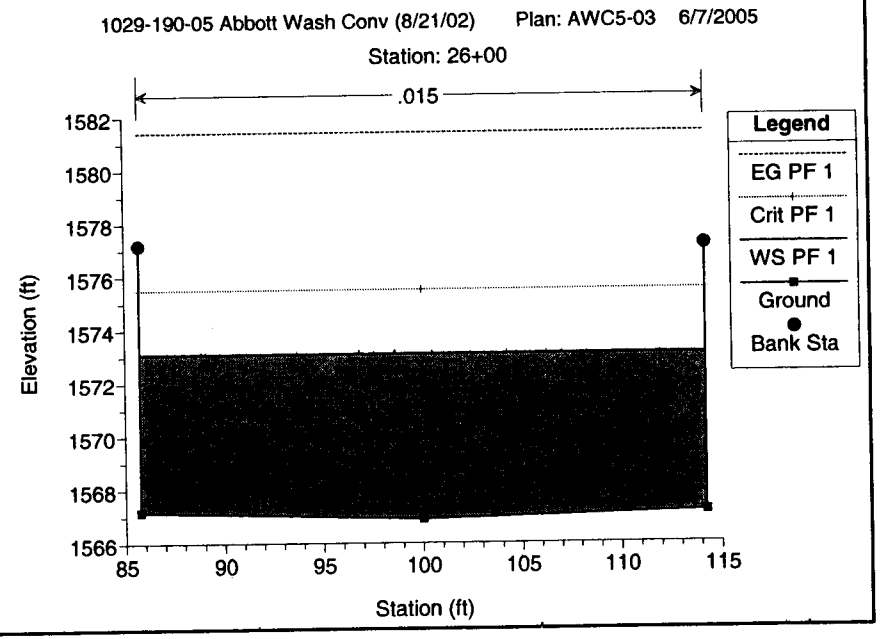

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 34+66.52, Begin Curve
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 34+20, Begin 2nd South Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
2nd South Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
2nd South Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

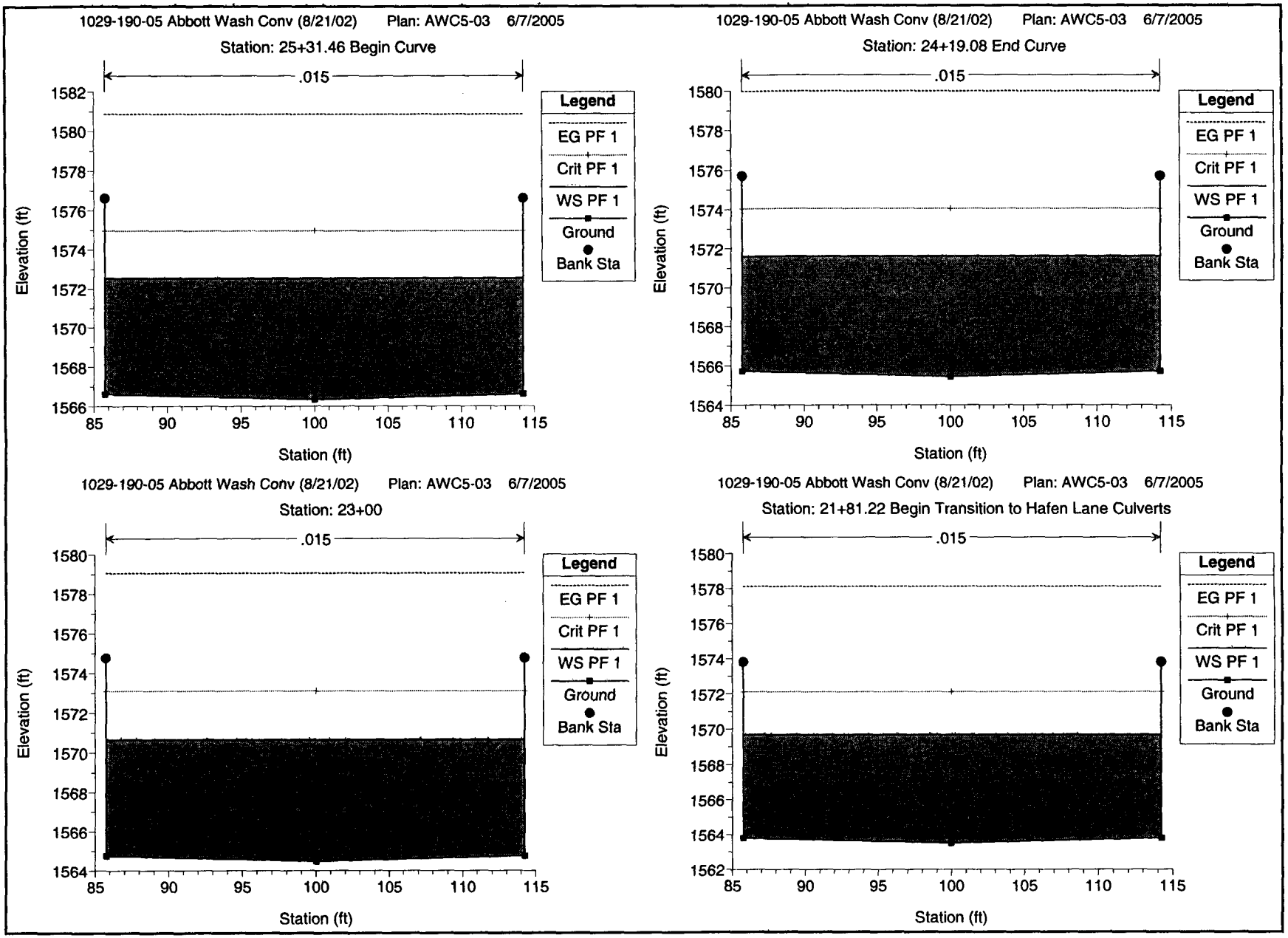

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 33+24, End of 2nd South Bridge
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 32+01.70, End Curve
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 31+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 30+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

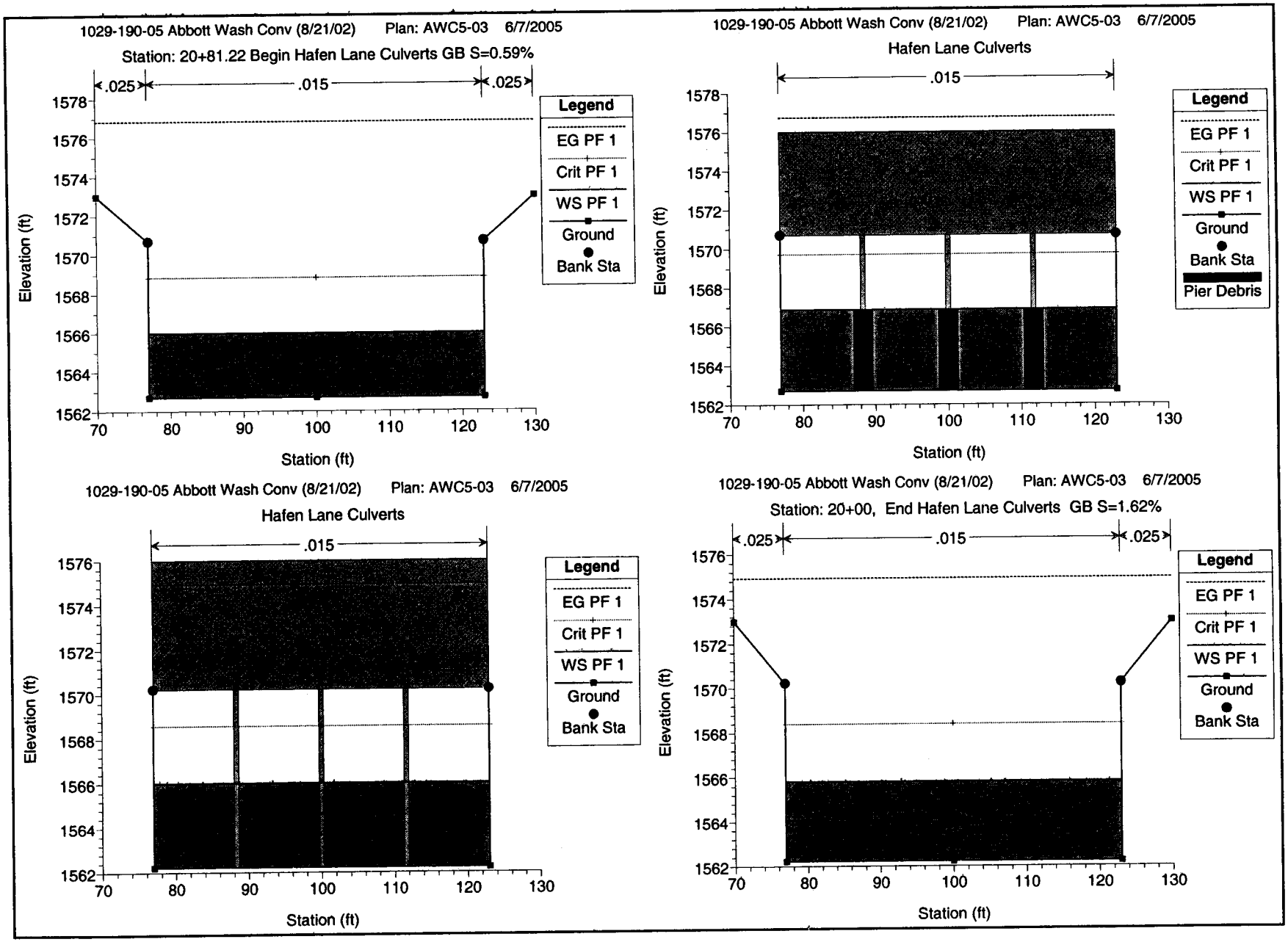

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 29+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1584
1582
1580
1578
1576
1574
1572
1570
1568
85
90
95
100
105
110
115

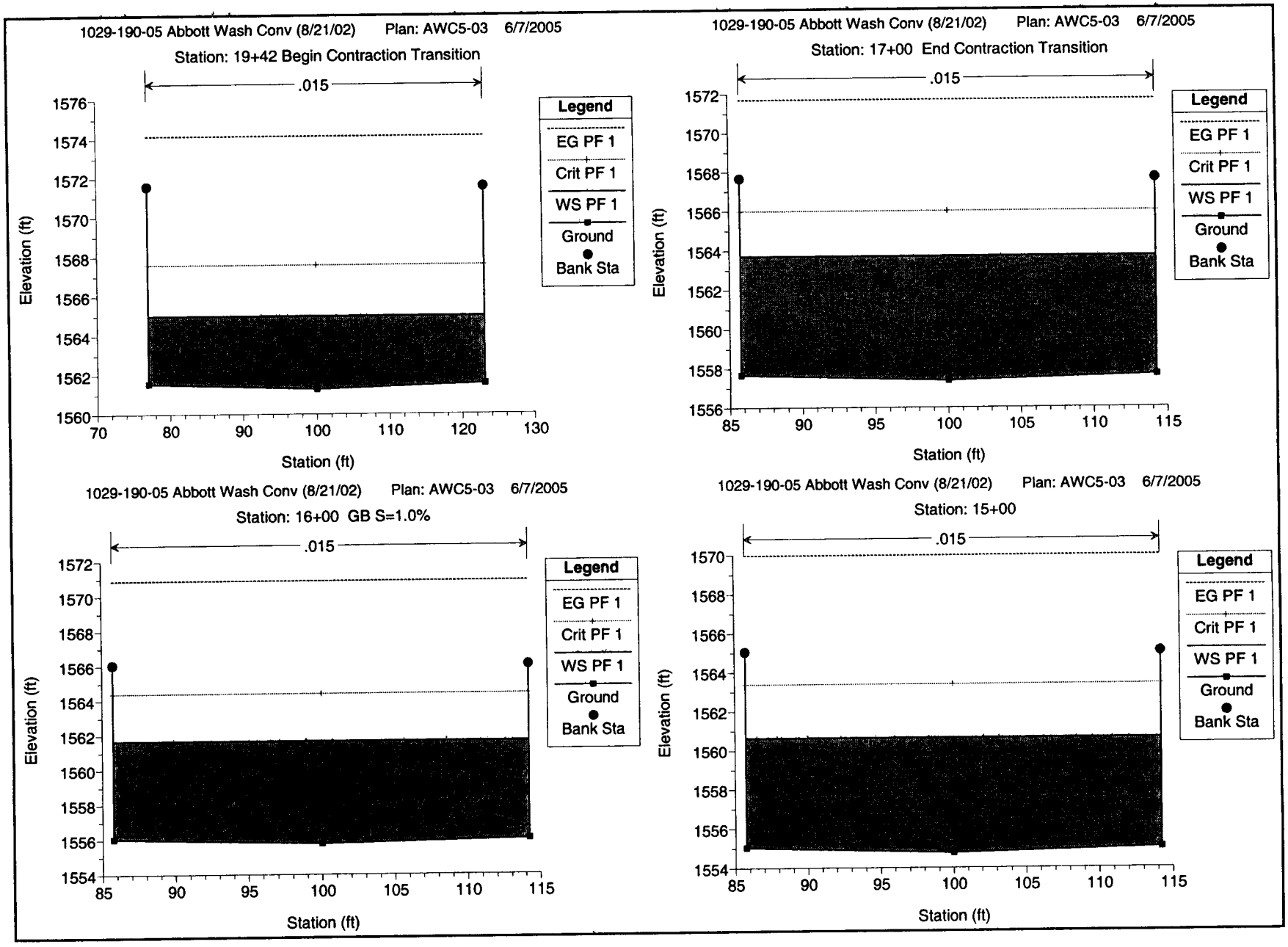

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 28+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1584
1582
1580
1578
1576
1574
1572
1570
1568
85
90
95
100
105
110
115

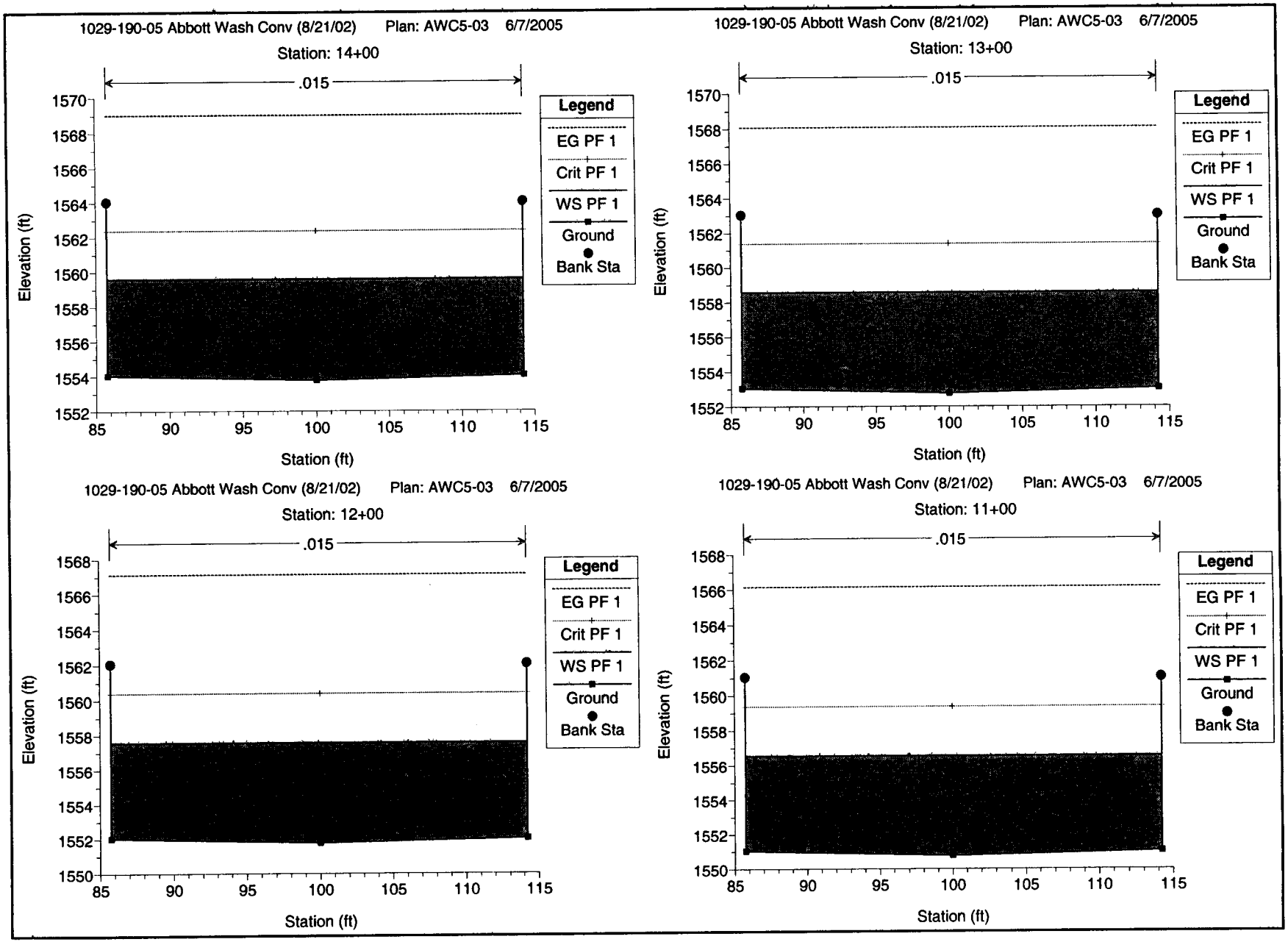

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 27+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1584
1582
1580
1578
1576
1574
1572
1570
1568
1566
85
90
95
100
105
110
115

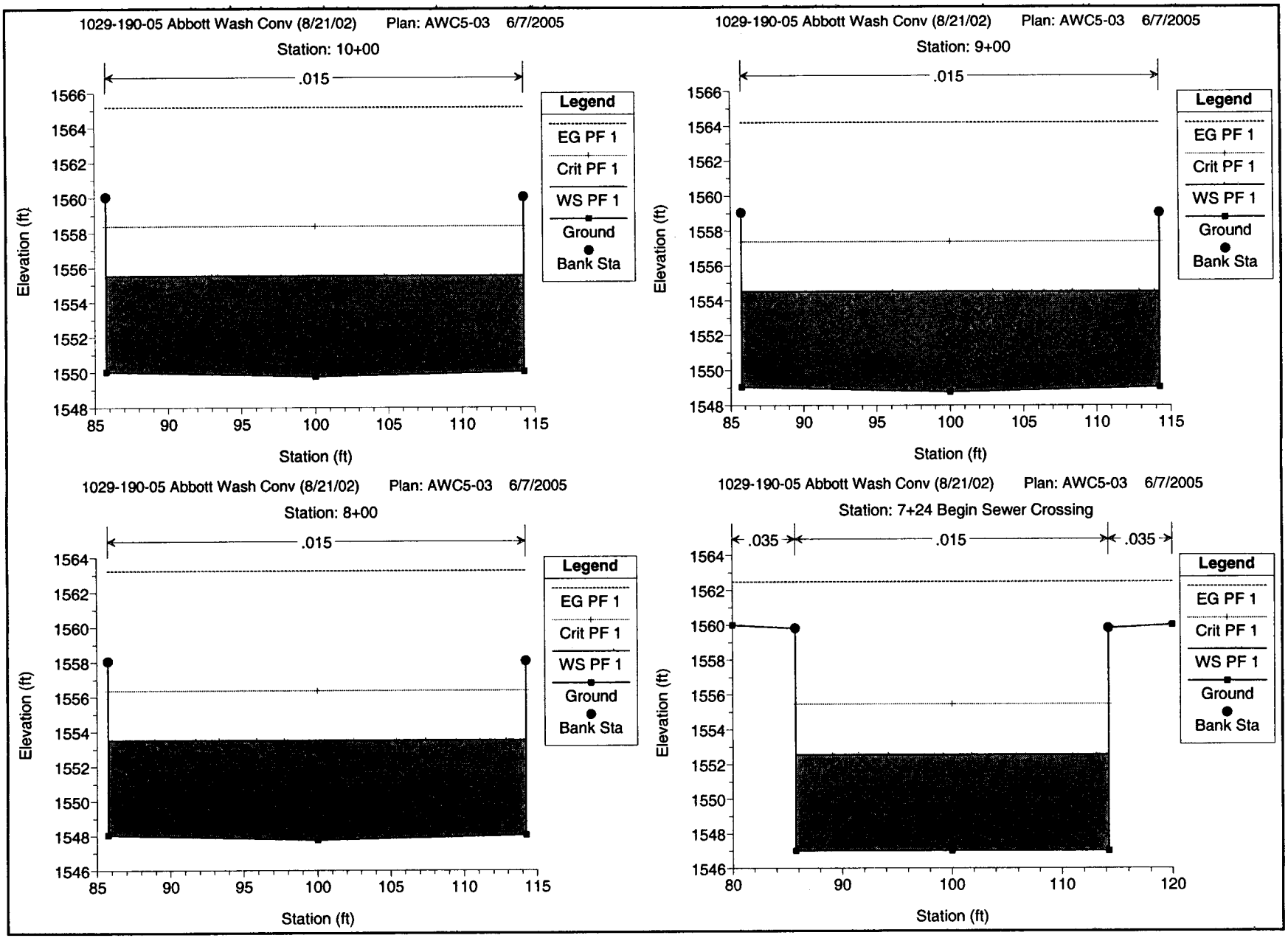

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 26+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1582
1580
1578
1576
1574
1572
1570
1568
1566
85
90
95
100
105
110
115

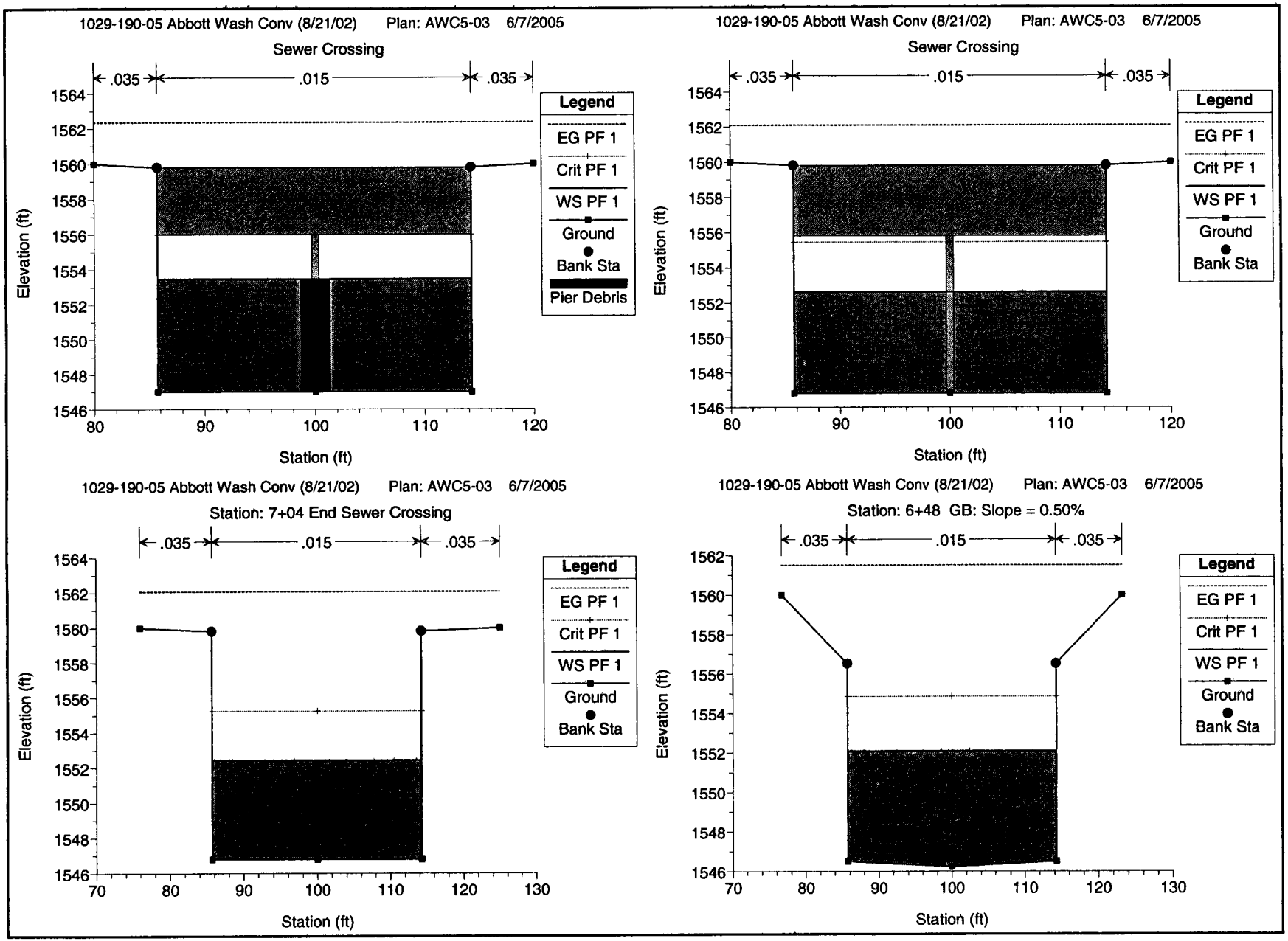

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 25+31.46 Begin Curve
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 24+19.08 End Curve
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 23+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 21+81.22 Begin Transition to Hafen Lane Culverts
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

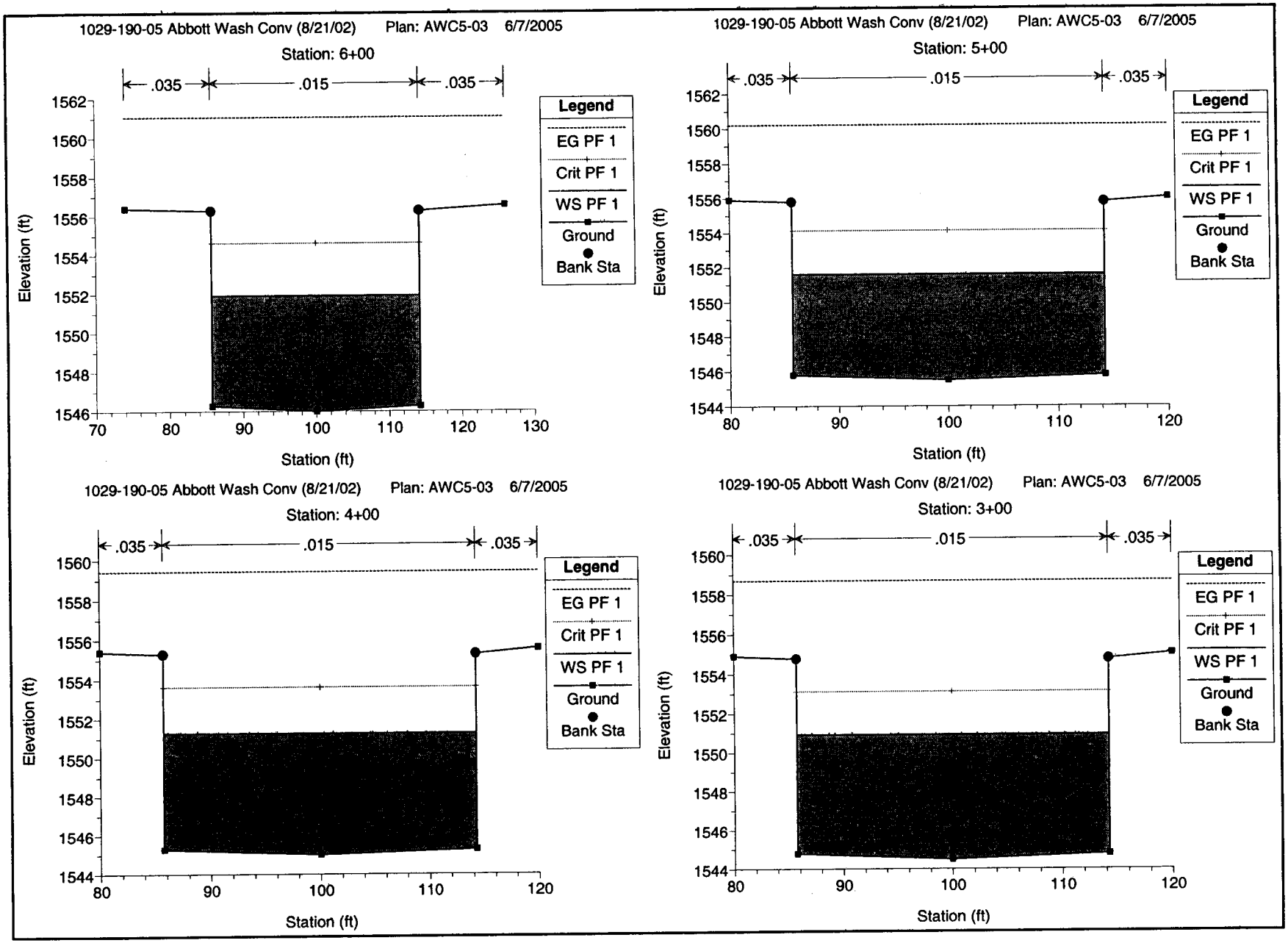

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 20+81.22 Begin Hafen Lane Culverts GB S=0.59%
.025
.015
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Hafen Lane Culverts
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Hafen Lane Culverts
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 20+00, End Hafen Lane Culverts GB S=1.62%
.025
.015
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

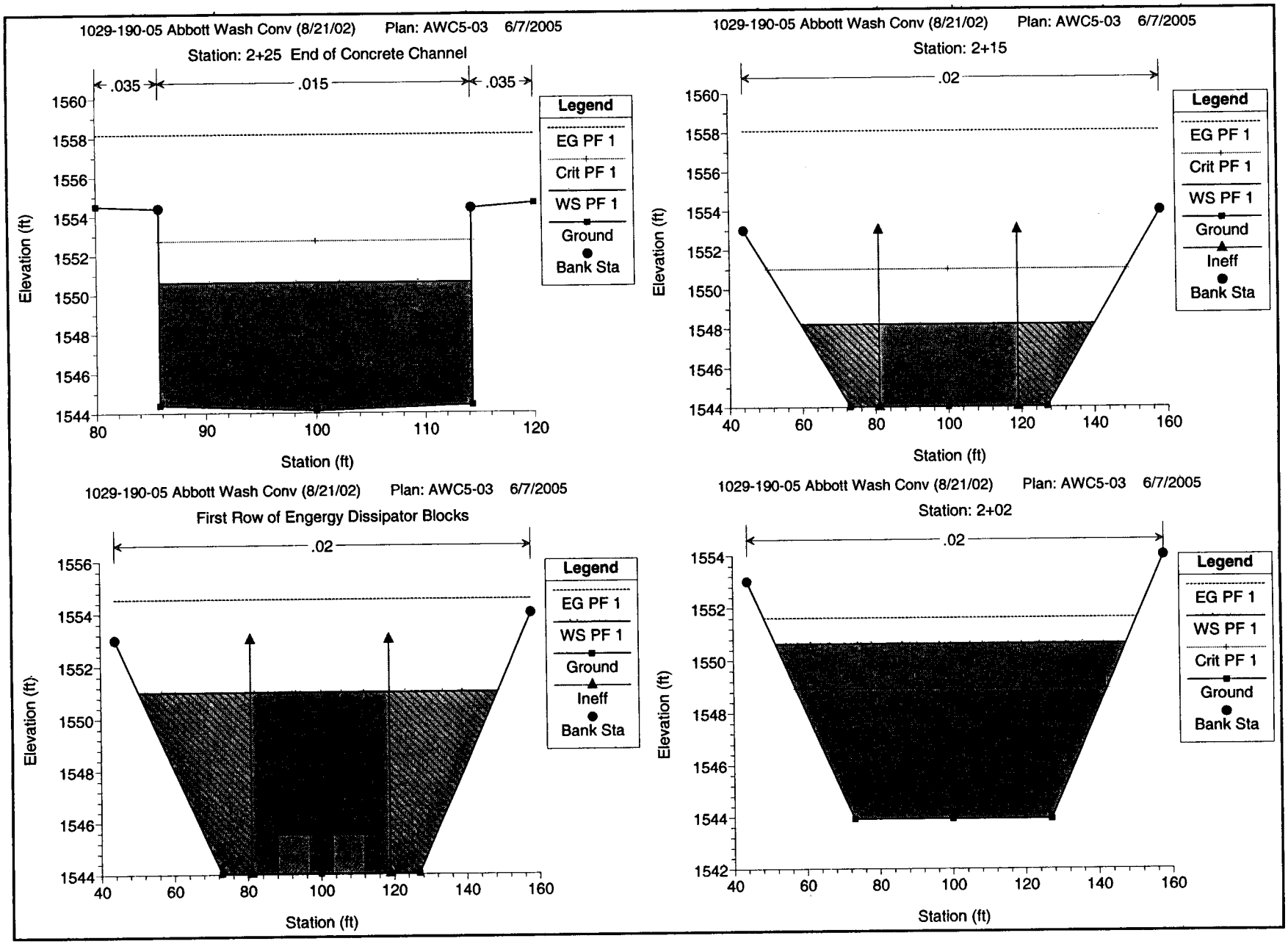

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 19+42 Begin Contraction Transition
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 17+00 End Contraction Transition
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 16+00 GB S=1.0%
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 15+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

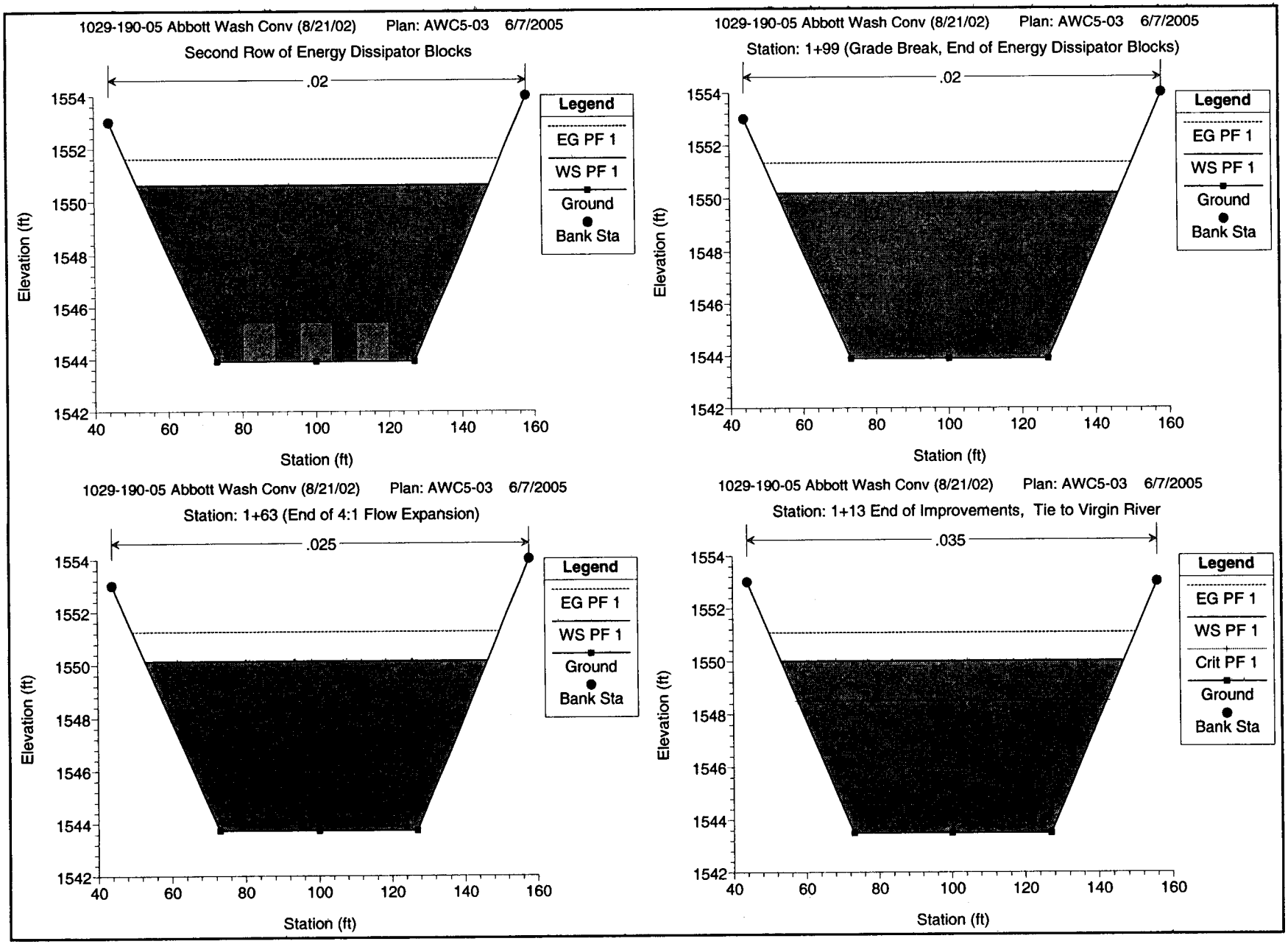

1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 14+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 13+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 12+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 11+00
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta


1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 10+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 9+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 8+00
.015
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 7+24 Begin Sewer Crossing
.035
.015
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Sewer Crossing
.035
.015
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Sewer Crossing
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 7+04 End Sewer Crossing
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 6+48 GB: Slope = 0.50%
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 6+00
.035
.015
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 5+00
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 4+00
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 3+00


1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 2+25 End of Concrete Channel
.035
.015
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 2+15
.02
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
First Row of Engergy Dissipator Blocks
.02
Legend
EG PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 2+02
.02
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Second Row of Energy Dissipator Blocks
.02
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 1+99 (Grade Break, End of Energy Dissipator Blocks)
.02
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 1+63 (End of 4:1 Flow Expansion)
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1029-190-05 Abbott Wash Conv (8/21/02) Plan: AWC5-03 6/7/2005
Station: 1+13 End of Improvements, Tie to Virgin River
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

Appendix C: WSEL Comparison Table

Table 1
100-Year Water Surface Elevation Comparison
HEC-RAS ver. 3.0.1 vs. HEC-RAS ver. 3.1.3

River Station	Flow (cfs)	WSEL Version 3.0.1	WSEL Version 3.1.3	Change in WSEL
8741.56	2790	1625.55	1625.55	0
8641.56	2790	1624.59	1624.65	0.06
8541.56	2790	1623.65	1623.66	0.01
8441.56	2790	1622.71	1622.70	-0.01
8341.56	2790	1621.77	1621.75	-0.02
8241.56	2790	1620.50	1620.50	0
8141.56	2790	1619.38	1619.39	0.01
8091.56	2790	1618.83	1618.81	-0.02
8041.56	2790	1619.41	1619.42	0.01
7991.56	2790	1619.48	1619.49	0.01
7941.56	2790	1619.34	1619.34	0
7900	Bridge			0
7611	2790	1613.70	1613.95	0.25
7537.59	3334	1614.19	1614.25	0.06
7476.58	3334	1612.24	1612.24	0
7416.02	3334	1611.28	1611.28	0
7358.36	3334	1608.83	1608.83	0
7200	Bridge			0
6988.71	3334	1606.11	1606.11	0
6840.4	3520	1606.01	1606.01	0
6700	3520	1604.93	1604.93	0
6600	3520	1604.19	1604.20	0.01
6500	3520	1603.48	1603.49	0.01
6400	3520	1602.78	1602.79	0.01
6300	3520	1602.09	1602.09	0
6200	3520	1601.41	1601.41	0
6100	3520	1600.73	1600.73	0
6000	3670	1600.50	1600.50	0
5900	3670	1599.76	1599.77	0.01
5800	3670	1599.04	1599.05	0.01
5700	3670	1598.34	1598.35	0.01
5600	3670	1596.98	1596.99	0.01
5500	3670	1595.73	1595.73	0
5400	3670	1594.54	1594.54	0
5300	3670	1593.39	1593.39	0
5200	3670	1592.26	1592.26	0
5100	4000	1591.62	1591.63	0.01
5092	Bridge			0
4991.79	4000	1590.55	1590.56	0.01
4900	4000	1590.22	1590.22	0
4800	4000	1589.66	1589.67	0.01
4700	4000	1589.05	1589.05	0
4600	4000	1588.43	1588.43	0
4500	4000	1587.81	1587.81	0
4400	4000	1587.18	1587.18	0
4300	4000	1586.55	1586.54	-0.01
4200	4000	1585.91	1585.91	0
4100	4000	1585.28	1585.27	-0.01
4000	4000	1584.63	1584.63	0
3900	4000	1583.99	1583.98	-0.01
3800	4000	1583.08	1583.07	-0.01
3700	4000	1582.19	1582.19	0
3600	4000	1581.34	1581.34	0
3466.52	4000	1580.20	1580.20	0
3420	4000	1579.58	1579.59	0.01
3370	Bridge			0

3324	4000	1578.99	1578.99	0
3201.7	4000	1578.18	1578.18	0
3100	4000	1577.28	1577.29	0.01
3000	4000	1576.44	1576.45	0.01
2900	4000	1575.59	1575.60	0.01
2800	4000	1574.75	1574.76	0.01
2700	4000	1573.92	1573.93	0.01
2600	4000	1573.09	1573.10	0.01
2531.46	4000	1572.53	1572.54	0.01
2419.08	4000	1571.62	1571.61	-0.01
2300	4000	1570.64	1570.65	0.01
2181.22	4000	1569.67	1569.68	0.01
2081.22	4000	1565.99	1565.99	0
2080	Bridge			0
2000	4000	1565.81	1565.81	0
1942	4000	1565.00	1565.00	0
1700	4000	1563.70	1563.71	0.01
1600	4000	1561.66	1561.66	0
1500	4000	1560.62	1560.62	0
1400	4000	1559.59	1559.60	0.01
1300	4000	1558.57	1558.58	0.01
1200	4000	1557.56	1557.56	0
1100	4000	1556.54	1556.54	0
1000	4000	1555.53	1555.53	0
900	4000	1554.52	1554.52	0
800	4000	1553.51	1553.51	0
724	4000	1552.56	1552.56	0
718	Bridge			0
704	4000	1552.44	1552.44	0
648	4000	1552.08	1552.08	0
600	4000	1551.93	1551.93	0
500	4000	1551.61	1551.60	-0.01
400	4000	1551.27	1551.26	-0.01
300	4000	1550.92	1550.91	-0.01
225	4000	1550.64	1550.63	-0.01
215	4000	1548.21	1548.21	0
214	Inl Struct			0
202	4000	1550.63	1550.63	0
201	Inl Struct			0
199	4000	1550.19	1550.19	0
163	4000	1550.14	1550.14	0
113	4000	1550.00	1550.00	0

July 20, 2006

Abbott Wash Conveyance System
Final Letter of Map Revision
Pursuant to 05-09-0588R

REGIONAL FLOOD CONTROL DISTRICT

City of Mesquite, Nevada

REGIONAL FLOOD CONTROL DISTRICT

Gale Wm. Fraser, II, P.E.
General Manager/Chief Engineer

BOARD OF DIRECTORS

Larry Brown
Chairman
City of Las Vegas

Chip Maxfield
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City of Mesquite

Roger Tobler
City of Boulder City

Bruce L. Woodbury
Clark County

July 20, 2006

FEMA Depot
3601 Eisenhower Avenue
Alexandria, VA 22304-6425

Attention: LOMR Depot

RE: Case No. 05-09-0588R
Requests for Final Letter of Map Revision
Abbott wash Conveyance System
City of Mesquite, NV

To Whom It May Concern:

On August 29, 2005 a Conditional Letter of Map Revision (CLOMR) was issued under Case No. 05-09-0588R. Please accept the attached documents addressing the conditions in the CLOMR in support of this request for a final Letter of Map Revision (LOMR). Following is an item by item address of each condition in the CLOMR:

1. Overview and concurrence form is attached.

2. As-built conditions do not vary in any manner consequential to the original request for CLOMR. Therefore, no revised application and certification forms are attached.

3. I apologize for the absence of the appropriate processing fee. Our accounting procedures do not allow me to make payments prior to receiving an invoice. Please request payment of the appropriate amount in writing. Payment will be processed and transmitted immediately thereafter.

4. As-built plans:

   a. Abbott Wash Conveyance Project Contract Drawings – Phase 1, Certified Record Drawings (As-Builts) certified by Nevada Civil Engineer No. 14044, Weston L. Nelson on 7-14-05 are attached in paper and electronic copy.

   b. As-built certification letter dated July 14, 2005 for Item 4a above along with documentation of facility acceptance by the City of Mesquite are attached. Note that damage occurred to the flexible (gabion) outlet from station 1+12 to 2+25 during major floods on the Virgin River in the winter of 2004/2005. This damage is noted on the as-built plans. This damage did not cause any structural damage to the concrete channel section and does not impact the flood carrying capacity of the overall facility and its ability to mitigate flood hazards as described in the CLOMR application. Design and implementation of repairs of this damage is being pursued by the City of Mesquite with funding by the Regional Flood Control District's maintenance Work Program.

   c. As-built certification letter for Abbot Wash Conveyance, Ph II Improvements included in Nevada Department of Transportation (NDOT) contract No. 3238, or NDOT Project No. STP-015-2(031)120 plans dated August 11, 2004 is attached. These are the same plans submitted in the CLOMR application and have been reproduced here.

600 S. Grand Central Parkway, Suite 300 • Las Vegas, Nevada 89106-4511
(702) 455-3139 • FAX: (702) 455-3870
Website: *http://www.regionalflood.org*

5. Community acknowledgement of this request is included on the Overview and concurrence form submitted under Item 1 above.

I am hopeful that this information will be sufficient for you to issue a final LOMR for the affected area. Please contact me at your earliest convenience if you should need additional information or have any questions.

Sincerely,

Kevin Eubanks, P.E.
Assistant General Manager

Enclosures

c: Allen Bell, City of Mesquite

KLE:jb

I:\Kevin's Projects\CLOMR 2004\Abbott\Abbott Trans 3.doc

Federal Emergency Management Agency

Washington, D.C. 20472

RECD
2005 SEP -1 PM 12:42

AUG 29 2005

The Honorable Bill Nicholes
Mayor, City of Mesquite
10 E Mesquite Blvd
Mesquite, NV 89027

IN REPLY REFER TO:
Case No.: 05-09-0588R
Community: City of Mesquite, NV
Community No.: 320035

104

Dear Mayor Nicholes:

This responds to a request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) comment on the effects that a proposed project would have on the effective Flood Insurance Rate Map (FIRM) for Clark County, Nevada and Incorporated Areas, in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated February 17, 2005, Mr. Kevin Eubanks, P.E., CFM, Assistant General Manager, Clark County Regional Flood Control District, requested that FEMA evaluate the effects that proposed channelization and construction of culverts along Abbott Wash, from just downstream of Pioneer Boulevard to approximately 300 feet upstream of the confluence with the Virgin River, would have on the flood hazard information shown on the effective FIRM.

All data required to complete our review of this request for a Conditional Letter of Map Revision (CLOMR) were submitted with letters from Mr. Mathew S. Baird, P.E., CFM, Senior Program Manager, and Brian K. Loffman CFM, Hydrologist, both with PBS&J; and Mr. Eubanks.

We reviewed the submitted data and the data used to prepare the effective FIRM for your community and determined that the proposed project meets the minimum floodplain management criteria of the NFIP. We believe that, if the proposed project is constructed as shown on the plans entitled "Abbott Wash Channel Improvement Plans," prepared by Bulloch Brothers Engineering, Inc., dated December 11, 2003, and on the plans entitled "Interstate-15 Improvements," prepared by the Nevada Department of Transportation, dated August 11, 2004, and the data listed below are received, a revision to the FIRM would be warranted.

As a result of the proposed modifications, the width of the Special Flood Hazard Area (SFHA), the area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), will decrease compared to the effective SFHA width along Abbott Wash from just downstream of Pioneer Boulevard to approximately 1,000 feet upstream of the confluence with the Virgin River. The maximum decrease in SFHA width, approximately 3,600 feet, will occur just upstream of Second South Street. The entire base flood will be contained in the channel throughout the revised reach.

Although the channel will extend into the unincorporated areas of Clark County, the flooding shown on the FIRMs is controlled by the Virgin River. As a result, no flood hazard changes will occur in the county as a result of the channel.

Upon completion of the project, your community may submit the data listed below and request that we make a final determination on revising the effective FIRM.

- Detailed application and certification forms must be used for requesting final revisions to the maps. Therefore, when the map revision request for the area covered by this letter is submitted, Form 1, entitled "Overview & Concurrence Form," must be included. (A copy of this form is enclosed.)

- The detailed application and certification forms listed below may be required if as-built conditions differ from the preliminary plans. If required, please submit new forms (copies of which are enclosed) or annotated copies of the previously submitted forms showing the revised information.

  Form 2, entitled "Riverine Hydrology & Hydraulics Form"

  Form 3, entitled "Riverine Structures Form"

  Hydraulic analyses, for as-built conditions, of the base flood and the regulatory floodway, together with a topographic work map showing the revised floodplain and floodway boundaries, must be submitted with Form 2.

- Effective September 1, 2002, FEMA revised the fee schedule for reviewing and processing requests for conditional and final modifications to published flood information and maps. In accordance with this schedule, the current fee for this map revision request is $3,800 and must be received before we can begin processing the request. Please note, however, that the fee schedule is subject to change, and requesters are required to submit the fee in effect at the time of the submittal. Payment of this fee shall be made in the form of a check or money order, made payable in U.S. funds to the National Flood Insurance Program, or by credit card. The payment must be forwarded to the following address:

  Federal Emergency Management Agency
  Fee-Charge System Administrator
  P.O. Box 22787
  Alexandria, VA 22304

- As-built plans, certified by a registered professional engineer, of all proposed project elements

- Community acknowledgment of the map revision request

After receiving appropriate documentation to show that the project has been completed, FEMA will initiate a revision to the FIRM.

The basis of this CLOMR is, in whole or in part, a channel-modification/culvert project. NFIP regulations, as cited in Paragraph 60.3(b)(7), require that communities assure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management regulations. Consequently, the ultimate responsibility for maintenance of the modified channel and culvert rests with your community.

This CLOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the

SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the Consultation Coordination Officer (CCO) for your community. Information on the CCO for your community may be obtained by calling the Director, Federal Insurance and Mitigation Division of FEMA in Oakland, California, at (510) 627-7175. If you have any questions regarding this CLOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Michael B. Godesky, CFM, Project Engineer
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

For: Doug Bellomo, P.E., Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

Enclosures

cc: The Honorable Rory Reid
Chair, Clark County Board
of Commissioners

Mr. J. Allen Bell, P.E.
City Engineer
City of Mesquite

Mr. Dave Betley, P.E.
Principal Engineer
Civil Engineering Division
Clark County Department of Development Services

Mr. Kevin Eubanks, P.E., CFM
Assistant General Manager
Clark County Regional Flood Control District

Mr. Mathew S. Baird, P.E., CFM
Senior Program Manager
PBS&J

Mr. Brian K. Loffman, CFM
Hydrologist
PBS&J

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour 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, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). 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.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☐ CLOMR: A letter from 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 FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

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
Ex: 480301 480287	City of Katy Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
320003	City of Mesquite	NV	32003C	0387E	09/27/02

2. Flooding Source: Abbott Wash

3. Project Name/Identifier: Request for Final LOMR pursuant to CLOMR Case No. 05-09-0588R

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 ☐ 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 types of flooding and structures (check all that apply)

Types of Flooding: ☑ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

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

☐ Dam ☐ Fill ☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $____

☑ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/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: Kevin L. Eubanks, P.E., CFM	Company: Clark County Regional Flood Control Dist	
Mailing Address: 600 Grand Central Parkway, #300 Las Vegas, NV 89106-4511	Daytime Telephone No.: 702-455-3139	Fax No.: 702-455-3870
	E-Mail Address: keubanks@ccrfcd.org	
Signature of Requester (required): KL Eub		Date: 7/14/06

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 requirement that no fill be 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. 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: J. Allen Bell, P.E., City Engineer		Telephone No.: 702-346-5259
Community Name: City of Mesquite	Community Official's Signature (required):	Date: 14 July '06

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. 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: Kevin L. Eubanks, P.E.	License No.: 09306 NV	Expiration Date: 12/31/06
Company Name: Clark County Regional Flood Control Dist	Telephone No.: 702-455-3139	Fax No.: 702-455-3870
Signature: KL Eub		Date: 7/14/06

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

Seal (Optional)

BULLOCH BROTHERS ENGINEERING INC.
ENGINEERS ★ SURVEYORS ★ LAND PLANNERS
Established in 1972

City of Mesquite
10 East Mesquite Boulevard
Mesquite, Nevada 89027

Date: July 14, 2005

Attention: Kurt Sawyer, Director of Building and Capital Projects

Regarding: Abbott Wash Conveyance, Ph. I, Final Acceptance (Excluding Damaged Gabion)

Dear Kurt,

To the best of my knowledge the improvements for the Abbott Wash Conveyance Project have been completed in conformance with the approved plans and specifications.

Punch List items have been completed. The Warranty Form and Guarantee Bond have been submitted to the City. Record Drawings are complete. Two of each of the following documents are included: 1) Certified Record Drawings, 2) Final Grading Report for Abbott Wash Conveyance. One copy is included for Clark County Regional Flood Control's records.

The final pay estimate has been submitted as requested, and effectively closes out the Project excluding retention held by the City to repair flood damage sustained to the Gabion. To the best of my knowledge the Contractor has submitted lien releases for all material and labor covered by the Contract.

Inspection services throughout the project construction have been conducted with the usual thoroughness and competence of the profession. No warranty, express or implied, is made with respect to the services rendered.

We recommend that the improvements for the Abbott Wash Conveyance Project, Phase 1, be accepted. An agenda item for City Council acceptance for the same, and a "Notice of Completion" for the City's signature are attached.

If further information or clarification regarding the above mentioned project is required please advise.

Sincerely,

Weston L. Nelson

Weston L. Nelson, P.E.
Bulloch Brothers Engineering, Inc.

Cedar City
P.O. Box 3174
Cedar City, UT 84721-3174
435.586.9592
435.586.4995 Fax

Mesquite
P.O. Box 925
Mesquite, NV 89024
702.346.5100
702.346.5102 Fax

ity of **Mesquite** Nevada

"Come for a Day ... Stay for a Lifetime"

DEPARTMENT OF BUILDING AND CAPITAL PROJECTS
Kurt O. Sawyer, *Director*
10 E. Mesquite Boulevard
Mesquite, Nevada 89027
(702) 346-2835 Fax: (702) 346-5382
ksawyer@ci.mesquite.nv.us

Date: August 1, 2005

Cresent L. Hardy, President
Legacy Construction & Development, Inc.
P.O. Box 2637
Mesquite, Nevada 89024

RE: Abbott Wash Conveyance Project, Phase 1
Notice of Completion

Dear Mr. Hardy,

In accordance with the Contract Documents, this **NOTICE OF COMPLETION** is hereby issued for **PHASE-1 OF THE ABBOTT WASH CONVEYANCE PROJECT** that extends from the Virgin River to Station 64+00 located north of Mesquite Boulevard as shown on the Contract Drawings.

Due to extraordinary circumstances, the gabion construction (Station: 1+12 to 2+25) is excluded and will be managed separately.

The completed improvements were placed on the Agenda for City Council approval on July 26, 2005, whereon the Council accepted the project, excluding the damaged portion of the gabions, which portion will be managed separately.

As required by the Contract Documents, all repairs arising out of defective materials, workmanship, or equipment shall be repaired upon receipt of notice from the City for the duration of the Warranty period, effective March 14, 2005.

Please call if you have any questions.

Sincerely,

Kurt O. Sawyer
Project Administrator/Manager

CC: Jill Reilly, P.E., Clark County Regional Flood Control District
Greg L. Bulloch, P.E., Bulloch Brothers Engineering, Inc.
Weston L. Nelson, P.E., Bulloch Brothers Engineering, Inc. (Engineer/Construction Management)

Agenda Item: City Council approval for improvements completed for the Abbott Wash Conveyance Project, Phase 1, from the Virgin River to Station 64+00.

Bulloch Brothers Engineering, Inc., acting as Construction Managers for the above mentioned Project, recommends City Council final acceptance of the improvements completed excluding the portion of the Gabion damaged in the January 11th (2005) flood event, which portion will be managed separately.

To the best of our knowledge, the improvements completed by Legacy Construction and Development, Inc. for the Abbott Wash Conveyance Project have been completed in conformance with the approved plans and specifications.

Punch List items have been completed. The Warranty Form and Guarantee Bond have been submitted to the City. Record Drawings are complete. The Final Grading Report for the above mentioned project have been submitted. The final pay estimate has been submitted as requested, and effectively closes out the Project excluding retention held by the City to repair flood damage sustained to the Gabion. To the best of our knowledge the Contractor has submitted lien releases for all material and labor covered by the Contract.

Inspection services throughout the project construction have been conducted with the usual thoroughness and competence of the profession. No warranty, express or implied, is made with respect to the services rendered.

As required by the Contract Documents, all repairs arising out of defective materials, workmanship, or equipment shall be repaired by the Contractor upon receipt of notice from the City for the duration of the Warranty period, effective March 14, 2005.

If further information or clarification regarding the above mentioned project is required please advise.

BULLOCH BROTHERS ENGINEERING
ENGINEERS ★ SURVEYORS ★ LAND PLANNERS
Established in 1972

Date: June 28, 2006

City of Mesquite
10 East Mesquite Boulevard
Mesquite, Nevada 89027

Attention: Kurt Sawyer, Director of Building and Capital Projects

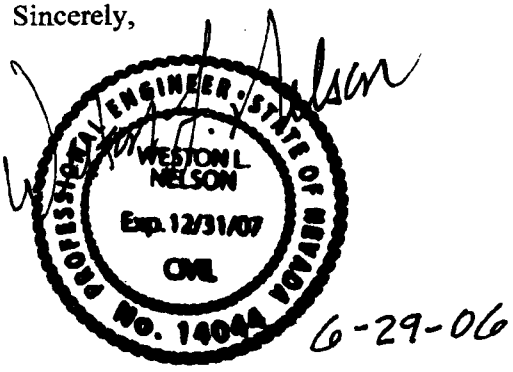
Regarding: As-Built Certification for Abbott Wash Conveyance, Ph. II Improvements

Dear Kurt,

The Abbott Wash – Phase II Improvements included in Nevada Department of Transportation (NDOT) Contract No. 3238, or Project No. STP-015-2(031)120, dated August 11, 2004, are complete, in place according to Plan, and are fully functional. Having observed the finished improvements in walking the project with the City, NDOT, and CCRFCD representatives, I certify to the best of my knowledge that the Abbott Wash portion of the improvements incorporated into the Contract Documents referenced above, which portion include Sheets DP-01 to DP-27, stamped and signed by Weston L. Nelson, P.E. on September 2, 2004, substantially represent what is now built. The various structures identified thereon conform to plan location, alignment, elevation, and geometry. In regards to the structural integrity and hydraulic capacity, these improvements are expected to perform as designed.

Please call if you need any further information or clarification regarding these improvements.

Sincerely,



6-29-06

Weston L. Nelson, P.E.
Bulloch Brothers Engineering, Inc.

CC: Allen Bell, P.E. – City Engineer for the City of Mesquite
Kevin Eubanks, P.E. – Assistant General Manager for CCRFCD

ity of **Mesquite** Nevada
"Come for a Day ... Stay for a Lifetime"

DEPARTMENT OF BUILDING AND CAPITAL PROJECTS
Kurt O. Sawyer, *Director*
10 E. Mesquite Boulevard
Mesquite, Nevada 89027
(702) 346-2835 Fax: (702) 346-5382
ksawyer@ci.mesquite.nv.us

Date: August 1, 2005

Cresent L. Hardy, President
Legacy Construction & Development, Inc.
P.O. Box 2637
Mesquite, Nevada 89024

RE: Abbott Wash Conveyance Project, Phase 1
Notice of Completion

Dear Mr. Hardy,

In accordance with the Contract Documents, this **NOTICE OF COMPLETION** is hereby issued for **PHASE-1 OF THE ABBOTT WASH CONVEYANCE PROJECT** that extends from the Virgin River to Station 64+00 located north of Mesquite Boulevard as shown on the Contract Drawings.

Due to extraordinary circumstances, the gabion construction (Station: 1+12 to 2+25) is excluded and will be managed separately.

The completed improvements were placed on the Agenda for City Council approval on July 26, 2005, whereon the Council accepted the project, excluding the damaged portion of the gabions, which portion will be managed separately.

As required by the Contract Documents, all repairs arising out of defective materials, workmanship, or equipment shall be repaired upon receipt of notice from the City for the duration of the Warranty period, effective March 14, 2005.

Please call if you have any questions.

Sincerely,

Kurt O. Sawyer
Project Administrator/Manager

CC: Jill Reilly, P.E., Clark County Regional Flood Control District
Greg L. Bulloch, P.E., Bulloch Brothers Engineering, Inc.
Weston L. Nelson, P.E., Bulloch Brothers Engineering, Inc. (Engineer/Construction Management)

Agenda Item: City Council approval for improvements completed for the Abbott Wash Conveyance Project, Phase 1, from the Virgin River to Station 64+00.

Bulloch Brothers Engineering, Inc., acting as Construction Managers for the above mentioned Project, recommends City Council final acceptance of the improvements completed excluding the portion of the Gabion damaged in the January 11th (2005) flood event, which portion will be managed separately.

To the best of our knowledge, the improvements completed by Legacy Construction and Development, Inc. for the Abbott Wash Conveyance Project have been completed in conformance with the approved plans and specifications.

Punch List items have been completed. The Warranty Form and Guarantee Bond have been submitted to the City. Record Drawings are complete. The Final Grading Report for the above mentioned project have been submitted. The final pay estimate has been submitted as requested, and effectively closes out the Project excluding retention held by the City to repair flood damage sustained to the Gabion. To the best of our knowledge the Contractor has submitted lien releases for all material and labor covered by the Contract.

Inspection services throughout the project construction have been conducted with the usual thoroughness and competence of the profession. No warranty, express or implied, is made with respect to the services rendered.

As required by the Contract Documents, all repairs arising out of defective materials, workmanship, or equipment shall be repaired by the Contractor upon receipt of notice from the City for the duration of the Warranty period, effective March 14, 2005.

If further information or clarification regarding the above mentioned project is required please advise.

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour 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, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). 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.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☐ CLOMR: A letter from 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 FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

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
Ex: 480301 480287	City of Katy Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
320003	City of Mesquite	NV	32003C	0387E	09/27/02

2. Flooding Source: Abbott Wash

3. Project Name/Identifier: Request for Final LOMR pursuant to CLOMR Case No. 05-09-0588R

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 ☐ 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 types of flooding and structures (check all that apply)

Types of Flooding:	☑ Riverine	☐ Coastal	☐ Shallow Flooding (e.g., Zones AO and AH)
	☐ Alluvial fan	☐ Lakes	☐ Other (Attach Description)
Structures:	☑ Channelization	☐ Levee/Floodwall	☑ Bridge/Culvert
	☐ Dam	☐ Fill	☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☐ Yes	Fee amount: $_____
	☑ No, Attach Explanation	

Please see the FEMA Web site at http://www.fema.gov/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: Kevin L. Eubanks, P.E., CFM	Company: Clark County Regional Flood Control Dist	
Mailing Address: 600 Grand Central Parkway, #300 Las Vegas, NV 89106-4511	Daytime Telephone No.: 702-455-3139	Fax No.: 702-455-3870
	E-Mail Address: keubanks@ccrfcd.org	
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 requirement that no fill be 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. 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: J. Allen Bell, P.E., City Engineer		Telephone No.: 702-346-5259
Community Name: City of Mesquite	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. 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: Kevin L. Eubanks, P.E.	License No.: 09306 NV	Expiration Date: 12/31/06
Company Name: Clark County Regioanl Flood Control Dist	Telephone No.: 702-455-3139	Fax No.: 702-455-3870
Signature:		Date:

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

Seal (Optional)

BULLOCH BROTHERS ENGINEERING
ENGINEERS ★ SURVEYORS ★ LAND PLANNERS
Established in 1972

Date: June 28, 2006

City of Mesquite
10 East Mesquite Boulevard
Mesquite, Nevada 89027

Attention: Kurt Sawyer, Director of Building and Capital Projects

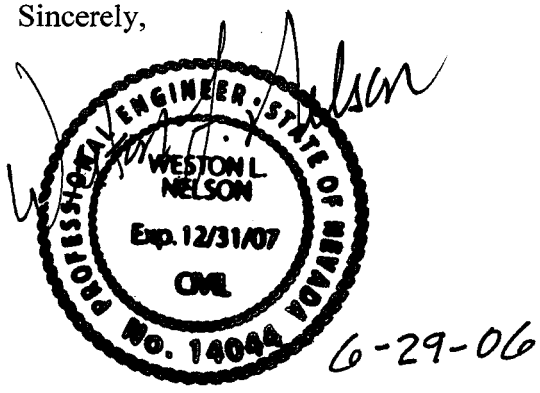
Regarding: As-Built Certification for Abbott Wash Conveyance, Ph. II Improvements

Dear Kurt,

The Abbott Wash – Phase II Improvements included in Nevada Department of Transportation (NDOT) Contract No. 3238, or Project No. STP-015-2(031)120, dated August 11, 2004, are complete, in place according to Plan, and are fully functional. Having observed the finished improvements in walking the project with the City, NDOT, and CCRFCD representatives, I certify to the best of my knowledge that the Abbott Wash portion of the improvements incorporated into the Contract Documents referenced above, which portion include Sheets DP-01 to DP-27, stamped and signed by Weston L. Nelson, P.E. on September 2, 2004, substantially represent what is now built. The various structures identified thereon conform to plan location, alignment, elevation, and geometry. In regards to the structural integrity and hydraulic capacity, these improvements are expected to perform as designed.

Please call if you need any further information or clarification regarding these improvements.

Sincerely,



Weston L. Nelson, P.E.
Bulloch Brothers Engineering, Inc.

CC: Allen Bell, P.E. – City Engineer for the City of Mesquite
Kevin Eubanks, P.E. – Assistant General Manager for CCRFCD

Federal Emergency Management Agency

Washington, D.C. 20472

RECD
2005 SEP -1 PM 12:42

AUG 29 2005

The Honorable Bill Nicholes
Mayor, City of Mesquite
10 E Mesquite Blvd
Mesquite, NV 89027

IN REPLY REFER TO:
Case No.: 05-09-0588R
Community: City of Mesquite, NV
Community No.: 320035

104

Dear Mayor Nicholes:

This responds to a request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) comment on the effects that a proposed project would have on the effective Flood Insurance Rate Map (FIRM) for Clark County, Nevada and Incorporated Areas, in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated February 17, 2005, Mr. Kevin Eubanks, P.E., CFM, Assistant General Manager, Clark County Regional Flood Control District, requested that FEMA evaluate the effects that proposed channelization and construction of culverts along Abbott Wash, from just downstream of Pioneer Boulevard to approximately 300 feet upstream of the confluence with the Virgin River, would have on the flood hazard information shown on the effective FIRM.

All data required to complete our review of this request for a Conditional Letter of Map Revision (CLOMR) were submitted with letters from Mr. Mathew S. Baird, P.E., CFM, Senior Program Manager, and Brian K. Loffman CFM, Hydrologist, both with PBS&J; and Mr. Eubanks.

We reviewed the submitted data and the data used to prepare the effective FIRM for your community and determined that the proposed project meets the minimum floodplain management criteria of the NFIP. We believe that, if the proposed project is constructed as shown on the plans entitled "Abbott Wash Channel Improvement Plans," prepared by Bulloch Brothers Engineering, Inc., dated December 11, 2003, and on the plans entitled "Interstate-15 Improvements," prepared by the Nevada Department of Transportation, dated August 11, 2004, and the data listed below are received, a revision to the FIRM would be warranted.

As a result of the proposed modifications, the width of the Special Flood Hazard Area (SFHA), the area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), will decrease compared to the effective SFHA width along Abbott Wash from just downstream of Pioneer Boulevard to approximately 1,000 feet upstream of the confluence with the Virgin River. The maximum decrease in SFHA width, approximately 3,600 feet, will occur just upstream of Second South Street. The entire base flood will be contained in the channel throughout the revised reach.

Although the channel will extend into the unincorporated areas of Clark County, the flooding shown on the FIRMs is controlled by the Virgin River. As a result, no flood hazard changes will occur in the county as a result of the channel.

Upon completion of the project, your community may submit the data listed below and request that we make a final determination on revising the effective FIRM.

- Detailed application and certification forms must be used for requesting final revisions to the maps. Therefore, when the map revision request for the area covered by this letter is submitted, Form 1, entitled "Overview & Concurrence Form," must be included. (A copy of this form is enclosed.)

- The detailed application and certification forms listed below may be required if as-built conditions differ from the preliminary plans. If required, please submit new forms (copies of which are enclosed) or annotated copies of the previously submitted forms showing the revised information.

  Form 2, entitled "Riverine Hydrology & Hydraulics Form"

  Form 3, entitled "Riverine Structures Form"

  Hydraulic analyses, for as-built conditions, of the base flood and the regulatory floodway, together with a topographic work map showing the revised floodplain and floodway boundaries, must be submitted with Form 2.

- Effective September 1, 2002, FEMA revised the fee schedule for reviewing and processing requests for conditional and final modifications to published flood information and maps. In accordance with this schedule, the current fee for this map revision request is $3,800 and must be received before we can begin processing the request. Please note, however, that the fee schedule is subject to change, and requesters are required to submit the fee in effect at the time of the submittal. Payment of this fee shall be made in the form of a check or money order, made payable in U.S. funds to the National Flood Insurance Program, or by credit card. The payment must be forwarded to the following address:

  Federal Emergency Management Agency
  Fee-Charge System Administrator
  P.O. Box 22787
  Alexandria, VA 22304

- As-built plans, certified by a registered professional engineer, of all proposed project elements

- Community acknowledgment of the map revision request

After receiving appropriate documentation to show that the project has been completed, FEMA will initiate a revision to the FIRM.

The basis of this CLOMR is, in whole or in part, a channel-modification/culvert project. NFIP regulations, as cited in Paragraph 60.3(b)(7), require that communities assure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management regulations. Consequently, the ultimate responsibility for maintenance of the modified channel and culvert rests with your community.

This CLOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the

SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the Consultation Coordination Officer (CCO) for your community. Information on the CCO for your community may be obtained by calling the Director, Federal Insurance and Mitigation Division of FEMA in Oakland, California, at (510) 627-7175. If you have any questions regarding this CLOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,



Michael B. Godesky, CFM, Project Engineer
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

For: Doug Bellomo, P.E., Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

Enclosures

cc: The Honorable Rory Reid
Chair, Clark County Board
of Commissioners

Mr. J. Allen Bell, P.E.
City Engineer
City of Mesquite

Mr. Dave Betley, P.E.
Principal Engineer
Civil Engineering Division
Clark County Department of Development Services

Mr. Kevin Eubanks, P.E., CFM
Assistant General Manager
Clark County Regional Flood Control District

Mr. Mathew S. Baird, P.E., CFM
Senior Program Manager
PBS&J

Mr. Brian K. Loffman, CFM
Hydrologist
PBS&J

BULLOCH BROTHERS ENGINEERING INC.
ENGINEERS ★ SURVEYORS ★ LAND PLANNERS
Established in 1972

City of Mesquite
10 East Mesquite Boulevard
Mesquite, Nevada 89027

Date: July 14, 2005

Attention: Kurt Sawyer, Director of Building and Capital Projects

Regarding: Abbott Wash Conveyance, Ph. I, Final Acceptance (Excluding Damaged Gabion)

Dear Kurt,

To the best of my knowledge the improvements for the Abbott Wash Conveyance Project have been completed in conformance with the approved plans and specifications.

Punch List items have been completed. The Warranty Form and Guarantee Bond have been submitted to the City. Record Drawings are complete. Two of each of the following documents are included: 1) Certified Record Drawings, 2) Final Grading Report for Abbott Wash Conveyance. One copy is included for Clark County Regional Flood Control's records.

The final pay estimate has been submitted as requested, and effectively closes out the Project excluding retention held by the City to repair flood damage sustained to the Gabion. To the best of my knowledge the Contractor has submitted lien releases for all material and labor covered by the Contract.

Inspection services throughout the project construction have been conducted with the usual thoroughness and competence of the profession. No warranty, express or implied, is made with respect to the services rendered.

We recommend that the improvements for the Abbott Wash Conveyance Project, Phase 1, be accepted. An agenda item for City Council acceptance for the same, and a "Notice of Completion" for the City's signature are attached.

If further information or clarification regarding the above mentioned project is required please advise.

Sincerely,

Weston L. Nelson, P.E.
Bulloch Brothers Engineering, Inc.

Cedar City
P.O. Box 3174
Cedar City, UT 84721-3174
435.586.9592
435.586.4995 Fax

Mesquite
P.O. Box 925
Mesquite, NV 89024
702.346.5100
702.346.5102 Fax

ABBOTT WASH CONVEYANCE PROJECT
CONTRACT DRAWINGS

A PORTION OF ABBOTT WASH FROM THE VIRGIN RIVER TO STA:64+00 (PHASE I)
INCLUDED IN THE "CITY OF MESQUITE MASTER PLAN UPDATE 2001"

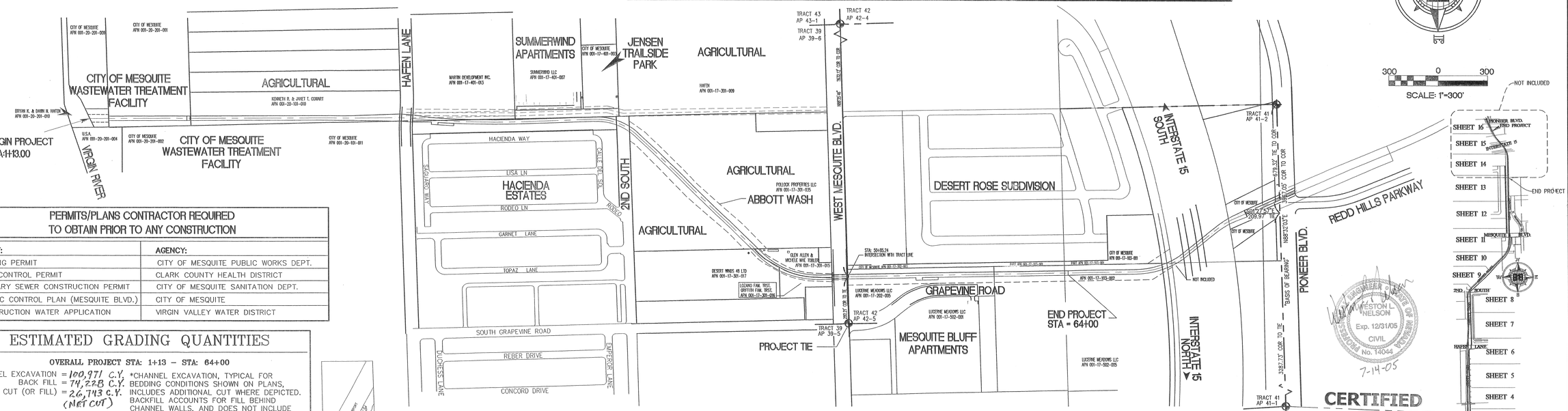
City of Mesquite
Nevada

DEPARTMENT OF PUBLIC WORKS
10 EAST MESQUITE BOULEVARD
MESQUITE, NEVADA 89027
(702) 346-5295

Call Two Working Days Before You Dig!
1-800-227-2600

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

FUNDED BY
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
600 S GRAND CENTRAL PARKWAY STE. 300
LAS VEGAS, NEVADA 89106-4511, PHONE: (702) 455-3139



300 0 300
SCALE: 1"=300'

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

PERMITS/PLANS CONTRACTOR REQUIRED TO OBTAIN PRIOR TO ANY CONSTRUCTION	
PERMIT:	**AGENCY:**
GRADING PERMIT	CITY OF MESQUITE PUBLIC WORKS DEPT.
DUST CONTROL PERMIT	CLARK COUNTY HEALTH DISTRICT
SANITARY SEWER CONSTRUCTION PERMIT	CITY OF MESQUITE SANITATION DEPT.
TRAFFIC CONTROL PLAN (MESQUITE BLVD.)	CITY OF MESQUITE
CONSTRUCTION WATER APPLICATION	VIRGIN VALLEY WATER DISTRICT

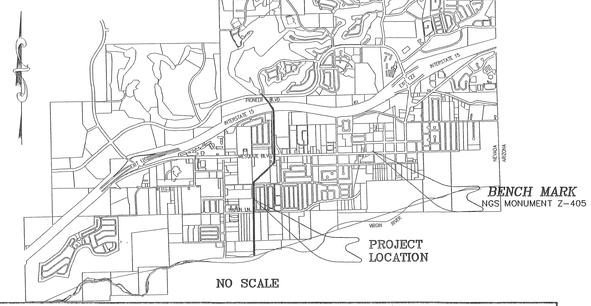
ESTIMATED GRADING QUANTITIES

OVERALL PROJECT STA: 1+13 – STA: 64+00

CHANNEL EXCAVATION = 100,971 C.Y.
BACK FILL = 74,228 C.Y.
NET CUT (OR FILL) = 26,743 C.Y. (NET CUT)

*CHANNEL EXCAVATION, TYPICAL FOR BEDDING CONDITIONS SHOWN ON PLANS, INCLUDES ADDITIONAL CUT WHERE DEPICTED. BACKFILL ACCOUNTS FOR FILL BEHIND CHANNEL WALLS, AND DOES NOT INCLUDE IMPORTED BASE MATERIAL.

NOTE: ABOVE QUANTITIES DO NOT ACCOUNT FOR SHRINKAGE OR SUBSIDENCE.



MESQUITE, NEVADA VICINITY MAP/BENCH MARK

VERTICAL CONTROL:

TOP OF STAINLESS STEEL ROD IN CASING SET BELOW GROUND AT SOUTHEAST CORNER OF LDS CHURCH PROPERTY, NORTH SIDE OF MESQUITE BOULEVARD, WEST SIDE OF TOWN WASH.

BENCH MARK BASED ON NGVD 1929, NGS MONUMENT Z-405, ELEVATION = 1595.65

HORIZONTAL CONTROL:

STATION 50+85.24 OF ABBOTT WASH CENTERLINE IS LOCATED 292.21 FEET EAST OF TRACT CORNER 42-5 AT A BEARING OF N88°35'46"E

APPROVAL BY CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

Gale Wm. Fraser, II — DATE: 12/9/2003
GALE Wm. FRASER, II, P.E.
GENERAL MANAGER/CHIEF ENGINEER

APPROVAL BY THE UTILITY COMPANIES

MICHAEL WINTERS — DATE: 12-4-03
VIRGIN VALLEY WATER DISTRICT

DOUG WAITE — DATE: 12-4-03
OVERTON POWER DIST. No.5

HAROLD OSTER — DATE: 12-3-03
RIO VIRGIN TELEPHONE CO.

SLADE FAUGHT — DATE: 12-4-03
VIRGIN VALLEY DISPOSAL INC.

KRAIG HAFEN — DATE: 12-8-03
MESQUITE IRRIGATION COMPANY

APPROVAL BY THE CITY OF MESQUITE

J. ALLEN BELL P.E. — DATE: 8 Dec '03
CITY ENGINEER

BILL TANNER — DATE: 12.5.03
DIRECTOR OF PUBLIC WORKS

KURT O. SAWYER — DATE: 12-5-03
DIRECTOR OF BUILDING

DEREK L. HUGHES — DATE: 12.3.03
CITY OF MESQUITE FIRE DEPARTMENT

DON C. MATSON, AICP — DATE: 12/5/03
DIRECTOR OF PLANNING AND REDEVELOPMENT

INDEX

SHEET 1	COVER	
SHEET 2	NOTES	
SHEET 3	PLAN & PROFILE 1 STA: 1+00.00 TO 6+00.00	
SHEET 4	PLAN & PROFILE 2 STA: 6+00.00 TO 11+00.00	
SHEET 5	PLAN & PROFILE 3 STA: 11+00.00 TO 16+50.00	
SHEET 6	PLAN & PROFILE 4 STA: 16+50.00 TO 22+50.00	
SHEET 7	PLAN & PROFILE 5 STA: 22+50.00 TO 28+50.00	
SHEET 8	PLAN & PROFILE 6 STA: 28+50.00 TO 34+50.00	
SHEET 9	PLAN & PROFILE 7 STA: 34+50.00 TO 40+50.00	
SHEET 10	PLAN & PROFILE 8 STA: 40+50.00 TO 46+50.00	
SHEET 11	PLAN & PROFILE 9 STA: 46+50.00 TO 52+50.00	
SHEET 12	PLAN & PROFILE 10 STA: 52+50.00 TO 58+50.00	
SHEET 13	PLAN & PROFILE 11 STA: 58+50.00 TO 64+50.00	
SHEET 14	PLAN & PROFILE 12 STA: 64+50.00 TO 69+50.00	OMITTED
SHEET 15	PLAN & PROFILE 13 STA: 69+50.00 TO 75+50.00	OMITTED
SHEET 16	PLAN & PROFILE 14 STA: 75+50.00 TO 79+55.15	OMITTED
SHEET 17	PLAN & PROFILE OF SIPHONS	
SHEET 18	NDOT DETAILS AND NOTES	
SHEET 19	GENERAL DETAILS (CHANNEL WALLS)	
SHEET 20	GENERAL DETAILS	
SHEET 21	GENERAL DETAILS	
SHEET 22	GENERAL DETAILS (GABIONS)	
SHEET 23	GENERAL DETAILS	
SHEET 24	ABBOTT WASH EASEMENTS/OWNERSHIP	
SHEET 25	SEWER PROFILE/16" WL AT MESQUITE BLVD. PROFILE	
SHEET 26	GENERAL DETAILS	

REVISIONS

NO	DESCRIPTION	DATE	BY

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BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
361 W MESQUITE BLVD, STE 4
MESQUITE, NEVADA 89027
(702) 346-5101
P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586-9592

ABBOTT WASH CONVEYANCE
COVER SHEET
FOR
THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA

WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
7-14-05

WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
11-24-03

SCALE: 1"=300'
DRAWN BY: B.C.
CHECKED BY: W.N.
PROJECT NO: 102-90-05
DATE: Nov. 2003
SHEET NO: 1 OF 26

PLOT DATE

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN STRICT CONFORMANCE TO THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF SITE IMPROVEMENTS LATEST REVISIONS. CLARK COUNTY, NEVADA, 1997 (AS REVISED) AND THE LATEST REVISION OF THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, OFF SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA". (C.C.A.S.D.), AND THE NEVADA DEPT. OF TRANSPORTATION STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION LATEST REVISIONS.
2. ALL DIMENSIONS ARE TO BACK-OF-CURB UNLESS OTHERWISE NOTED.
3. EXACT LOCATIONS OF SAW CUT LINES MAY BE DETERMINED IN THE FIELD BY THE CITY OF MESQUITE.
4. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "NEVADA WORK ZONE TRAFFIC CONTROL HANDBOOK-1985" AND TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES-2000."
5. CURB AND GUTTER WITH A GRADE 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 ASAP AFTER CONSTRUCTION.
6. ALL CEMENT SHALL BE TYPE V.
7. TBC IS 0.50' HIGHER THAN FINISH GRADE UNLESS OTHERWISE NOTED.
8. ALL WORK DONE WITHIN THE PUBLIC RIGHT-OF-WAY AND OUTSIDE OF THE PROJECT BOUNDARIES WILL REQUIRE A SEPARATE ENCROACHMENT PERMIT ISSUED BY THE CITY OF MESQUITE. TRENCH AND PAVEMENT REPLACEMENT CONDITIONS WILL BE IN CONFORMANCE WITH THE PERMIT.
9. ALL EXISTING CONSTRUCTION TO BE MET BY NEW CONSTRUCTION SHALL BE FIELD VERIFIED FOR VERTICAL AND HORIZONTAL LOCATIONS BEFORE THE START OF DEPENDENT NEW CONSTRUCTION. THE ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCY OF EXISTING CONDITIONS FROM THOSE SHOWN ON THE PLANS BEFORE THE START OF THE NEW CONSTRUCTION SO THAT ANY CHANGES WHICH MAY BE REQUIRED CAN BE MADE.
10. ANY ERRORS OR DISCREPANCIES IN THE PLANS SHALL BE REPORTED TO THE DESIGN ENGINEER PRIOR TO COMMENCEMENT OF CONSTRUCTION. ERRORS OR DISCREPANCIES DISCOVERED AFTER COMMENCEMENT OF CONSTRUCTION, SHALL ALSO BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE DESIGN ENGINEER. IT IS THE CONTRACTOR(S) RESPONSIBILITY TO REPORT SUCH ERRORS OR DISCREPANCIES WITH THE CONCURRENCE OF HIS CLIENT AND WITH THE APPROVAL OF THE CITY ENGINEER.
11. ALL CLEARING AND GRADING WORK SHALL BE IN STRICT CONFORMANCE TO THE TECHNICAL SPECIFICATIONS. A GEOTECHNICAL REPORT HAS BEEN PREPARED FOR THIS PROJECT AND IS TITLED "GEOTECHNICAL ENGINEERING REPORT ABBOTT WASH CONVEYANCE IMPROVEMENTS" LOCATED IN MESQUITE, NEVADA. THE GEOTECHNICAL REPORT WAS PREPARED BY LANDMARK TESTING AND ENGINEERING, 376 E. SUNLAND DRIVE, #10, ST. GEORGE, UTAH 84790, (435) 986-0566.
12. THE CONTRACTOR(S) SHALL REVIEW THE ABOVE-MENTIONED GEOTECHNICAL INVESTIGATION PRIOR TO STARTING THE WORK.
13. ALL WORK WITHIN PUBLIC RIGHT-OF-WAY AND EASEMENTS TO BE WARRANTED BY THE CONTRACTOR(S), FOR ONE YEAR FROM DATE OF FINAL APPROVAL.
14. CALL 1-800-227-2600 AT LEAST TWO WORKING DAYS BEFORE YOU DIG. THE CONTRACTOR IS TO NOTIFY UNDERGROUND SERVICE ALERT. EXISTING UTILITIES ARE SHOWN ON PLANS FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. THE CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES. THE ENGINEER BEARS NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR SHOWN INCORRECTLY.
15. DIMENSIONS SHOWN TAKE PRECEDENCE OVER SCALING.
16. ALL ELEVATIONS SHOWN ON THESE PLANS ARE BASED ON NGVD 1929, NGS MONUMENT Z-405, ELEVATION 1595.65. TOP OF STAINLESS STEEL ROD IN CASING SET BELOW GROUND AT SOUTHEAST CORNER OF LDS CHURCH PROPERTY, NORTH SIDE OF MESQUITE BOULEVARD, WEST SIDE OF TOWN WASH.
17. SIDEWALK EXPANSION JOINTS SHOWN ON UNIFORM STANDARD DRAWING #234 SHALL BE MODIFIED TO CONFORM WITH SPECIFICATIONS MANDATED BY THE CITY OF MESQUITE IN A LETTER DATED JULY 30, 1997: SIDEWALK EXPANSION JOINTS SHALL BE CONSTRUCTED AT 15' INTERVALS WHEN USING THE STANDARD 1/2" FELT MATERIAL; OR, AS AN ALTERNATIVE, SIDEWALK JOINTS MAY BE CONSTRUCTED AT 30' INTERVALS WHEN AN APPROVED ELASTOMERIC SEALANT MATERIAL IS USED.
18. CONTRACTOR SHALL COORDINATE A PRE-CONSTRUCTION MEETING INVOLVING THE POWER COMPANY, THE TELEPHONE COMPANY(S), THE CABLE COMPANY(S) WHILE ALSO INVITING THE PUBLIC WORKS DEPARTMENT FROM THE CITY OF MESQUITE TO DETERMINE UTILITY LINES, JUNCTION BOXES AND TRANSFORMER LOCATIONS, AND EASEMENTS.
19. ESTIMATED GRADING QUANTITIES ARE BASED ON A TRAPEZOID SHAPED CROSS SECTION WITH 2:1 SIDE SLOPES AND A FLAT BOTTOM, DUG TO THE APPROXIMATE DEPTH BELOW THE CHANNEL WALL FOOTINGS FOR THE VARIOUS BEDDING CONDITIONS, EXTENDING HORIZONTALLY ACROSS THE CHANNEL. SEE DETAIL A, SHEET 20, DEPICTS TYPICAL EXCAVATION. REFER TO SECTION 203 IN THE TECHNICAL SPECIFICATIONS FOR FURTHER INFORMATION.

ABBREVIATIONS LIST

TOP OR T.O.P.	= TOP OF PIPE	SD	= STORM DRAIN
FM	= FORCE MAIN	WL	= WATER LINE
STA:	= STATION	MIN.	= MINIMUM
TYP.	= TYPICAL	B.V.	= BUTTERFLY VALVE
℄	=CENTER LINE	G.V.	= GATE VALVE
P℄	= PROPERTY LINE	ELL	= ELBOW FITTING
F℄	= FLOW LINE	SS	= SANITARY SEWER
INV	= INVERT	ø	= INSIDE DIAMETER
ROW	= RIGHT OF WAY	PC	= POINT OF CURVATURE
TOF	= TOP OF FOOTING	PT	= POINT OF TANGENCY

CITY OF MESQUITE SANITATION NOTES

1. ALL SANITARY SEWER CONSTRUCTION SHALL REQUIRE A CONSTRUCTION PERMIT TO BE ISSUED BY THE CITY OF MESQUITE SANITATION DEPARTMENT TO THE GENERAL CONTRACTOR FOR THE PROJECT. THIS WILL REQUIRE A COPY OF THE IMPROVEMENT PLANS SIGNED BY ALL UTILITIES, COPY OF CONTRACTORS CLASS A LICENSE AND A DATE WHEN CONSTRUCTION WILL START. THE GENERAL CONTRACTOR WILL ALSO BE REQUIRED TO HAVE A COPY OF THE LATEST EDITION OF THE "DESIGN AND CONSTRUCTION STANDARDS FOR WASTE-WATER COLLECTION SYSTEMS FOR SOUTHERN NEVADA", ON THE PROJECT AT ALL TIMES. THE MESQUITE SANITATION DEPARTMENT CAN BE NOTIFIED AT 10 E. MESQUITE BLVD., OR BY CALLING 1-702-346-2849, 1-702-346-5295.
2. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE "DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS FOR SOUTHERN NEVADA" AS ADOPTED BY THE CLARK COUNTY SANITATION DISTRICT, AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORK'S CONSTRUCTION OFF SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IN ALL CASES, THE DISTRICT'S CRITERIA SHALL SUPERSEDE THE UNIFORM STANDARD SPECIFICATIONS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENTS OF THE ABOVE SPECIFICATIONS.
3. THE "STANDARD DRAWINGS" AS SPECIFIED IN THE LATEST EDITION OF THE "DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS FOR SOUTHERN NEVADA" AS ADOPTED BY THE CLARK COUNTY SANITATION DISTRICT SHALL APPLY TO ALL CONSTRUCTION.
4. SEWER MAINS ONLY TO BE LAID IN SEWER TRENCHES.
5. ALL HOUSE LATERALS TO BE LAID AT NOT LESS THAN MINIMUM SLOPES SHOWN IN THE STANDARDS.
6. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY OF MESQUITE SANITATION DEPARTMENT. ALL NEW SEWER LINE CONSTRUCTION WILL BE PLUGGED AT THE MAIN LINE TIE-IN AND THERE WILL BE NO SEWER LINE USAGE UNTIL ALL SEWER LINES WITHIN THE PROJECT ARE ACCEPTED BY THE SANITATION DEPT.
7. SOIL TESTING SHALL BE IN ACCORDANCE WITH SECTION 3.11 OF THE STANDARDS.
8. ALL EXFILTRATION, INFILTRATION AND AIR TESTING OF LINES SHALL BE IN ACCORDANCE WITH THE STANDARDS.
9. CUT SHEETS MUST BE SUBMITTED TO THE CITY SANITATION DEPARTMENT BEFORE CONSTRUCTION WILL BE PERMITTED TO START.
10. THE LOCATION OF THE SEWER SERVICE LATERAL WHERE IT PASSES UNDER THE CURB WILL BE INDICATED BY INSCRIBING AN S IN THE TOP OF THE CURB OR BY INSERTION OF A BRASS TAG MARKED S IN THE TOP OF THE CURB.
11. THE MESQUITE SANITATION DEPARTMENT SHALL BE NOTIFIED 24 HOURS IN ADVANCE OF THE PROJECT COMPLETION WALK THROUGH, AND WILL BE PROVIDED WITH A SET OF AS-BUILTS. AS-BUILTS, AS A MINIMUM SHALL INCLUDE DISTANCE BETWEEN MANHOLES, LATERAL LOCATION AT THE THE PROPERTY LINE, ALIGNMENT CHANGES AND EXISTING UTILITIES THAT CROSS THE SEWER LINES. THE ENGINEER WILL PROVIDE RECORD DRAWINGS, MYLARS OF GOOD QUALITY, TO THE DEPARTMENT REFLECTING THE CERTIFIED AS-BUILTS SUPPLIED BY THE CONTRACTOR. ONCE ALL THESE CONDITIONS ARE SATISFIED, AND THE PUNCH LIST IS COMPLETED TO THE DEPARTMENTS APPROVAL, THE COMPLETION DATE WILL BE ESTABLISHED AND THE WARRANTY WILL BE IN EFFECT FOR ONE YEAR FROM THAT DATE.

STREET LIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS EXCEPT AS NOTED ON THE STREET LIGHTING PLANS SHALL CONFORM TO THE CLARK COUNTY AREA UNIFORM STANDARD DRAWINGS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, OFF SITE IMPROVEMENT, CLARK COUNTY AREA, NEVADA.
2. ALL LIGHT POLES ARE TO BE GALVANIZED.
3. NEW SERVICE POINT REQUIRED.
4. STREETLIGHT CONDUIT SHALL CONFORM TO CLARK COUNTY STANDARD SPECIFICATION (SECTION 623) AND SHALL BE SCHEDULE 40 PVC OF THE SIZE 1 1/4 INCH. UNDERGROUND CONDUIT SHALL BE INSTALLED TYPICALLY 3 FEET BEHIND THE BACK OF CURB IN LINE WITH THE CENTER OF THE LIGHTING POLE FOUNDATIONS WHERE FEASIBLE. DEVIATION FROM THIS ALIGNMENT SHALL BE PERMITTED UPON THE ENGINEERS APPROVAL. PLACEMENT OF THE CONDUIT WITHIN THE PAVEMENT AREA STREET WILL BE PERMITTED TO AVOID CONFLICTS BEHIND THE SIDEWALK AREA. THE CONDUIT SHALL BE BURIED A MINIMUM OF 24 INCHES BELOW FINISHED GRADE SURFACE. CONDUIT SHALL ALSO INCLUDE THE FURNISHING AND INSTALLATION OF ALL ELECTRICAL WIRE AS REQUIRED FOR THE OPERATION OF THE NEW STREETLIGHTS. CONTRACTOR SHALL PROVIDE FINAL AS-BUILT LOCATIONS OF ALL CONDUIT.

STREET LIGHT NOTES (CONT.)

5. PULLBOXES SHALL BE NO. 3 1/2 PULLBOX AND INSTALLED PER CLARK COUNTY STANDARD SPECIFICATIONS (SECTION623) AND CLARK COUNTY UNIFORM STANDARD DRAWINGS. MAXIMUM DISTANCE ALLOWED BETWEEN PULLBOXES AND POLES IS 300 FEET. MAXIMUM BEND SHALL NOT EXCEED 270° IN ANY ONE RUN. PULLBOXES SHALL ALSO BE LOCATED AT BOTH SIDES OF STREET CROSSINGS. CONTRACTOR SHALL PROVIDE FINAL AS-BUILT LOCATIONS OF ALL PULLBOXES.
6. ELECTRICAL SERVICE POINTS AND METER BASES. THE STREET LIGHTING SYSTEM INCLUDE THE CONNECTION TO SERVICE POINTS LOCATED BY OVERTON POWER. CONTRACTOR SHALL COORDINATE CONNECTION AND SERVICE POINT LOCATIONS WITH OVERTON POWER. THE SERVICE SOURCE WILL BE 120/240 VOLT, SINGLE PHASE, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MATERIAL AND EQUIPMENT NECESSARY FOR CONNECTION TO THESE SERVICE POINTS. CONTRACTOR SHALL PROVIDE FINAL AS-BUILT LOCATIONS OF ALL ELECTRICAL SERVICE POINTS AND METER BASES.

REV. 4-15-99

VIRGIN VALLEY WATER DISTRICT NOTES

1. THE LOCATION OF THE WATER SERVICE LATERAL WHERE IT PASSES UNDER THE CURB SHALL BE INDICATED BY INSCRIBING A "W" IN THE TOP OF THE CURB OR BY INSERTING A BRASS TAG MARKED "W" IN THE TOP OF THE CURB. SERVICES SHALL BE SHOWN ON "AS BUILT" PLANS.
2. DISTRIBUTION WATER MAINS SHALL BE INSTALLED WITH A MINIMUM 42" COVER BELOW FINISHED GRADE EXCEPT WHERE INDICATED OTHERWISE ON THE PLANS WITH SPECIFIC PROPOSED COVER SHOWN AND APPROVED BY THE VIRGIN VALLEY WATER DISTRICT.
3. INTERRUPTION OF EXISTING WATER SERVICE WHILE MAKING CONNECTIONS TO EXISTING WATER MAINS SHALL NOT BE ALLOWED WITHOUT SPECIAL APPROVAL OF THE VIRGIN VALLEY WATER DISTRICT. A MINIMUM OF 48 HOURS NOTICE TO THE DISTRICT SHALL BE REQUIRED BEFORE MAKING CONNECTIONS. CONNECTION TO THE EXISTING SYSTEM SHALL BE DONE DURING THE TIME OF LEAST INCONVENIENCE TO CUSTOMERS OF EXISTING SYSTEM. INTERRUPTIONS OF SERVICE SHALL BE LIMITED TO LESS THAN FOUR (4) HOURS PER 24 HOUR PERIOD. CONTRACTOR SHALL NOTIFY ALL CUSTOMERS WHO WILL BE AFFECTED BY SERVICE INTERRUPTION AT LEAST 24 HOURS PRIOR TO THE INTERRUPTION OF SERVICE.
4. TEMPORARY CONSTRUCTION WATER MAY BE OBTAINED FROM AN EXISTING FIRE HYDRANT BY MAKING APPLICATION AT THE OFFICE OF THE VIRGIN VALLEY WATER DISTRICT. UNAUTHORIZED CONNECTIONS TO THE DISTRICT'S WATER SYSTEM IS A VIOLATION AND SUBJECT TO LEGAL ACTION.
5. THE CONTRACTOR SHALL NOTIFY THE VIRGIN VALLEY WATER DISTRICT (1-702-346-5731), AT LEAST TWO WORKING DAYS PRIOR TO EXCAVATING FOR EXISTING WATER FACILITIES SO THAT APPROPRIATE WATER SYSTEMS CAN BE MARKED IN THE FIELD.
6. THE LOCATION AND ELEVATION OF EXISTING WATER FACILITIES SHALL BE CONFIRMED BY FIELD MEASUREMENT AND EXCAVATION EXPLORATION BY THE CONTRACTOR.
7. THE EXISTENCE AND LOCATION OF WATER FACILITIES SHOWN ON THE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. TO THE BEST OF THE DESIGN ENGINEER'S KNOWLEDGE, THE EXISTING WATER FACILITIES ARE AS SHOWN ON THE PLANS. THE VIRGIN VALLEY WATER DISTRICT SHALL NOT BE HELD RESPONSIBLE FOR ANY ERROR IN THE LOCATION AND ELEVATION OF THE EXISTING WATER FACILITIES.
8. NO REVISIONS SHALL BE MADE TO THE WATER SYSTEM SHOWN ON THESE PLANS WITHOUT THE APPROVAL OF THE VIRGIN VALLEY WATER DISTRICT. MAJOR DESIGN REVISIONS MUST BE SUBMITTED IN DUPLICATE BY THE DESIGN ENGINEER TO THE VIRGIN VALLEY WATER DISTRICT GENERAL MANAGER OR DISTRICT ENGINEER FOR APPROVAL.
9. THE VIRGIN VALLEY WATER DISTRICT INSPECTOR SHALL BE NOTIFIED A MINIMUM OF 24 HOURS PRIOR TO ANY REQUIRED INSPECTION. CALL 1-702-346-5731 WEEKDAYS BETWEEN 8:00 A.M. AND 4:30 P.M.
10. PIPE DEFLECTIONS FOR SHORT RADIUS CURVES AND ANGLE POINTS SHALL NOT EXCEED THE MANUFACTURER'S SPECIFICATIONS AND SHALL NORMALLY BE ACCOMPLISHED BY MEANS OF STANDARD FITTINGS, THE LOCATIONS OF WHICH SHALL BE DETAILED ON THE PLANS.
11. ALL NEW WATER LINES WILL BE TESTED AND DISINFECTED PER VIRGIN VALLEY WATER DISTRICT STD. SPEC. SEC. IX PRIOR TO BEING PLACED IN SERVICE. ARRANGEMENT FOR A TOTAL COLIFORM BACTERIA TEST SHALL BE MADE WITH THE VIRGIN VALLEY WATER DISTRICT 24 HOURS IN ADVANCE OF THE NEW SYSTEM BEING READY FOR TESTING. ANY COSTS ASSOCIATED WITH THE BACTERIA ANALYSIS SHALL BE BILLED TO THE DEVELOPER. AT NO TIME SHALL A LINE THAT HAS NOT BEEN TESTED AND FOUND FREE OF CONTAMINATION BE CONNECTED TO THE DISTRICT'S WATER SYSTEM.
12. APPROVED BACKFLOW PREVENTION DEVICES SHALL BE INSTALLED FOR ALL IRRIGATION AND PRIVATE FIRE SERVICES.
13. IT IS THE INTENT OF THESE SPECIFICATIONS AND IMPROVEMENT PLANS THAT THE WORK PERFORMED UNDER THE CONTRACT SHALL RESULT IN A COMPLETE OPERATING WATER SYSTEM IN SATISFACTORY WORKING CONDITION WITH RESPECT TO THE FUNCTIONAL PURPOSES OF THE INSTALLATION. IF THERE ARE ANY QUESTIONS REGARDING THE STATED OR IMPLIED MEANING OF THESE PLANS, THE CONTRACTOR IS DIRECTED TO CONTACT THE DESIGN ENGINEER IMMEDIATELY.
14. ALL WATER SYSTEM CONSTRUCTION SHALL CONFORM TO THE VIRGIN VALLEY WATER DISTRICT "DESIGN STANDARDS AND SPECIFICATIONS FOR WATER WORKS CONSTRUCTION".
15. EACH LIVING UNIT SHALL BE PROVIDED WITH A PRESSURE REGULATOR CLASS 150 (MINIMUM).
16. A CONSTRUCTION PERMIT SHALL BE ISSUED BY THE VIRGIN VALLEY WATER DISTRICT PRIOR TO COMMENCING CONSTRUCTION. ISSUING OF THIS PERMIT SHALL BE CONDITIONED ON THE FOLLOWING:
    a. PROVIDE A SET OF APPROVED CONSTRUCTION PLANS
    b. PROVIDE A COPY OF THE PERFORMANCE BOND SUBMITTED TO THE CITY OF MESQUITE
    c. PAY ALL FEES DUE TO THE VIRGIN VALLEY WATER DISTRICT
17. THE VIRGIN VALLEY WATER DISTRICT SHALL BE NOTIFIED 24 HOURS IN ADVANCE OF SCHEDULING THE FINAL INSPECTION. THE COMPLETION DATE OF THE PROJECT AND THE START OF THE WARRANTY PERIOD SHALL BE DETERMINED BY SATISFYING THE CONDITIONS OF THE FINAL 'PUNCH LIST' AND THE SUBMITTAL OF THE 'AS-BUILT' DRAWINGS BY THE ENGINEER OF RECORD.
18. WATER METERS MUST BE PURCHASED THROUGH THE VIRGIN VALLEY WATER DISTRICT. INSTALLATION OF WATER METERS MUST BE DONE BY OR AUTHORIZED BY THE WATER DISTRICT AND WILL REQUIRE 24 HOUR NOTICE PRIOR TO INSTALLATION.

REV. 6-1-02

ADDITIONAL WATER NOTES REQUIRED BY CLARK COUNTY HEALTH DISTRICT

1. ALL CONSTRUCTION AND MATERIAL SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR WATER DISTRIBUTION SYSTEMS"(UDACS) EXCEPT FOR PROJECTS SERVICED BY THE "VIRGIN VALLEY WATER DISTRICT".
2. WATERLINES SHALL BE FLUSHED, TESTED AND DISINFECTED PER "VIRGIN VALLEY WATER DISTRICT DESIGN STANDARDS AND SPECIFICATIONS FOR WATER WORKS CONSTRUCTION", SECTION IX, PRIOR TO BEING PLACED IN SERVICE. A WATER SAMPLE STATION IS REQUIRED FOR NEW SUBDIVISIONS PER "VIRGIN VALLEY WATER DISTRICT DESIGN STANDARDS AND SPECIFICATIONS FOR WATER WORKS CONSTRUCTION", SECTION VIII.B.10.

12-19-01

CITY OF MESQUITE FIRE NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE CITY OF MESQUITE ORDINANCE #211, NFPA #24, 1995 EDITION AND THE UNIFORM FIRE CODE, 1997 EDITION.
2. ON ANY BUILDING CONSTRUCTION SITE, ACCESSIBLE FIRE HYDRANTS SHALL BE INSTALLED BEFORE COMBUSTIBLE MATERIALS ARE DELIVERED TO THE SITE AND CONSTRUCTION COMMENCES. SAID FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER WITH REQUIRED WATER SUPPLY.
3. IF DURING CONSTRUCTION IT BECOMES NECESSARY TO CLOSE ANY CONTROL VALVE OR PLAN A HYDRANT OUT OF SERVICE, THE CITY OF MESQUITE FIRE DEPARTMENT MUST BE CONTACTED.
4. PAINTING OF CURBS AND/OR STRIPING OF ASPHALT AREAS AND PROTECTION OF HYDRANT FROM PHYSICAL INJURY, PER CITY OF MESQUITE FIRE DEPARTMENT FIRE HYDRANT INSTALLATION/SPECIFICATIONS HANDOUT.
5. NO FIRE HYDRANT SHALL BE LOCATED WITHIN 25 FEET OF ANY STRUCTURE, OR 6 FEET OF A DRIVEWAY, POWER POLE, LIGHT STANDARD, OR ANY OTHER OBSTRUCTION. FOR WALL, FENCE AND PLANT LOCATIONS, A PERIMETER AROUND THE HYDRANT MEASURING A MINIMUM OF 3 FEET FROM ITS CENTER SHALL BE MAINTAINED CLEAR OF ALL OBSTRUCTIONS AT ALL TIMES.
6. AT ALL TIMES DURING CONSTRUCTION, SUITABLE EMERGENCY VEHICLE ACCESS ROADS MUST BE MAINTAINED. ROADWAYS MUST BE SMOOTH, COMPACTED AND CAPABLE OF SUPPORTING THE IMPOSED LOADS OF ALL EMERGENCY VEHICLES.
7. PRIOR TO ACCEPTANCE OF ANY PRIVATE FIRE SERVICE MAIN, A SATISFACTORY HYDROSTATIC TEST WITH PIPING JOINTS UNCOVERED MUST BE CONDUCTED. APPROVED PLANS AND A CONTRACTOR'S MATERIALS AND TEST CERTIFICATE MUST BE PROVIDED AT TIME OF INSPECTION.
8. BLUE REFLECTIVE MARKERS INSTALLED PER UFC 901.4.3, MUST BE PROVIDED BEFORE FINAL HYDRANT ACCEPTANCE CAN BE OBTAINED.
9. CURB TO BE PAINTED RED, TEN FEET EACH WAY FROM FIRE HYDRANTS.

REV. 10-13-98

TRAFFIC NOTES

1. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED.
2. ALL CONSTRUCTION SIGNING, BARRICADING AND TRAFFIC DELINEATION SHALL CONFORM TO THE "NEVADA WORK ZONE TRAFFIC CONTROL HANDBOOK-1985" AND TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES-2000."
3. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL, OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY ENGINEER
4. THE DEVELOPER SHALL BE RESPONSIBLE TO PROVIDE AND INSTALL ALL PERMANENT SIGNS SHOWN ON THE PLANS. STREET NAME SIGNS AND ALL SIGN POST INSTALLATIONS SHALL CONFORM IN THEIR ENTIRETY TO CITY OF MESQUITE/CLARK COUNTY STANDARDS.
5. IF A PROPOSED STREETLIGHT STANDARD IS FIELD LOCATED TO WITHIN FIVE (5) FEET OF ANY SIGN SHOWN HEREON TO BE MOUNTED ON A SIGN POST, THE POST MOUNTING MAY BE CHANGED TO THE STREETLIGHT STANDARD. MOUNTING WITH THE APPROVAL OF THE CITY ENGINEER.
6. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC INTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HEREUNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.
7. PRIOR TO CONSTRUCTION OF THE STREET SIGN, CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PUBLIC WORKS DEPARTMENT OF THE CITY OF MESQUITE.

REV. 05-03-02

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

REVISIONS

NO	DESCRIPTION	DATE	BY

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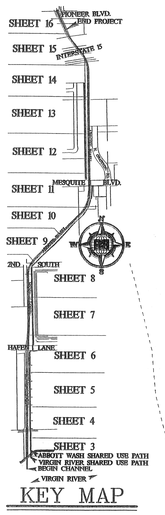
ABBOTT WASH CONVEYANCE
GENERAL NOTES
FOR
THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA
MESQUITE, NEVADA

PRELIMINARY
KRISTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14094
12-11-03

KRISTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14094
7-14-05

PLOT DATE

SCALE: NTS	DRAWN BY: B.C.	CHECKED BY: W.N.	
PROJECT NO: 029-30-05	DATE: NOV 2003	SHEET NO: 2 OF 26	



KEY MAP

ABBOTT WASH PLAN VIEW

STA: 1+00.00 TO 6+00.00
SCALE HOR: 1"=20'

CURVE DATA TABLE

CURVE	RADIUS	LENGTH	DELTA	TANGENT
C1	94.0'	61.54'	37°30'46"	31.92'
C2	106.0'	69.4'	37°30'46"	36.00'

GRADING QUANTITIES

STA: 1+13–6+00

CHANNEL EXCAVATION = 10,957 C.Y.
BACKFILL = 6,572 C.Y.
NET CUT (OR FILL) = 4,385 NET CUT

*Channel Excavation accounts for additional cut required for Bedding Condition II. Backfill accounts for fill behind Channel Walls and does not include imported Base Material. Quantities do not account for shrinkage or subsidence.

CONSTRUCTION NOTES

8 4" EXPANSION JOINT AND CUTOFF WALL, SEE DETAIL (F/20)

9 INSTALL MANHOLE STEPS PER LADDER STEP DETAIL PLACE BOTTOM STEP 1' VERTICALLY ABOVE THE CHANNEL FLOOR. PAINT YELLOW STRIPE, 3" WIDE, ON EITHER SIDE OF LADDER. INSTALL 30" WIDE OPENING, IN POST AND CABLE RAILING AT LADDER LOCATIONS. SEE DETAIL (A/23)

10 INSTALL 15' WIDE DOUBLE SWING GATE, IN PERIMETER FENCING AT ACCESS RAMP LOCATIONS, PER C.C. AREA STANDARD DRAWING NO. 253. H=6'.

12 INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL SEE DETAIL (A/23)

31 PROVIDE AND MOUNT WARNING SIGN ON 6' CHAIN LINK FENCE SEE DETAIL (A/20) FOR SIGN INFORMATION.

60 PROJECT INCLUDES A YUMA CLAPPER RAIL HABITAT REPLACEMENT RATIO OF 2:1 FOR HABITAT LOSS DUE TO CONSTRUCTION ADJACENT TO RIVER BANK. REFER TO SECTION 212 OF TECHNICAL SPECIFICATIONS. CONTRACTOR SHALL REVEGETATE DISTURBED AREA BEYOND GABION INSTALLATION WITH NATIVE VEGETATION/NATIVE WETLAND PLANTS AS SPECIFIED IN CONTRACT DOCUMENTS. EXTENT OF NATIVE VEGETATION/NATIVE WETLAND PLANT REPLACEMENT BEYOND DISTURBED AREA TO BE DETERMINED IN FIELD BY AUTHORIZED REPRESENTATIVE (UP TO 800 SQ FT ±)

65 INSTALL 6' WIDE SINGLE GATE WITH TOP LATCH PER C.C. AREA STD DWG NO 253. (USDPWC)

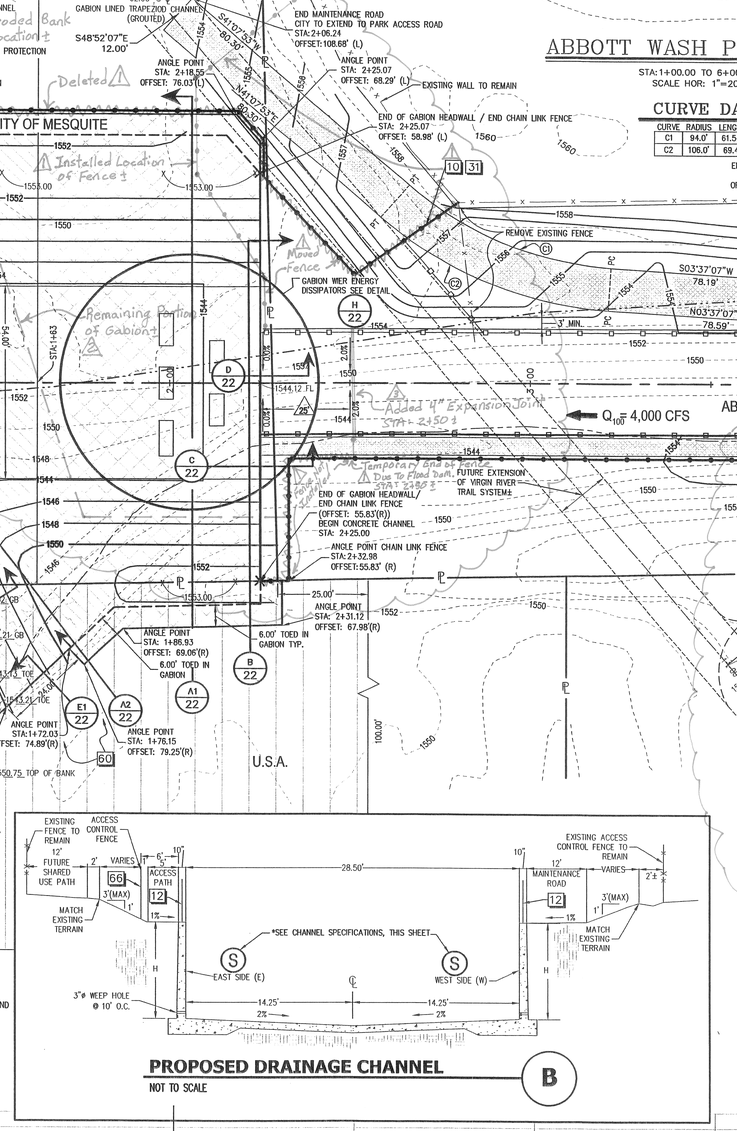
66 INSTALL CHAIN LINK FENCE H=6' PER C.C. AREA STD DWG NO 252. (USDPWC)

67 INSTALL CHAIN LINK FENCE, H=6', MOUNT FENCE ON TOP OF CONCRETE CHANNEL WALL/HEADWALL. SEE DETAIL (J/20).

STA:	SIDE	H	TYPE	CHANNEL WIDTH	FLOOR CROSS SLOPE	*DETAIL 1	*DETAIL 2
2+25–6+45	E	9	V	28.50'	2%	A/19	A/20
	W	9	V				

*DETAIL 1=REINFORCEMENT/GEOMETRY DETAILS
*DETAIL 2=FOUNDATION/CONSTRUCTION DETAILS

CHANNEL SPECIFICATIONS S
NOT TO SCALE



LEGEND

- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING FLOWLINE IN CHANNEL
- = EXISTING GRADE ℄ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- = EXISTING FENCE, FENCE TYPE VARIES
- = NEW POST AND CABLE RAILING AS NOTED ON PLANS
- = NEW 6' TALL CHAIN LINK FENCE
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q100 =HGL)
- = EXISTING FEATURES OR OTHER AS NOTED ON PLANS
- = ESTIMATED EXCAVATION
- 3 = CONSTRUCTION NOTE
- ℄ = PROPERTY LINE
- A/22 = CROSS SECTION
- FL OF BOX 1547.00 = NEW SPOT ELEVATION
- FL OF BOX 1547.00 = EXISTING SPOT ELEVATION
- BH-17/8+42.53/7.34 RT = (TEST/ BORE LOCATION±/STA: ±/OFFSET±) TEST/BORE LOCATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- SM–CL = SOIL CLASSIFICATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- E = EMERGENCY ACCESS LADDER AND GATE LOCATION
- 40 FLOOR C.S. = TRANSITION LENGTH, TYPE OF TRANSITION
- = GROUTED GABION CHANNEL
- = VEGETATED GABION CHANNEL
- = WORK ZONE IN USA PROPERTY
- = MAINTENANCE ROAD/ACCESS PATH
- = CHANNEL WALL FOOTING/FLOOR
- = CUT–OFF WALL

3 = As-Built Information

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

Call Two Working Days Before You Dig!
1-800-227-2600

SCALE: 1"=20'

DISCLAIMER:
THE OVERALL GRADING, DRAINAGE SWALES AND OTHER DRAINAGE SYSTEMS DEPICTED ON THIS PLAN ARE SHOWN AS A REPRESENTATION OF MINIMUM DRAINAGE REQUIREMENTS. HOWEVER, IT IS TO BE UNDERSTOOD THAT EROSION MAY AND MOST LIKELY WILL OCCUR ON CUT SLOPES, FILL SLOPES, MINOR DRAINAGE SWALES DIRECTED AT DOWN SLOPES AND/OR RETAINING WALLS, AND MINOR DRAINAGE SWALES DIRECTED TOWARD MORE MAJOR DRAINAGE FACILITIES (I.E.; STREETS, CURBS & GUTTER, STORM DRAIN). IT SHOULD ALSO BE UNDERSTOOD THAT THE DEVELOPER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SOME FORM OF EROSION PROTECTION FOR THE AREAS NOTED ABOVE.

PROPOSED DRAINAGE CHANNEL B
NOT TO SCALE

ESTIMATED OVER-EXCAVATION DEPTH STA: 1+13 TO STA: 7+00, 2' BELOW GABION MATS OR 2' BELOW CONCRETE LINER± (BEDDING CONDITION II) SEE SHEETS 20 & 22 FOR FURTHER BEDDING CONDITION INFORMATION.

ABBOTT WASH PROFILE VIEW

STA: 1+00.00 TO 6+00.00
SCALE HOR: 1"=20'
SCALE VER: 1"=5'

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)
WESTON L. NELSON Exp. 12/31/05 CIVIL No. 14044
7-14-05

NO	DESCRIPTION	DATE	BY
1	Ac. Built Fence	6-2005	W.N.
2	Flood Damaged (Jan 2005)	6-2005	W.N.
3	Add Exp. Joint + Cut off	6-2005	W.N.
4	Moved 4" Exp. Joint	6-2005	W.N.

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS–LAND SURVEYORS–LAND PLANNERS
P.O. BOX 3174 CEDAR CITY, UTAH 84720 (435) 586-9592
561 W MESQUITE BLVD. STE 4 MESQUITE, NEVADA 89027 (702) 346-5101

B8

ABBOTT WASH CONVEYANCE AND PROFILE 1
FOR
THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA

12-11-03

SCALE:	1"= 20'
DRAWN BY:	JRK
CHECKED BY:	W.N.
PROJECT NO:	1029-390-05
DATE:	NOV 2003
SHEET NO:	3 OF 26

PLOT DATE

SEWER MANHOLE TABLE

MANHOLE #	INVERT IN	INVERT OUT	RIM ELEV.
NEW #A	1557.80 (NE)	1557.70 (SW)	1563.00±
NEW #B	1557.61 (NE)	1557.51 (W)	1561.00±
NEW #C	1557.35 (E)	1557.25 (W)	1563.00±
EXISTING #2042	1557.30 (E)	1557.25 (W)	1561.64
EXISTING #4	1557.25 (NE)	1557.25 (W)	1563.28
EXISTING #5	1557.69 (E)	1557.69 (SW)	1563.42
EXISTING #6	1557.73 (NE)	1557.68 (W)	1562.85
EXISTING #100	1558.50 (NE)	1558.46 (SW)	1563.13

SANITARY SEWER PIPE/SD PIPE

PIPE ID	BEARING	DISTANCE	SLOPE %	DIAMETER	MATERIAL
PPA	N36°01'05"E	56.40± C TO C	0.20±	24"	DI CLASS
PPB	N89°48'17"E	82.14' C TO C	0.18	24"	DI CLASS
PPC	N89°48'17"E	6.00' C TO C	0.00	24"	DI CLASS
PPD	N00°11'43"W	5.00' C TO CAP	0.50	24"	DI CLASS
EP1	N67°14'02"E	364.00' C TO C	0.21	24"	–
EP2	N67°14'02"E	326.50' C TO C	0.21	24"	–
EP3	N67°14'02"E	37.50' C TO C	0.21	24"	–
EP4	N89°29'38"E	73.03' C TO C	0.01	24"	–
EP5	N23°59'45"E	33.67' C TO C	1.31	24"	–
EP6	N88°19'05"E	111.24' C TO C	0.00	24"	–
SD1	PERP. TO WASH	16.00'	0.50	48"	RCP CLASS III
SD2	PERP. TO WASH	12.00'	0.50	48"	RCP CLASS III

Call Two Working Days Before You Dig!
1-800-227-2600

ABBOTT WASH PLAN VIEW

STA: 6+00.00 TO 11+00.00
SCALE HOR: 1"=20'

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

FENCE ANGLE POINT TABLE

ANG. PT.	STATION	OFFSET
1	6+52.40	56.02' (L)
2	6+63.11	14.67' (L)
3	7+04.00	14.67' (L)
4	7+04.00	14.67' (R)
5	6+97.65	21.08' (R)
6	7+23.57	21.08' (R)
7	7+23.62	14.67' (L)
8	7+67.08	14.67' (L)
9	7+67.09	39.41' (L)

DISCLAIMER:
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GRADING QUANTITIES

STA: 6+00–11+00

CHANNEL EXCAVATION = 8,039 C.Y.
BACKFILL = 6,235 C.Y.
NET CUT (OR FILL) = 1,804 NET CUT

*Channel Excavation accounts for additional cut required for Bedding Conditions II & III. Backfill accounts for fill behind Channel Walls, and does not include Imported Base Material. Quantities do not account for shrinkage or subsidence.

CONSTRUCTION NOTES

1. COORDINATE CONNECTION WITH THE CITY OF MESQUITE SANITATION DEPARTMENT. EXISTING SEWER TO REMAIN IN SERVICE UNTIL NEW SEWER IS IN PLACE AND READY FOR CONNECTION AT EACH END.
2. INSTALL NEW 60" STANDARD ECCENTRIC SEWER MANHOLE PER C.C. SANITATION DISTRICT "DESIGN & CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS", STANDARD DRAWING NO. SD-1 COORDINATE RIM ELEVATION WITH THE CITY OF MESQUITE SANITATION DEPARTMENT. MANHOLES CONSTRUCTED FROM CORROSION RESISTANT MATERIAL. SEE SECTION 630 OF TECHNICAL SPECIFICATIONS.
3. CONTRACTOR TO REMOVE EXISTING SEWER AND SEWER MANHOLES FROM NEW MH #A TO EXISTING MH #4, CONTRACTOR SHALL CUT, CAP & SOLID GROUT EXISTING PIPE 5' OUT FROM UPSTREAM SIDE OF MH#4 AND DOWNSTREAM SIDE OF NEW MH# A
8. 4" EXPANSION JOINT AND CUTOFF WALL. SEE DETAIL E, SHEET 20
9. INSTALL MANHOLE STEPS PER LADDER STEP DETAIL (L/20). PLACE BOTTOM STEP 1' VERTICALLY ABOVE THE CHANNEL FLOOR. PAINT YELLOW STRIPE, 3" WIDE, ON EITHER SIDE OF LADDER. INSTALL 30" WIDE OPENING, IN POST AND CABLE RAILING AT LADDER LOCATIONS. SEE DETAIL (A/23)
10. INSTALL 15' WIDE DOUBLE SWING GATE, IN PERIMETER FENCING AT ACCESS RAMP LOCATIONS, PER C.C. AREA STANDARD DRAWING NO. 253. H=6'. (USDPWC)
12. INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL SEE DETAIL (A/23)
14. STUB NEW 48" RCP, CLASS III @ S=0.50% FOR FUTURE DRAINAGE L=12', CONFLUENCE ANGLE=45° FROM CHANNEL WALL
16. INSTALL PIPE THROUGH WALL PER DETAIL (L/21)
17. INSTALL AT A CONFLUENCE ANGLE OF 45° FROM CHANNEL WALL
17. CAP NEW PIPE PER DETAIL (J/21)
28. STUB NEW 48" RCP, CLASS III @ S=0.50% FOR FUTURE DRAINAGE L=16'. INSTALL AT A CONFLUENCE ANGLE OF 45° FROM CHANNEL WALL
29. LOWER FORCE MAIN (FM) AND WATER LATERAL (W) PER CURRENT "VIRGIN VALLEY WATER DISTRICT DESIGN STANDARDS AND SPECIFICATIONS FOR WATER WORKS CONSTRUCTION" PER DRAWING NO. 5.1. LOWER ELECTRICAL CONDUIT (E), COORDINATE WITH CITY OF MESQUITE SANITATION DEPARTMENT. LOWER SIPHON (ES) PER DETAIL S4 ON SHEET 17. TOP OF PIPE (ES) SHALL BE 2.0' MINIMUM BELOW CHANNEL LINER. TRENCH BACKFILL FOR RESPECTIVE PIPES SHALL CONFORM TO C.C. AREA STANDARD DRAWING NO. 502. DETAIL INCLUDED ON SHEET 17. CONTRACTOR TO RELOCATE EXISTING UTILITIES.
31. PROVIDE AND MOUNT WARNING SIGN ON 6' CHAIN LINK FENCE SEE DETAIL (A/28) FOR SIGN INFORMATION.
65. INSTALL 6' WIDE SINGLE GATE WITH TOP LATCH PER C.C. AREA STD DWG NO 253. (USDPWC)
66. INSTALL CHAIN LINK FENCE H=6' PER C.C. AREA STD DWG NO 252. (USDPWC)
67. INSTALL CHAIN LINK FENCE, H=6', MOUNT FENCE ON TOP OF CONCRETE CHANNEL WALL/HEADWALL. SEE DETAIL (J/20).
70. REMOVE EXISTING CONCRETE STRUCTURE.

LEGEND

- = EXISTING FEATURES OR OTHER AS NOTED ON PLANS
- = ESTIMATED EXCAVATION
- SS = NEW DUCTILE IRON SEWER LINE WITH SIZE SHOWN
- SS = EXISTING PVC SEWER LINE WITH SIZE SHOWN
- SD = NEW STORM DRAIN WITH SIZE SHOWN
- SD = EXISTING STORM DRAIN WITH SIZE SHOWN
- FS = NEW EFFLUENT SIPHON
- ES = EXISTING EFFLUENT SIPHON
- FM = EXISTING FORCE MAIN SEWER LINE
- E = EXISTING ELECTRICAL SERVICE
- W = EXISTING WATER LINE/SERVICE (SIZE AS NOTED)
- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING FLOWLINE IN CHANNEL
- = EXISTING GRADE @ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- x x = EXISTING FENCE, FENCE TYPE VARIES
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q_{100}=HGL)
- = NEW FENCE AS NOTED ON PLANS
- = NEW POST AND CABLE RAILING AS NOTED ON PLANS.

- = NEW MANHOLE
- = EXISTING MANHOLE
- = BOX CULVERT
- = TRACT LINE
- 3 = CONSTRUCTION NOTE
- = PROPERTY LINE
- A/22 = CROSS SECTION
- = TRACT CORNER PER RECORD OF SURVEY FOR CLARK COUNTY FILE 31, PAGE 65 OF SURVEYS
- FL OF BOX 1547.00 = NEW SPOT ELEVATION
- FL OF BOX 1547.00 = EXISTING SPOT ELEVATION
- BH-17/8+42.53/7.34' RT = (TEST/BORE LOCATION±/STA: ±/OFFSET±) TEST/BORE LOCATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- SM CL = SOIL CLASSIFICATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- E = EMERGENCY ACCESS LADDER GATE LOCATION
- 40' FLOOR C.S. = TRANSITION LENGTH, TYPE OF TRANSITION
- = MAINTENANCE ROAD/ACCESS PATH
- = CHANNEL WALL FOOTING/FLOOR
- = CUT–OFF WALL
- 1 = FENCE ANGLE POINT

= As-Built Information

PROPOSED DRAINAGE CHANNEL

NOT TO SCALE — B

DUAL 14' X 9' CAST-IN-PLACE BOX CULVERT

NOT TO SCALE — C

PROFILE-ACCESS ROAD CULVERT

NOT TO SCALE — CS

CHANNEL SPECIFICATIONS

NOT TO SCALE — S

STA:	SIDE	H	TYPE	CHANNEL WIDTH	FLOOR CROSS SLOPE	*DETAIL 1	*DETAIL 2
2+25–6+48	E	9'	Ⓥ	28.50'	2%	A/19	A/20
2+25–6+48	W	9'	Ⓧ	28.50'	2%	A/19	A/20
6+48–7+04	E	10'	Ⓥ	28.50'	VARIES	A/19	A/20
6+48–7+04	W	10'	Ⓧ	28.50'	VARIES	A/19	A/20
7+24–8+00	E	10'	Ⓥ	28.50'	VARIES	A/19	A/20
7+24–8+00	W	10'	Ⓧ	28.50'	VARIES	A/19	A/20
8+00–17+00	E	8.5'	Ⓥ	28.50'	2%	A/19	A/20
8+00–17+00	W	8.5'	Ⓧ	28.50'	2%	A/19	A/20

*DETAIL 1=REINFORCEMENT/GEOMETRY DETAILS
*DETAIL 2=FOUNDATION/CONSTRUCTION DETAILS

ABBOTT WASH PROFILE VIEW

STA: 6+00.00 TO 11+00.00
SCALE HOR: 1"=20'
SCALE VER: 1"=5'

BULOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS–LAND SURVEYORS–LAND PLANNERS
P.O. BOX 3174 CEDAR CITY, UTAH 84720 (435) 586-9992
561 W MESQUITE BLVD, STE 4 MESQUITE, NEVADA 89027 (702) 346-5101

NO	DESCRIPTION	DATE	BY
1	As-Built Fencing	6-2005	W.N.
2	As-Built Manhole Location	6-2005	W.N.

THE ENGINEER AND SURVEYOR HAVE PREPARED THESE PLANS IN ACCORDANCE WITH THE MINIMUM STANDARD DETAIL REQUIREMENTS FOR PUBLIC WORKS CONSTRUCTION AND THAT THEY ARE IN COMPLIANCE WITH THE ENGINEER'S AND SURVEYOR'S CERTIFICATION REQUIREMENTS OF NRS 625 AND 625A. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ACCURACY AND CORRECTNESS OF THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY ERRORS, OMISSIONS, OR DISCREPANCIES FOUND IN THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL NOT PROCEED WITH ANY AFFECTED WORK UNTIL THE ENGINEER HAS ISSUED CORRECTED OR CLARIFIED CONTRACT DOCUMENTS.

ABBOTT WASH CONVEYANCE PLAN AND PROFILE 2

FOR

THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA
MESQUITE, NEVADA

WESTON L. NELSON — Exp. 12/31/05 — CIVIL — No. 14044 — 12-11-03

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

7-14-05

KEY MAP

SCALE:	DRAWN BY:	CHECKED BY:
1"= 20'	JRH	WN

PROJECT NO:	DATE:	SHEET NO:
1029-190-05	NOV 2003	4 OF 26

PLOT DATE

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

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ABBOTT WASH PLAN VIEW

STA: 11+00.00 TO 16+50.00
SCALE HOR: 1"=20'

GRADING QUANTITIES

STA: 11+00–16+50

CHANNEL EXCAVATION = 10,587 C.Y.
BACKFILL = 7,165 C.Y.
NET CUT (OR FILL) = 3,422 NET CUT

*Channel Excavation accounts for additional cut required for Bedding Condition III. Backfill accounts for fill behind Channel Walls, and does not include Imported Base Material. Quantities do not account for shrinkage or subsidence.

KENNETH R. & JANET T. COWART AGRICULTURAL

REMOVE EXISTING FENCE STA: 7+68± TO 19+55±

N00°21'53"W 1274.53'

12' MAINTENANCE ROAD

28.50' CHANNEL

S00°11'43"E 1475.00' END TO PT

S00°11'43"E 1600.00' END TO PT

S00°11'43"E 1475.00' END TO PT

CITY OF MESQUITE PROPERTY

ABBOTT WASH

Q_{100} = 4,000 CFS

GRADE BREAK

BH-16/15+55.86/2.81' RT

5' PERSONAL ACCESS PATH

FUTURE SHARED USE PATH

SHARED USE PATH STATIONING

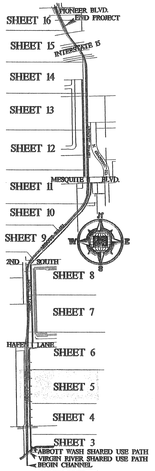
EXISTING FENCE TO REMAIN

COLLECTION BOX FOR OVERLAND TREATMENT (TYP)

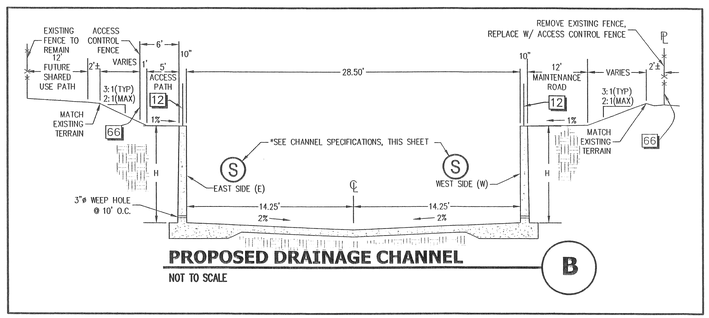
CITY OF MESQUITE WASTEWATER TREATMENT OVERLAND FLOW SEWER TREATMENT FACILITY

MATCHLINE STA:11+00.00 FOR CONTINUATION SEE SHEET 4

MATCHLINE STA:16+50.00 FOR CONTINUATION SEE SHEET 6



KEY MAP



PROPOSED DRAINAGE CHANNEL

NOT TO SCALE

B

CONSTRUCTION NOTES

8 4" EXPANSION JOINT AND CUTOFF WALL, SEE DETAIL E/20

12 INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL SEE DETAIL A/23

31 PROVIDE AND MOUNT WARNING SIGN ON 6' CHAIN LINK FENCE SEE DETAIL A/28 FOR SIGN INFORMATION.

66 INSTALL CHAIN LINK FENCE H=6' PER C.C. AREA STD DWG NO 252. (USDPWC)

STA:	SIDE	H	TYPE	CHANNEL WIDTH	FLOOR CROSS SLOPE	*DETAIL 1	*DETAIL 2
8+00–17+00	E	8.5	V	28.50'	2%	A/19	A/20
	W	8.5	V				

*DETAIL 1=REINFORCEMENT/GEOMETRY DETAILS
*DETAIL 2=FOUNDATION/CONSTRUCTION DETAILS

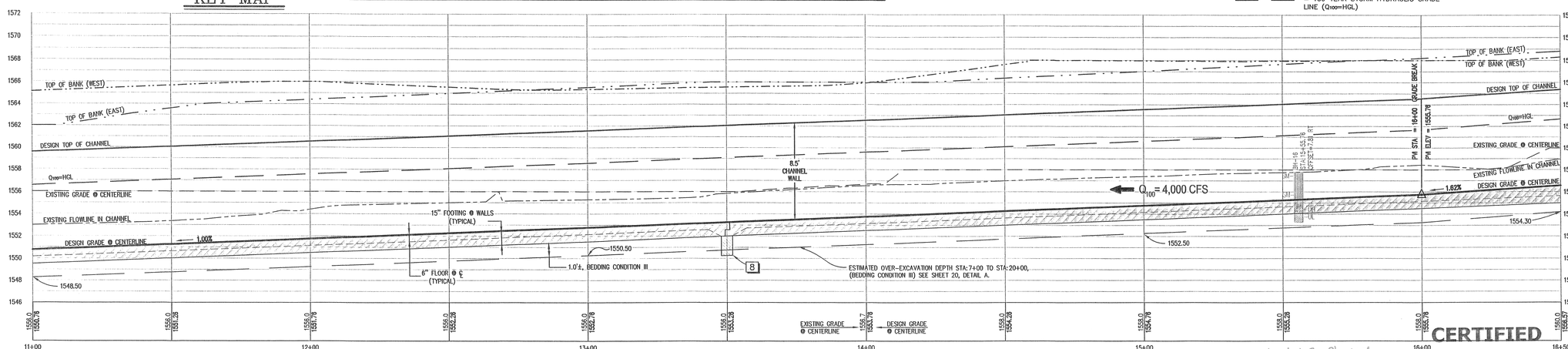
CHANNEL SPECIFICATIONS

NOT TO SCALE

S

LEGEND

- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING FLOWLINE IN CHANNEL
- = EXISTING GRADE @ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- = EXISTING FENCE, FENCE TYPE VARIES
- = NEW FENCE AS NOTED ON PLANS
- = NEW POST AND CABLE RAILING AS NOTED ON PLANS.
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q100=HGL)
- = EXISTING FEATURES OR OTHER AS NOTED ON PLANS
- = ESTIMATED EXCAVATION
- 3 = CONSTRUCTION NOTE
- ℄ = PROPERTY LINE
- A/23 = CROSS SECTION
- FL OF BOX 1547.00 = NEW SPOT ELEVATION
- FL OF BOX 1547.00 = EXISTING SPOT ELEVATION
- BH-17/8+42.53/7.34' RT = (TEST/BORE LOCATION±/STA:±/OFFSET±) TEST/BORE LOCATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- SM-CL = SOIL CLASSIFICATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- = MAINTENANCE ROAD/ACCESS PATH
- = CHANNEL WALL FOOTING/FLOOR
- = CUT-OFF WALL



ABBOTT WASH PROFILE VIEW

STA: 11+00.00 TO 16+50.00
SCALE HOR: 1"=20'
SCALE VER: 1"=5'

Constructed Per Plan W.N.

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

Call Two Working Days Before You Dig!
1-800-227-2600

NO	DESCRIPTION	DATE	BY
	REVISIONS		

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BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS–LAND SURVEYORS–
LAND PLANNERS

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(702) 346-5101

P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586-9592

B8

ABBOTT WASH CONVEYANCE
PLAN AND PROFILE 3
FOR
THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA

Preston Nelson Exp. 12/31/05 CIVIL No. 13044 — 12-11-03

Preston Nelson Exp. 12/31/05 CIVIL No. 13044 — 7-14-05

SCALE:	DRAWN BY:	CHECKED BY:
NTS	JRH	W.N.

PROJECT NO:	DATE:	SHEET NO:
1029-190-05	NOV 2003	5 OF 26

PLOT DATE

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

DISCLAIMER:

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CURVE TABLE

CURVE	RADIUS	LENGTH	TANGENT	DELTA
1	4985.75'	560.32'	280.45'	06°26'21"
2	5000.00'	561.92'	281.25'	06°26'21"
3	5014.25'	563.52'	282.06'	06°26'21"
4 HAFEN	1000.00'	122.55'	61.35'	07°01'18"
5 HAFEN	1000.00'	122.68'	61.42'	07°01'45"

FENCE ANGLE POINT TABLE

ANG PT	STATION	OFFSET	ANG PT	STATION	OFFSET	ANG PT	STATION	OFFSET
1	19+55.10	41.15' (L)	4	20+00.68	30.01' (R)	7	20+94.86	21.94' (L)
2	19+56.39	21.58' (L)	5	20+80.96	36.05' (R)	8	21+04.11	50.06' (L)
3	20+00.47	23.00' (L)	6	20+80.96	23.00' (L)	9	21+96.22	37.25' (L)

GRADING QUANTITIES

STA: 16+50–22+50

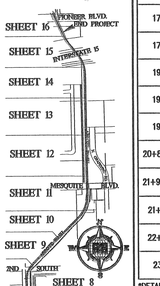
CHANNEL EXCAVATION = 12,392 C.Y.
BACKFILL = 5,897 C.Y.
NET CUT (OR FILL) = 6,495 NET CUT

*Channel Excavation accounts for additional cut required for Bedding Condition no. III. Backfill accounts for fill behind Channel Walls, and does not include Imported Base Material. Quantities do not account for shrinkage or subsidence.

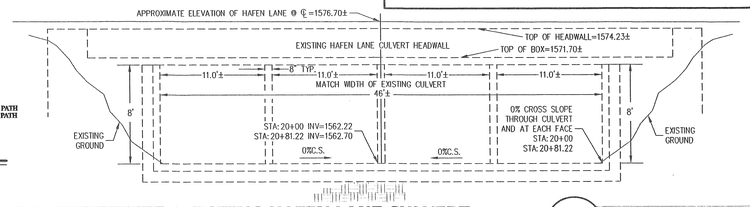
STA:	SIDE	H	TYPE	CHANNEL WIDTH	FLOOR CROSS SLOPE	*DETAIL 1	*DETAIL 2
17+00–19+60	E	8.5'	Ⓥ	VARIES	2%	A/19	A/20
17+00–19+20	W	8.5'	Ⓧ	VARIES	2%	A/19	A/20
19+20–19+60	W	8.5'–12'	Ⓧ	VARIES	2%	B/19	A/20
19+60–20+00	E	8.5'	Ⓥ	VARIES	VARIES	A/19	A/20
19+60–20+00	W	12'–14.5'	Ⓧ	VARIES	VARIES	C/19	A/20
20+81.22–21+94.09	E	10'	Ⓥ	VARIES	VARIES	A/19	A/20
	W	10'	Ⓧ				
21+94.09–22+34.09	E	0'	Ⓧ	VARIES	2%	SEE DETAIL	A/23
21+94.09–30+75	W	8.5'	Ⓧ	28.5'	2%	A/19	A/20
22+34.09–23+30	E	0'–8.5'	Ⓧ	28.5'	2%	A/19	A/20
23+30–24+50	E	8.5'	Ⓧ	28.5'	2%	A/19	A/20

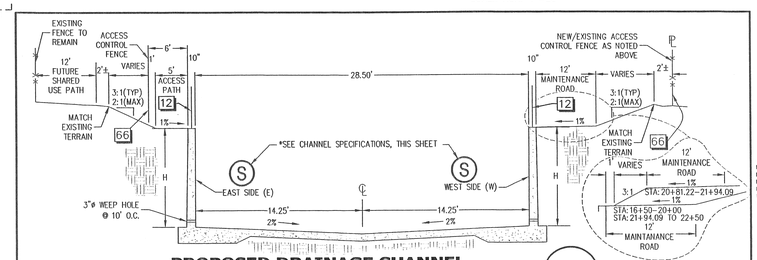
*DETAIL 1=REINFORCEMENT/GEOMETRY DETAILS
*DETAIL 2=FOUNDATION/CONSTRUCTION DETAILS

CHANNEL SPECIFICATIONS (S)
NOT TO SCALE



KEY MAP





PROPOSED DRAINAGE CHANNEL (B)
NOT TO SCALE

STA:16+50–17+00 CHANNEL WIDTH=28.5'
STA:17+00–20+00 CHANNEL WIDTH VARIES 28.5' TO 46.0'
STA:20+81.22–21+94.09 CHANNEL WIDTH VARIES 46.0' TO 28.5'
STA:21+94.09 TO 22+50 CHANNEL WIDTH=28.5'

ABBOTT WASH PLAN VIEW
STA:16+50.00 TO 22+50.00
SCALE HOR: 1"=20'

CONSTRUCTION NOTES

5 EXTEND/TRIM CULVERT TO EXTERIOR FACE OF CHANNEL WALL. SEE DETAIL L/21 FOR TYPICAL PIPE THROUGH WALL CONSTRUCTION.

6 REMOVE RIP-RAP SOUTH OF CULVERT

7 1" EXPANSION JOINT AND CUTOFF WALL LOCATED AT FACE OF CULVERT SEE DETAIL L/21

8 4" EXPANSION JOINT AND CUTOFF WALL. SEE DETAIL L/20

9 INSTALL MANHOLE STEPS PER LADDER STEP DETAIL L/20 PLACE BOTTOM STEP 1' VERTICALLY ABOVE THE CHANNEL FLOOR. PAINT YELLOW STRIPE, 3' WIDE, ON EITHER SIDE OF LADDER. INSTALL 30" WIDE OPENING, IN POST AND CABLE RAILING AT LADDER LOCATIONS. SEE DETAIL A/23

10 INSTALL 15' WIDE DOUBLE SWING GATE, IN PERIMETER FENCING AT LOCATIONS SHOWN, PER C.C. AREA STANDARD DRAWING NO. 253. H=6'. (USDPWC)

12 INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL SEE DETAIL A/23

13 RAISE EXISTING MANHOLE RIM TO GRADE AND COLLAR PER "DESIGN AND CONSTRUCTION STANDARDS FOR WASTE WATER COLLECTION SYSTEMS" 1997 SOUTHERN NEVADA.

16 INSTALL PIPE THROUGH WALL PER DETAIL J/21 INSTALL AT A CONFLUENCE ANGLE OF 45° FROM CHANNEL WALL

17 CAP NEW PIPE PER DETAIL J/21

31 PROVIDE AND MOUNT WARNING SIGN ON CHAIN LINK FENCE/GATE SEE DETAIL A/26 FOR SIGN INFORMATION.

32 INSTALL CHANNEL IDENTIFICATION SIGN SEE DETAIL 9/26

39 INSTALL 12' COMMERCIAL DRIVEWAY, PER CC AREA STD DWG NO. 224

50 PROVIDE PAINTED DEPTH GAUGE ON CHANNEL WALL, (GAUGING STATION STRUCTURE NOT REQUIRED) I/23

65 INSTALL 6' WIDE SINGLE GATE WITH TOP LATCH PER C.C. AREA STD DWG NO 253. (USDPWC)

66 INSTALL CHAIN LINK FENCE H=6' PER C.C. AREA STD DWG NO 252. (USDPWC)

67 INSTALL CHAIN LINK FENCE, H=6', MOUNT FENCE ON TOP OF CONCRETE CHANNEL WALL/HEADWALL. SEE DETAIL J/20

LEGEND

- = EXISTING FEATURES OR OTHER AS NOTED ON PLANS
- = ESTIMATED EXCAVATION
- SS = EXISTING PVC SEWER LINE WITH SIZE SHOWN
- SD = NEW STORM DRAIN
- SD = EXISTING STORM DRAIN
- FM = EXISTING FORCE MAIN SEWER LINE
- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING FLOWLINE IN CHANNEL
- = EXISTING GRADE @ CENTERLINE
- = EXISTING TOP OF BANK
- x = EXISTING FENCE, FENCE TYPE VARIES
- = NEW CHAIN LINK FENCE AS NOTED ON PLANS
- = NEW POST AND CABLE RAILING AS NOTED ON PLANS
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q_{100}=HGL)
- = As-Built Information
- = EXISTING MANHOLE
- = EXISTING ASPHALT
- 3 ROW = CONSTRUCTION NOTE
- ℄ = RIGHT OF WAY
- = PROPERTY LINE
- A/23 = CROSS SECTION
- FL OF BOX 1547.00 / FL OF BOX 1547.00 = NEW SPOT ELEVATION
- = EXISTING SPOT ELEVATION
- BH-17/B4 42.53/7.34' RT = (TEST/BORE LOCATION±/STA:±/OFFSET±) TEST/BORE LOCATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- SM/CL = SOIL CLASSIFICATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- 3 = CURVE NUMBER
- 40' FLOOR C.S. = TRANSITION LENGTH, TYPE OF TRANSITION
- E = EMERGENCY ACCESS LADDER AND GATE LOCATION
- = MAINTENANCE ROAD/ACCESS PATH
- = CUT-OFF WALL
- = CHANNEL WALL FOOTING/FLOOR

EXISTING HAFEN LANE CULVERT (H)
NOT TO SCALE STA:20+00–20+81.22

ABBOTT WASH PROFILE VIEW
STA:16+50.00 TO 22+50.00 SCALE HOR: 1"=20' SCALE VER: 1"=5'

Call Two Working Days Before You Dig!
1-800-227-2600

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

REVISIONS			
NO	DESCRIPTION	DATE	BY
1	As-Built Fencing	6-2005	W.N.
2	As-Built Expansion Joint Location	6-2005	W.N.
3	Added 2nd Expansion Joint	6-2005	W.N.

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS - LAND SURVEYORS - LAND PLANNERS
561 W MESQUITE BLVD, STE 4
MESQUITE, NEVADA 89027
(702) 346-5101
P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586-9592

ABBOTT WASH CONVEYANCE PLAN AND PROFILE 4
FOR
THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA

SCALE: 1"=20'
DRAWN BY: JRH
CHECKED BY: W.N.
PROJECT NO: 1029-90-05
DATE: NOV 2003
SHEET NO: 6 OF 26

PLOT DATE

Exp. 12/31/05 CIVIL No. 14044 — 12-11-03

WESTON L NELSON Exp. 12/31/05 CIVIL No. 14044 — 7-19-05

ABBOTT WASH PLAN VIEW

STA: 22+50.00 to 28+50.00
SCALE HOR: 1"=20'

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

DISCLAIMER:

THE OVERALL GRADING, DRAINAGE SWALES AND OTHER DRAINAGE SYSTEMS DEPICTED ON THIS PLAN ARE SHOWN AS A REPRESENTATION OF MINIMUM DRAINAGE REQUIREMENTS. HOWEVER, IT IS TO BE UNDERSTOOD THAT EROSION MAY AND MOST LIKELY WILL OCCUR ON CUT SLOPES, FILL SLOPES, MINOR DRAINAGE SWALES DIRECTED AT DOWN SLOPES AND/OR RETAINING WALLS, AND MINOR DRAINAGE SWALES DIRECTED TOWARD MORE MAJOR DRAINAGE FACILITIES (I.E.; STREETS, CURBS & GUTTER, STORM DRAIN). IT SHOULD ALSO BE UNDERSTOOD THAT THE DEVELOPER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SOME FORM OF EROSION PROTECTION FOR THE AREAS NOTED ABOVE.

GRADING QUANTITIES

STA: 22+50–28+50

CHANNEL EXCAVATION = 6,117 C.Y.
BACK FILL = 6,759 C.Y.
NET CUT (OR FILL) = 639 NET FILL

*Channel Excavation, typical for Bedding Conditions shown, includes additional cut where depicted. Backfill accounts for fill behind Channel Walls and does not include imported Base Material. Quantities do not account for shrinkage or subsidence.

MARTIN DEVELOPMENT INC.

MATCHLINE STA: 22+50.00 FOR CONTINUATION SEE SHEET 6

MATCHLINE STA: 28+50.00 FOR CONTINUATION SEE SHEET 8

ABBOTT WASH

CITY OF MESQUITE

HACIENDA ESTATES MOBILE HOME PARK

EXISTING 6' WROUGHT IRON FENCE TO REMAIN.

END 6' CHAIN LINK FENCE STA: 27+02.98 OFFSET: 73.87' (L)

Add 24" RCP (Extend Past Sanitary Sewer & Fence Main)

EXISTING 60" SEWER MANHOLE STA: 26+93.31 OFFSET 50.44' LT.

FENCE ANGLE POINT STA: 25+52.25 OFFSET: 37.25' (L)

FENCE ANGLE POINT STA: 25+64.34 OFFSET: 42.25' (L)

FENCE ANGLE POINT STA: 27+02.99 OFFSET: 42.25' (L)

N02°14'21"E

N22°30'00"W

N00°44'05"W

S83°28'45"W

VARIES

15'±

30'

12' MAINTENANCE ROAD

28.50' CHANNEL

5' PERSONAL ACCESS PATH

Q_{100} = 4,000 CFS

S=10%

TOP OF WALL VARIES 8.5'–0' (EAST SIDE)

END CHANNEL ACCESS STA: 23+30 (8.5' WALL)

FENCE ANGLE POINT STA: 23+69.71 OFFSET: 21.25' (R)

ACCESS ROAD ANGLE POINT STA: 23+69.69 OFFSET: 35.25' (R)

FENCE ANGLE POINT STA: 23+69.71 OFFSET: 36.25' (R)

60' GRAVEL BASE FOR CHANNEL ACCESS (6" TYPE II @ 95%)

ACCESS ROAD ANGLE POINT STA: 23+69.52 OFFSET: 59.01' (R)

ACCESS ROAD ANGLE POINT STA: 24+29.60 OFFSET: 20.25' (R)

ACCESS ROAD ANGLE POINT STA: 24+28.67 OFFSET: 67.58' (R)

1.00' TYP.

RAMP WALL & FOOTING TYP. WALL DETAIL SHOWN ON WITH 5" TOE AND NO FLOOR BEYOND TOE

T.O.F. 1564.20
T.O.W. 1572.70

T.O.F. 1565.95
T.O.W. 1572.70
TO 1572.95

T.O.F. 1567.70
T.O.W. 1572.95
TO 1573.20

T.O.F. 1569.45
T.O.W. 1573.20
TO 1573.45

T.O.F. 1571.20
T.O.W. 1573.45
TO 1573.64

21" FOOTING STEP STA: 22+54

21" FOOTING STEP STA: 22+74

21" FOOTING STEP STA: 22+94

21" FOOTING STEP STA: 23+14

NOTE: CARRY LONGITUDINAL FOOTING STEEL THROUGH STEPS, TYPICAL FOR RAMP WALLS

EXISTING BLOCK WALL TO REMAIN

SHARED USE PATH STATIONING

FUTURE SHARED USE PATH

STA: 24+00 1576.71 GB

STA: 25+00 1578.00 GB

1578.86

1576.11

1575.51

1574.90

STA: 26+00

BH-14/28+00.07/2.02' RT

S02°08'12"E 425.85' PT TO PC

PT = 27+56

SHEET 16 — MESQUITE BLVD. END PROJECT

SHEET 15 — INTERSTATE 15

SHEET 14

SHEET 13

SHEET 12

SHEET 11 — MESQUITE BLVD.

SHEET 10

SHEET 9

SHEET 8

SHEET 7

SHEET 6

SHEET 5

SHEET 4

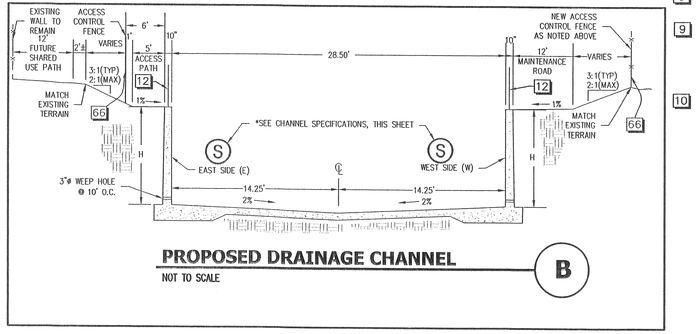
SHEET 3

2ND SOUTH

HAFEN LANE

ABBOTT WASH SHARED USE PATH
VIRGIN RIVER SHARED USE PATH
VIRGIN RIVER CHANNEL

KEY MAP



PROPOSED DRAINAGE CHANNEL

NOT TO SCALE

B

CONSTRUCTION NOTES

8 4" EXPANSION JOINT AND CUTOFF WALL. SEE DETAIL E/20

9 INSTALL MANHOLE STEPS PER LADDER STEP DETAIL. PLACE BOTTOM STEP 1' VERTICALLY ABOVE THE CHANNEL FLOOR. PAINT YELLOW STRIPE, 3' WIDE, ON EITHER SIDE OF LADDER. INSTALL 30" WIDE OPENING, IN POST AND CABLE RAILING AT LADDER LOCATIONS. SEE DETAIL A/23

10 INSTALL 15' WIDE DOUBLE SWING GATE, IN PERIMETER FENCING AT LOCATIONS SHOWN, PER C.C. AREA STANDARD DRAWING NO. 253. H=6'. (USDPWC)

12 INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL SEE DETAIL A/23

31 PROVIDE AND MOUNT WARNING SIGN ON 6' CHAIN LINK FENCE/GATE SEE DETAIL A/26 FOR SIGN INFORMATION.

66 INSTALL CHAIN LINK FENCE H=6' PER C.C. AREA STD DWG NO 252. (USDPWC)

STA:	SIDE	H	TYPE	CHANNEL WIDTH	FLOOR CROSS SLOPE	*DETAIL 1	*DETAIL 2
21+94.00–30+75	W	8.5'	Ⓧ	28.50'	2%	A/19	A/20
22+34–23+30	E	0'–8.5'	Ⓧ	28.50'	2%	A/19	A/20
23+30–24+50	E	8.5'	Ⓧ	28.50'	2%	A/19	A/20
24+50–30+75	E	8.5'	Ⓥ	28.50'	2%	A/19	A/20
22+35±–23+30	*R	8.5'	Ⓧ	15'R	VARIES	A/19	A/20

*DETAIL 1=REINFORCEMENT/GEOMETRY DETAILS
*DETAIL 2=FOUNDATION/CONSTRUCTION DETAILS
*R=RAMP WALL 15' EAST OF EAST CHANNEL WALL
*15'R=15' RAMP WIDTH

CHANNEL SPECIFICATIONS

NOT TO SCALE

S

LEGEND

- SS — = EXISTING PVC SEWER LINE WITH SIZE SHOWN
- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING FLOW LINE IN CHANNEL
- = EXISTING GRADE ℄ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q_{100}=HGL)
- = NEW CHAIN LINK FENCE AS NOTED ON PLANS
- = NEW POST AND CABLE RAILING AS NOTED ON PLANS.
- = As-Built Information
- = EXISTING MANHOLE
- = EXISTING FEATURES OR OTHER AS NOTED ON PLANS
- = ESTIMATED EXCAVATION
- 3 = CONSTRUCTION NOTE
- ROW = RIGHT OF WAY
- ℄ = PROPERTY LINE
- A/23 = CROSS SECTION
- FL OF BOX 1547.00 = NEW SPOT ELEVATION
- FL OF BOX 1547.00 = EXISTING SPOT ELEVATION
- BH-17/8+42.53/7.34' RT = (TEST/BORE LOCATION±/STA: ±/OFFSET±) TEST/BORE LOCATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- SM CL = SOIL CLASSIFICATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- ③ = CURVE NUMBER
- E = EMERGENCY ACCESS LADDER AND GATE LOCATION
- = MAINTENANCE ROAD/ACCESS PATH
- = CUT-OFF WALL
- = CHANNEL WALL FOOTING/FLOOR

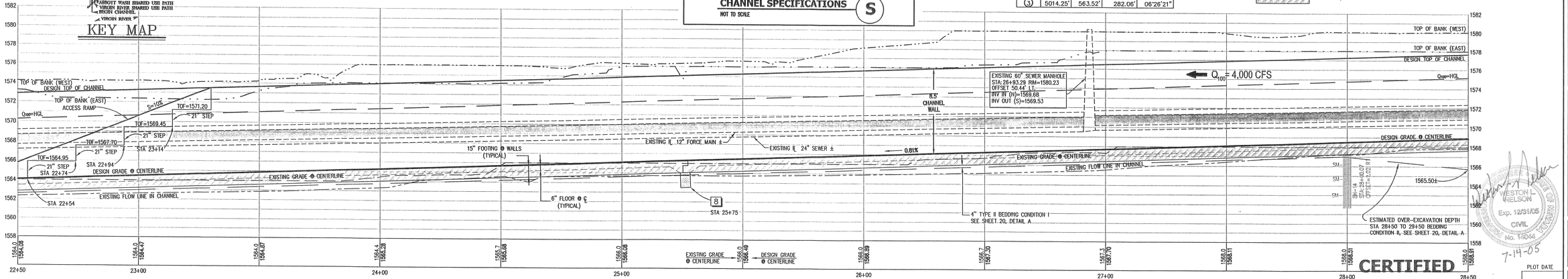
CURVE TABLE

CURVE	RADIUS	LENGTH	TANGENT	DELTA
①	4985.75'	560.32'	280.45'	06°26'21"
②	5000.00'	561.92'	281.25'	06°26'21"
③	5014.25'	563.52'	282.06'	06°26'21"

Call Two Working Days Before You Dig!
1-800-227-2600

ABBOTT WASH PROFILE VIEW

STA: 22+50.00 to 28+50.00
SCALE HOR: 1"=20'
SCALE VER: 1"=5'



CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

WESTON L NELSON Exp. 12/31/05 CIVIL No. 14044

7-14-05

12-11-03

NO	DESCRIPTION	DATE	BY
1	Add 24" RCP (Storm Drain)	6-2003	W.N.

THE INFORMATION CONTAINED ON THESE PLANS IS THE PROPERTY OF BULLOCH BROTHERS ENGINEERING INC. AND IS NOT TO BE USED IN WHOLE OR IN PART FOR ANY PROJECT OTHER THAN THE SPECIFIC PROJECT FOR WHICH IT WAS PREPARED WITHOUT THE EXPRESSED WRITTEN CONSENT OF BULLOCH BROTHERS ENGINEERING INC.

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS–LAND SURVEYORS–LAND PLANNERS

561 W MESQUITE BLVD. STE 4
MESQUITE, NEVADA 89027
(702) 346-5101

P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586-9552

ABBOTT WASH CONVEYANCE PLAN AND PROFILE 5
FOR
THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA
MESQUITE, NEVADA

SCALE:	DRAWN BY:	CHECKED BY:
1"=20'	B.C.	W.N.

PROJECT NO:	DATE:	SHEET NO:
1029-190-05	NOV. 2003	7 OF 26

PLOT DATE

GRADING QUANTITIES

STA: 28+50–34+50

CHANNEL EXCAVATION = 6,676 C.Y.
BACKFILL = 8,499 C.Y.
NET CUT (OR FILL) = 1,823 NET FILL

*Channel Excavation , typical for Bedding Conditions, includes additional cut where depicted. Backfill accounts for fill behind channel wall, and does not include imported base material. Quantities do not account for shrinkage or subsidence.

SUMMERWIND LLC
SUMMERWIND APARTMENTS

EXISTING WROUGHT IRON FENCE TO REMAIN

FENCE ANGLE POINT TABLE

ANG PT	STA:	OFF.	ANG PT	STA:	OFF.
①	32+88.74	81.15' (L)	⑤	33+35.99	21.25" (R)
②	33+03.00	28.68' (L)	⑥	34+36.78	21.25" (R)
③	33+23.50	14.25' (L)	⑦	34+07.70	14.25" (L)
④	33+35.99	14.25" (R)	⑧	34+08.55	40.45' (L)

ABBOTT WASH PLAN VIEW

STA: 28+50.00 TO 34+50.00
SCALE HOR: 1"=20'

CITY OF MESQUITE
JENSEN TRAILSIDE PARK

TELEPHONE± 4–3"ø PVC CONDUIT 26" DEEP THROUGH WASH

POWER ±

EXISTING PARK MAINTENANCE BUILDING

REPLACE EXISTING FENCE

CONTRACTOR TO VERIFY LOCATION & DEPTH OF EXISTING UTILITIES. UTILITIES MAY STAY IN PLACE IF CONSTRUCTION OF NEW CHANNEL/ CULVERT DOES NOT AFFECT UTILITIES. IF UTILITIES NEED TO BE MOVED TO ALLOW FOR CONSTRUCTION CONTRACTOR SHALL PROTECT & SUPPORT UTILITIES DURING CONSTRUCTION. CONTINUED SERVICE NEEDS TO BE MAINTAINED THROUGHOUT CONSTRUCTION. CONTRACTOR SHALL COORDINATE CONSTRUCTION WITH UTILITIES. RELOCATED CONDUITS SHALL BE PLACED ON TOP OF CULVERT 13.5'± FROM SOUTH END OF CULVERT. (1.0' MIN SEPARATION BETWEEN TELEPHONE & POWER.)

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

DISCLAIMER:
THE OVERALL GRADING, DRAINAGE SWALES AND OTHER DRAINAGE SYSTEMS DEPICTED ON THIS PLAN ARE SHOWN AS A REPRESENTATION OF MINIMUM DRAINAGE REQUIREMENTS. HOWEVER, IT IS TO BE UNDERSTOOD THAT EROSION MAY AND MOST LIKELY WILL OCCUR ON CUT SLOPES, FILL SLOPES, MINOR DRAINAGE SWALES DIRECTED AT DOWN SLOPES AND/OR RETAINING WALLS, AND MINOR DRAINAGE SWALES DIRECTED TOWARD MORE MAJOR DRAINAGE FACILITIES (I.E.; STREETS, CURBS & GUTTER, STORM DRAIN). IT SHOULD ALSO BE UNDERSTOOD THAT THE DEVELOPER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SOME FORM OF EROSION PROTECTION FOR THE AREAS NOTED ABOVE.

HAFEN

POLLOCK PROPERTIES LLC AGRICULTURAL

2ND SOUTH

MATCHLINE STA: 28+50.00 FOR CONTINUATION SEE SHEET 7

MATCHLINE STA: 34+50.00 FOR CONTINUATION SEE SHEET 9

CITY OF MESQUITE

ABBOTT WASH

WASH EASEMENT FOR CITY OF MESQUITE

FUTURE SHARED USE PATH

HACIENDA ESTATES MOBILE HOME PARK

EXISTING BLOCK WALL TO REMAIN

12' MAINTENANCE ROAD

5' PERSONAL ACCESS PATH

28.50' CHANNEL

25' WALL HEIGHT

8.5' WALL STA: 30+75

10' WALL STA: 31+00

Q_{100} = 4,000 CFS

Direction of Flow

Typical "a" Exp. Joint

Fixed Side of Joint

Slip Side of Joint

Delete Post & Cable Fence STA: 31+12.3 To 33+23.3

Moved Chain Link Fence To Top of Channel Wall

REMOVE & DISPOSE BRIDGE FOOTING

REMOVE & SALVAGE EXISTING PEDESTRIAN BRIDGE

REMOVE & DISPOSE EXISTING 18" PVC STORM DRAIN

REMOVE & DISPOSE TRIMMED PIPE

Capped Pipe

POTHOLE UTILITIES COORDINATE SD CROSSING WITH UTILITIES

Constructed Box Culvert In Segments Sections See Attached As-Builts

Add Backhoe Drain To Top of MH

Delete

Move

Extend Existing 24" cmp Through Pipe Cap, Extend Cmp To Field Drain.

As-Built Location (Re-used Existing Cmp)

Modified Cap

Added Temporary PVC Pipe for Irrigation

MH 2037 RIM=1584.43, IN=1573.08 / OUT SE=1572.83

MH 2036 RIM=1584.33 IN=1573.83 OUT SE=1573.73

INSTALL 11¼° ELL

MATCH PIPE MATERIAL

FUTURE 24"x38" ELLIPTICAL RCP SD STUB @ S=0.50%

FUTURE SD MH RIM=1585.00± INV IN(W)=1576.80 INV OUT(SE)=1575.80

EXISTING 18" CMP IRRIGATION DRAINAGE PIPE TOP=1587.97 @ INLET PIPE TOP=1584.66 @ OUTLET

100' ABBOTT WASH EASEMENT

NEW 30" RCP CLASS III WEST SIDE STA 34+15 L=8', S=0.50% INV=1574.75±

NEW 48"ø CLASS III RCP SD, L=4'± @ S=6.60%

INV=1574.35

INV=1579.24 (WEST BANK)

STA: 33+23.50 BEG. CULVERT

STA: 33+29.47 BEG. CULVERT

HEADWALL SKEW @ STA: 33+29.47 = 24°

STA: 33+65

STA: 32+75±

STA: 34+07.70 END CULVERT

STA: 34+15.84 END CULVERT

STA: 34+30.39 END CULVERT

NEW 48"ø CLASS III RCP SD, L=36'±, S=2.63%

INV=1581.00± MATCH EXISTING CONDITION

EXISTING 24"ø PVC IRR. PIPE (DEPTH = 1'±)

L=185.39'

NEW DROP MH INV IN=1584.47 INV OUT=1578.00

REUSE EXISTING 18"CMP EXTEND THROUGH CAP OF 30" STUB

CUT CMP & STUB THROUGH MH WALL

12' ACCESS ROAD

FLOW

TYPICAL EACH END

SCALE: 1"=20'

60.00' R.O.W.

LEGEND

- SS = EXISTING PVC SEWER LINE WITH SIZE SHOWN
- SD = NEW STORM DRAIN
- SD = EXISTING STORM DRAIN
- FM = EXISTING FORCE MAIN SEWER LINE
- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING FLOWLINE IN CHANNEL
- = EXISTING GRADE @ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- = EXISTING FENCE, FENCE TYPE VARIES
- = ABBOTT WASH EASEMENT
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q_{100}=HGL)
- = TELEPHONE LINE
- = POWER LINE
- = NEW CHAIN LINK FENCE AS NOTED ON PLANS
- = NEW POST AND CABLE RAILING AS NOTED ON PLANS.
- = EXISTING FEATURES OR OTHER AS NOTED ON PLANS
- = ESTIMATED EXCAVATION
- = As-Built Information
- = EXISTING MANHOLE
- = BOX CULVERT
- = TRACT LINE
- 3 = CONSTRUCTION NOTE
- ROW = RIGHT OF WAY
- ℄ = PROPERTY LINE
- A/23 = CROSS SECTION
- FL OF BOX 1547.00 = NEW SPOT ELEVATION
- FL OF BOX 1542.00 = EXISTING SPOT ELEVATION
- ③ = CURVE NUMBER
- E/40 = EMERGENCY ACCESS LADDER AND GATE LOCATION
- = TRANSITION LENGTH, TYPE OF TRANSITION
- = MAINTENANCE ROAD/ACCESS PATH
- = CHANNEL WALL FOOTING/FLOOR
- = CUT-OFF WALL

KEY MAP

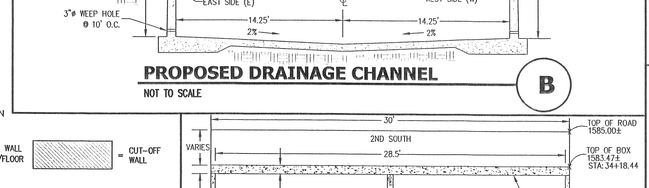
SHEET 16 … SHEET 3 (MESQUITE BLVD., 2ND SOUTH, HAFEN LANE, INTERSTATE 15, VIRGIN RIVER, ABBOTT WASH SHARED USE PATH, VIRGIN RIVER SHARED USE PATH, BEGIN CHANNEL)

CONSTRUCTION NOTES

7 1" EXPANSION JOINT AND CUTOFF WALL LOCATED AT FACE OF CULVERT.
8 4" EXPANSION JOINT AND CUTOFF WALL, SEE DETAIL E/20
9 INSTALL MANHOLE STEPS PER LADDER STEP DETAIL L/20. PLACE BOTTOM STEP 1' VERTICALLY ABOVE THE CHANNEL FLOOR. PAINT YELLOW STRIPE, 3' WIDE, ON EITHER SIDE OF LADDER. INSTALL 30" WIDE OPENING, IN POST AND CABLE RAILING AT LADDER LOCATIONS. SEE DETAIL A/23
10 INSTALL 15' WIDE DOUBLE SWING GATE, IN PERIMETER FENCING AT LOCATIONS SHOWN, PER C.C. AREA STANDARD DRAWING NO. 253. H=6'. (USDPWC)
12 INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL SEE DETAIL A/21
16 INSTALL PIPE THROUGH WALL PER DETAIL J/21
17 CAP NEW PIPE PER DETAIL J/21
20 INSTALL NEW TYPE I MANHOLE PER C.C. AREA STANDARD DRAWING NO. 406.
31 PROVIDE AND MOUNT WARNING SIGN ON EMERGENCY ACCESS GATE SEE DETAIL A/26 FOR SIGN INFORMATION.
50 PROVIDE PAINTED DEPTH GAUGE ON CHANNEL WALL, (GAUGING STATION I/23 STRUCTURE NOT REQUIRED)
65 INSTALL 6' WIDE SINGLE GATE WITH TOP LATCH PER C.C. AREA STD DWG NO 253 (USDPWC)
66 INSTALL CHAIN LINK FENCE H=6' PER C.C. AREA STD DWG NO 252. (USDPWC)
67 INSTALL CHAIN LINK FENCE, H=6', MOUNT FENCE ON TOP OF CONCRETE CHANNEL WALL/HEADWALL. SEE DETAIL J/20

CURVE TABLE

CURVE	RADIUS	LENGTH	TANGENT	DELTA
④	364.25'	296.26'	156.87'	46°36'02"
⑤	350.00'	284.67'	150.74'	46°36'02"
⑥	335.75'	273.08'	144.60'	46°36'02"

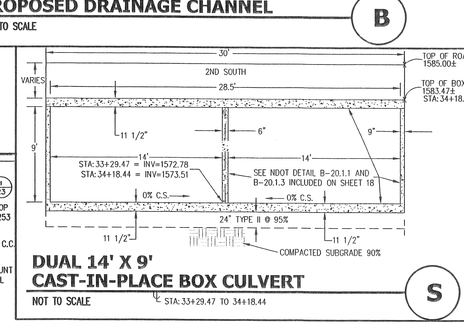


PROPOSED DRAINAGE CHANNEL — B
NOT TO SCALE

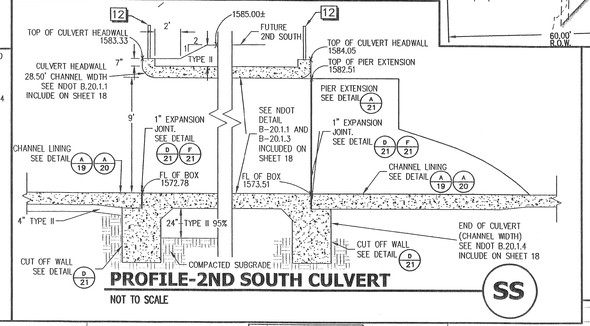
STA:	SIDE	H	TYPE	CHANNEL WIDTH	FLOOR CROSS SLOPE	*DETAIL 1	*DETAIL 2
24+50–30+75	E	8.5'	Ⓥ	28.50'	2%	A/19	A/20
30+75–34+35.99	E	10'	Ⓥ	28.50'	VARIES	A/19	A/20
34+30.39–35+25	E	10'	Ⓥ	28.50'	VARIES	A/19	A/20
21+94.09–30+75	W	8.5'	Ⓧ	28.50'	2%	A/19	A/20
30+75–33+23.50	W	10'	Ⓧ	28.50'	VARIES	A/19	A/20
34+07.70–35+25	W	10'	Ⓧ	28.50'	VARIES	A/19	A/20

*DETAIL 1=REINFORCEMENT/GEOMETRY DETAILS
*DETAIL 2=FOUNDATION/CONSTRUCTION DETAILS

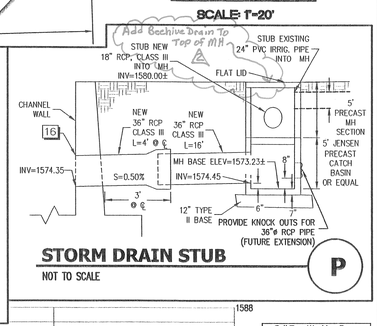
CHANNEL SPECIFICATIONS — S
NOT TO SCALE



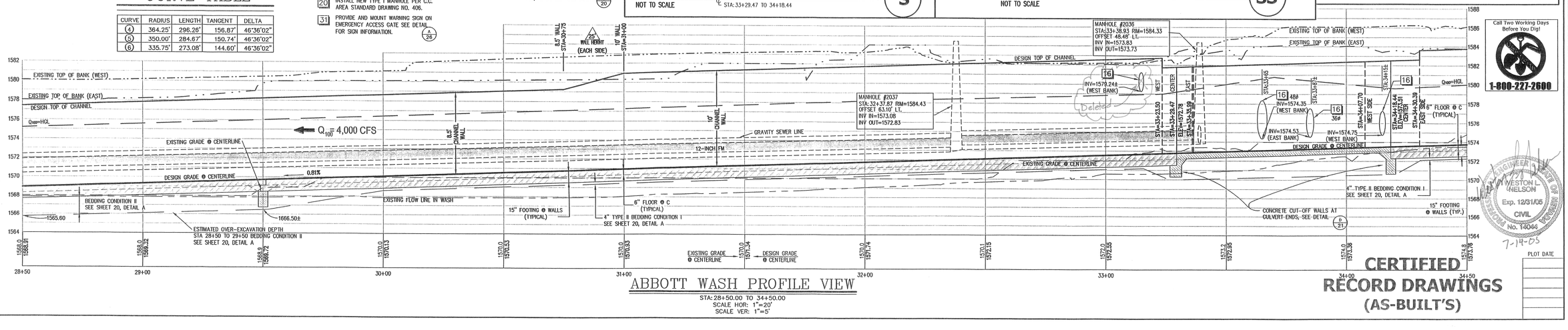
DUAL 14' X 9' CAST-IN-PLACE BOX CULVERT — S
NOT TO SCALE
STA: 33+29.47 TO 34+18.44



PROFILE-2ND SOUTH CULVERT — SS
NOT TO SCALE



STORM DRAIN STUB — P
NOT TO SCALE



ABBOTT WASH PROFILE VIEW
STA: 28+50.00 TO 34+50.00
SCALE HOR: 1"=20'
SCALE VER: 1"=5'

Call Two Working Days Before You Dig!
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CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

NO	DESCRIPTION	DATE	BY
1	As-Built Channel Location	6-2005	WN
2	As-Built Storm Drain Location	6-2005	WN
3	As-Built Culvert Layout	6-2005	WN

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS–LAND SURVEYORS– LAND PLANNERS
561 W MESQUITE BLVD, STE 4
MESQUITE, NEVADA 89027
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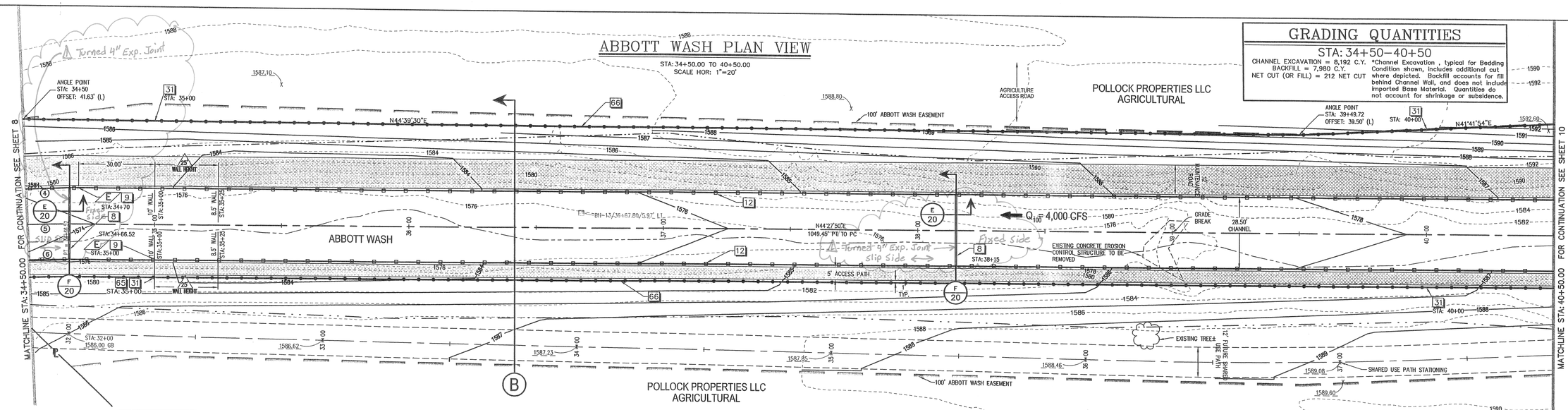
P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586-9592

ABBOTT WASH CONVEYANCE
PLAN AND PROFILE
FOR
THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA

SCALE: 1"= 20'
DRAWN BY: BC
CHECKED BY: WN
PROJECT NO: 1029-190-05
DATE: NOV 2003
SHEET NO: 8 OF 26
PLOT DATE

ABBOTT WASH PLAN VIEW

STA: 34+50.00 TO 40+50.00
SCALE HOR: 1"=20'

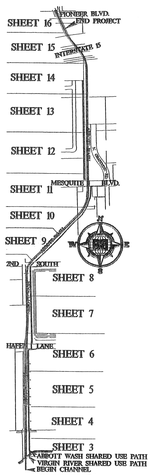


GRADING QUANTITIES

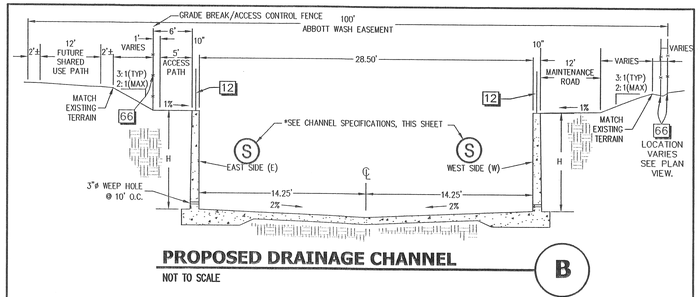
STA: 34+50–40+50

CHANNEL EXCAVATION = 8,192 C.Y.
BACKFILL = 7,980 C.Y.
NET CUT (OR FILL) = 212 NET CUT

*Channel Excavation , typical for Bedding Condition shown, includes additional cut where depicted. Backfill accounts for fill behind Channel Wall, and does not include imported Base Material. Quantities do not account for shrinkage or subsidence.



KEY MAP



PROPOSED DRAINAGE CHANNEL (B)

NOT TO SCALE

STA:	SIDE	H	TYPE	CHANNEL WIDTH	FLOOR CROSS SLOPE	*DETAIL 1	*DETAIL 2
34+30.39–35+25	E	10'	Ⓥ	28.50'	VARIES	A/19	A/20
35+25–43+00	E	8.5'	Ⓥ	28.50'	2%	A/19	A/20
34+07.70–35+25	W	10'	Ⓧ	28.50'	VARIES	A/19	A/20
35+25–43+00	W	8.5'	Ⓧ	28.50'	2%	A/19	A/20

*DETAIL 1=REINFORCEMENT/GEOMETRY DETAILS
*DETAIL 2=FOUNDATION/CONSTRUCTION DETAILS

CHANNEL SPECIFICATIONS (S)

NOT TO SCALE

LEGEND

- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING FLOWLINE IN CHANNEL
- = EXISTING GRADE @ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- = ABBOTT WASH EASEMENT
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q_{100}=HGL)
- = NEW CHAIN LINK FENCE AS NOTED ON PLANS
- = NEW POST AND CABLE RAILING AS NOTED ON PLANS.
- = As-Built Information
- = EXISTING FEATURES OR OTHER AS NOTED ON PLANS
- = ESTIMATED EXCAVATION
- 3 = CONSTRUCTION NOTE
- ℄ = PROPERTY LINE
- A/23 = CROSS SECTION
- FL OF BOX 1547.00 = NEW SPOT ELEVATION
- FL OF BOX 1547.00 = EXISTING SPOT ELEVATION
- BH-17/8+42.53/7.34' RT = (TEST/BORE LOCATION±/STA:±/OFFSET±) TEST/BORE LOCATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- SM / CL = SOIL CLASSIFICATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- 3 = CURVE NUMBER
- E = EMERGENCY ACCESS LADDER AND GATE LOCATION
- 40' FLOOR C.S. = TRANSITION LENGTH, TYPE OF TRANSITION
- = MAINTENANCE ROAD/ACCESS PATH
- = CHANNEL WALL FOOTING/FLOOR
- = CUT-OFF WALL

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

DISCLAIMER:

THE OVERALL GRADING, DRAINAGE SWALES AND OTHER DRAINAGE SYSTEMS DEPICTED ON THIS PLAN ARE SHOWN AS A REPRESENTATION OF MINIMUM DRAINAGE REQUIREMENTS. HOWEVER, IT IS TO BE UNDERSTOOD THAT EROSION MAY AND MOST LIKELY WILL OCCUR ON CUT SLOPES, FILL SLOPES, MINOR DRAINAGE SWALES DIRECTED AT DOWN SLOPES AND/OR RETAINING WALLS, AND MINOR DRAINAGE SWALES DIRECTED TOWARD MORE MAJOR DRAINAGE FACILITIES (I.E.; STREETS, CURBS & GUTTER, STORM DRAIN). IT SHOULD ALSO BE UNDERSTOOD THAT THE DEVELOPER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SOME FORM OF EROSION PROTECTION FOR THE AREAS NOTED ABOVE.

CURVE TABLE

CURVE	RADIUS	LENGTH	TANGENT	DELTA
4	364.25'	296.26'	156.87'	46°36'02"
5	350.00'	284.67'	150.74'	46°36'02"
6	335.75'	273.08'	144.60'	46°36'02"

CONSTRUCTION NOTES

8 4" EXPANSION JOINT AND CUTOFF WALL. SEE DETAIL E/20

9 INSTALL MANHOLE STEPS PER LADDER STEP DETAIL L/20. PLACE BOTTOM STEP 1' VERTICALLY ABOVE THE CHANNEL FLOOR. PAINT YELLOW STRIPE, 3" WIDE, ON EITHER SIDE OF LADDER. INSTALL 30" WIDE OPENING, IN POST AND CABLE RAILING AT LADDER LOCATIONS. SEE DETAIL A/23

12 INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL SEE DETAIL A/23

31 PROVIDE AND MOUNT WARNING SIGN ON CHAIN LINK FENCE/GATE SEE DETAIL A/26 FOR SIGN INFORMATION.

65 INSTALL 6' WIDE SINGLE GATE WITH TOP LATCH PER C.C. AREA STD DWG NO 253. (USDPWC)

66 INSTALL CHAIN LINK FENCE H=6' PER C.C. AREA STD DWG NO 252. (USDPWC)

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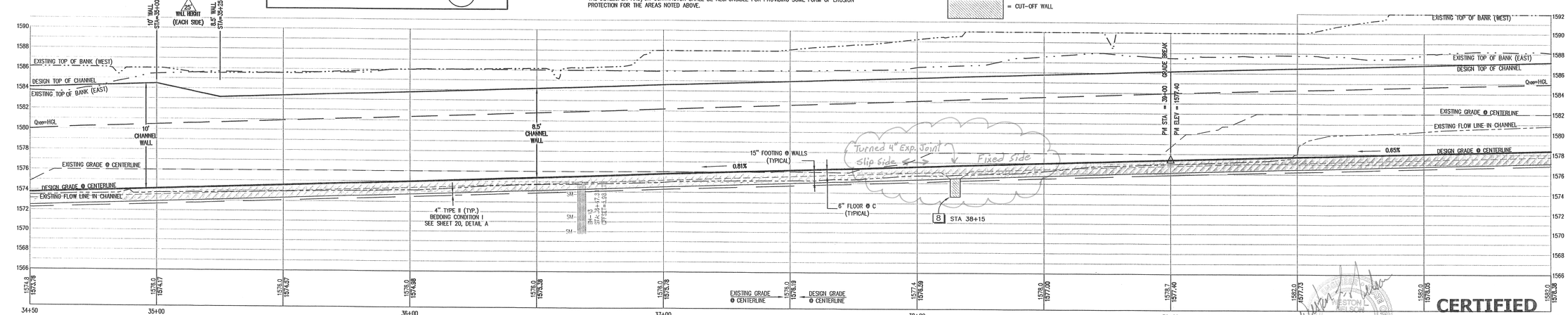
20 0 20
SCALE: 1"=20'



ABBOTT WASH PROFILE VIEW

STA: 34+50.00 to 40+50.00
SCALE HOR: 1"=20'
SCALE VER: 1"=5'

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

7-14-05

NO	DESCRIPTION	DATE	BY
1	As-Built Exp. Joint	6-2005	B.N.L.

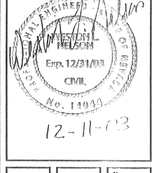
REVISIONS

I HEREBY CERTIFY THAT THE ABOVE AS-BUILT INFORMATION WAS OBTAINED BY ME OR UNDER MY DIRECT SUPERVISION AND IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. I FURTHER CERTIFY THAT THIS AS-BUILT INFORMATION COMPLIES WITH THE REQUIREMENTS OF THE CITY OF MESQUITE AND THAT ALL DEVIATIONS FROM THE APPROVED CONSTRUCTION PLANS ARE NOTED HEREON.

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS—LAND SURVEYORS—LAND PLANNERS
P.O. BOX 3174, CEDAR CITY, UTAH 84720, (435) 586-9592
561 W MESQUITE BLVD, STE 4, MESQUITE, NEVADA 89027, (702) 346-5101

ABBOTT WASH CONVEYANCE PLAN AND PROFILE

FOR THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA



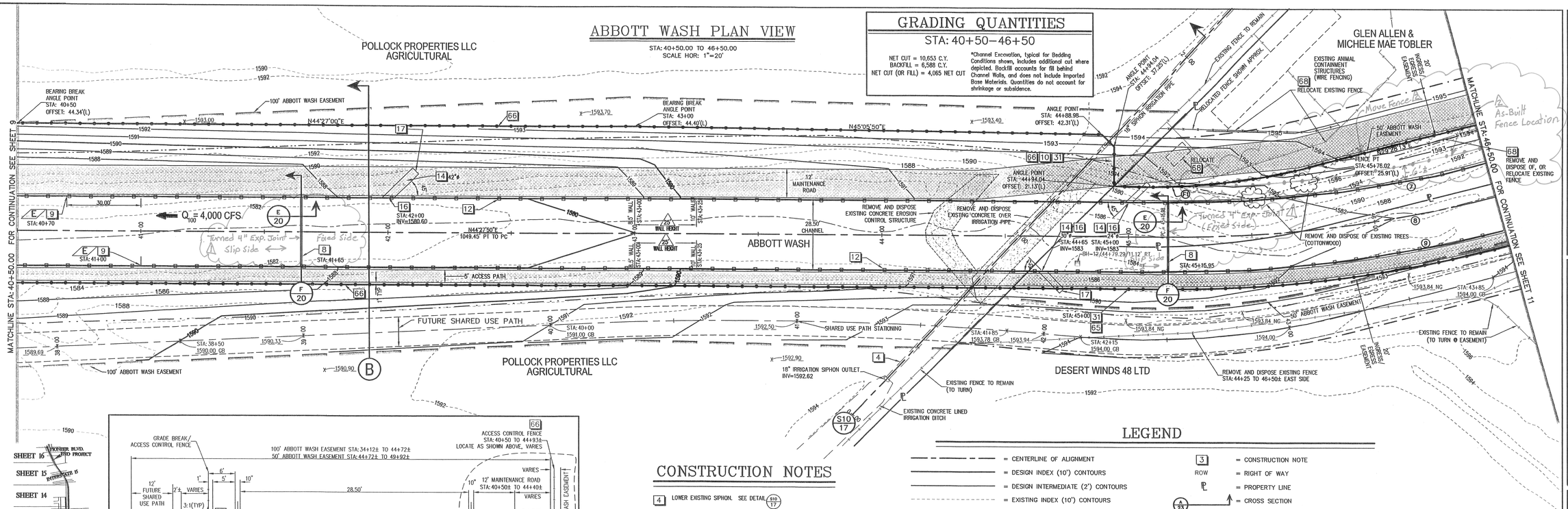
SCALE:	DRAWN BY:	CHECKED BY:
1"= 20'	BC	WN

PROJECT NO:	DATE:	SHEET NO:
1029-190-05	NOV 2003	9 OF 26

PLOT DATE

ABBOTT WASH PLAN VIEW

STA: 40+50.00 TO 46+50.00
SCALE HOR: 1"=20'

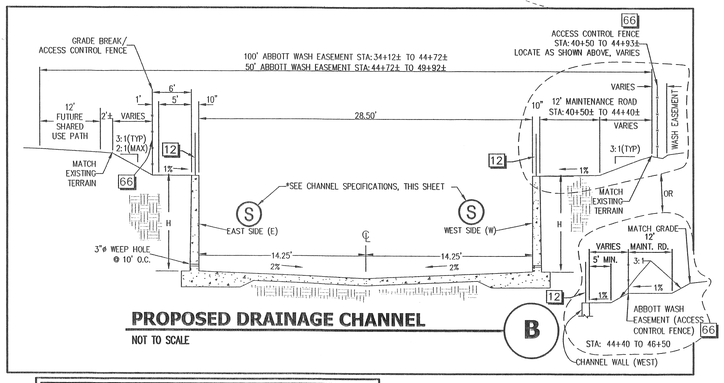


GRADING QUANTITIES

STA: 40+50–46+50

NET CUT = 10,653 C.Y.
BACKFILL = 6,588 C.Y.
NET CUT (OR FILL) = 4,065 NET CUT

*Channel Excavation, typical for Bedding Conditions shown, includes additional cut where depicted. Backfill accounts for fill behind Channel Walls, and does not include imported Base Materials. Quantities do not account for shrinkage or subsidence.



STA:	SIDE	H	TYPE	CHANNEL WIDTH	FLOOR CROSS SLOPE	*DETAIL 1	*DETAIL 2
35+25–43+00	E	8.5'	Ⓥ	28.50'	2%	A/19	A/20
43+00–45+00	E	10'	Ⓥ	28.50'	2%	A/19	A/20
45+00–47+25	E	10'	Ⓧ	28.50'	2%	A/19	A/20
35+25–43+00	W	8.5'	Ⓧ	28.50'	2%	A/19	A/20
43+00–49+09.28	W	10'	Ⓧ	28.50'	2%	A/19	A/20

*DETAIL 1=REINFORCEMENT/GEOMETRY DETAILS
*DETAIL 2=FOUNDATION/CONSTRUCTION DETAILS

CHANNEL SPECIFICATIONS (S)
NOT TO SCALE

CURVE TABLE

CURVE	RADIUS	LENGTH	TANGENT	DELTA
⑦	485.75'	386.17'	203.94'	45°33'01"
⑧	500.00'	397.50'	209.93'	45°33'01"
⑨	514.25'	408.83'	215.91'	45°33'01"
F1	259.53'	79.70'	40.16'	17°35'40"

CONSTRUCTION NOTES

4 LOWER EXISTING SIPHON. SEE DETAIL S10/17
8 4" EXPANSION JOINT AND CUTOFF WALL. SEE DETAIL E/20
9 INSTALL MANHOLE STEPS PER LADDER STEP DETAIL PLACE BOTTOM STEP 1' VERTICALLY ABOVE THE CHANNEL FLOOR. PAINT YELLOW STRIPE, 3" WIDE, ON EITHER SIDE OF LADDER. INSTALL 30" WIDE OPENING, IN POST AND CABLE RAILING AT LADDER LOCATIONS. SEE DETAIL A/23
10 INSTALL 15' WIDE DOUBLE SWING GATE, IN PERIMETER FENCING AT LOCATIONS SHOWN, PER C.C. AREA STANDARD DRAWING NO. 253. H=6'. (USD PWC)
12 INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL SEE DETAIL A/23
14 STUB NEW STORM DRAIN (RCP CLASS III) @ S=0.50% FOR FUTURE DRAINAGE L=12' @ CEN ±
16 INSTALL PIPE THROUGH WALL PER DETAIL I/21
17 CAP NEW PIPE PER DETAIL J/21
31 PROVIDE AND MOUNT WARNING SIGN ON EMERGENCY ACCESS GATE SEE DETAIL A/26 FOR SIGN INFORMATION.
65 INSTALL 6' WIDE SINGLE GATE WITH TOP LATCH PER C.C. AREA STD DWG NO 253 (USD PWC).
66 INSTALL CHAIN LINK FENCE H=6' PER C.C. AREA STD DWG NO 252 (USD PWC).
68 COORDINATE REMOVAL & DISPOSAL OR RELOCATION OF FENCE, MATERIALS, STRUCTURES, ON TOBLER PROPERTY WITH PROPERTY OWNER.

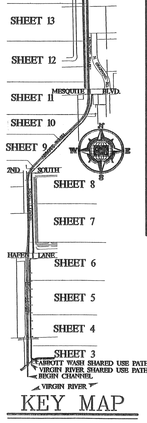
NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

DISCLAIMER:
THE OVERALL GRADING, DRAINAGE SWALES AND OTHER DRAINAGE SYSTEMS DEPICTED ON THIS PLAN ARE SHOWN AS A REPRESENTATION OF MINIMUM DRAINAGE REQUIREMENTS. HOWEVER, IT IS TO BE UNDERSTOOD THAT EROSION MAY AND MOST LIKELY WILL OCCUR ON CUT SLOPES, FILL SLOPES, MINOR DRAINAGE SWALES DIRECTED AT DOWN SLOPES AND/OR RETAINING WALLS, AND MINOR DRAINAGE SWALES DIRECTED TOWARD MORE MAJOR DRAINAGE FACILITIES (I.E.; STREETS, CURBS & GUTTER, STORM DRAIN). IT SHOULD ALSO BE UNDERSTOOD THAT THE DEVELOPER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SOME FORM OF EROSION PROTECTION FOR THE AREAS NOTED ABOVE.

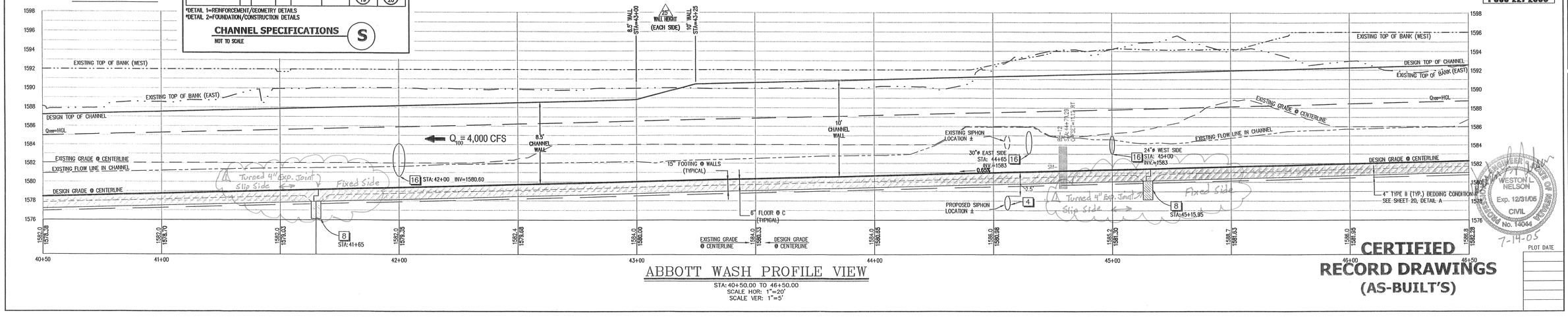
LEGEND

= CENTERLINE OF ALIGNMENT
= DESIGN INDEX (10') CONTOURS
= DESIGN INTERMEDIATE (2') CONTOURS
= EXISTING INDEX (10') CONTOURS
= EXISTING INTERMEDIATE (2') CONTOURS
= EXISTING FLOW LINE IN CHANNEL
= EXISTING GRADE @ CENTERLINE
= EXISTING TOP OF BANK – EAST
= EXISTING TOP OF BANK – WEST
= ABBOTT WASH EASEMENT
= EXISTING FENCE, FENCE TYPE VARIES
= 100 YEAR STORM HYDRAULIC GRADE LINE (Q100=HGL)
= NEW CHAIN LINK FENCE AS NOTED ON PLANS
= NEW POST AND CABLE RAILING AS NOTED ON PLANS.
= EXISTING FEATURES OR OTHER AS NOTED ON PLANS
= ESTIMATED EXCAVATION
= EASEMENT LINE

3 = CONSTRUCTION NOTE
ROW = RIGHT OF WAY
℄ = PROPERTY LINE
A/23 = CROSS SECTION
FL OF BOX 1547.00 = NEW SPOT ELEVATION
FL OF BOX 1547.00 = EXISTING SPOT ELEVATION
BH-17/B+42.53/7.34' RT = (TEST/BORE LOCATION±/STA:±/OFFSET±) TEST/BORE LOCATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
SM–CL = SOIL CLASSIFICATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
③ = CURVE NUMBER
E = EMERGENCY ACCESS LADDER AND GATE LOCATION
40' FLOOR C.S. = TRANSITION LENGTH, TYPE OF TRANSITION
= MAINTENANCE ROAD/ACCESS PATH
= CHANNEL WALL FOOTING/FLOOR
= CUT-OFF WALL
= As-Built Information



KEY MAP



ABBOTT WASH PROFILE VIEW

STA: 40+50.00 TO 46+50.00
SCALE HOR: 1"=20'
SCALE VER: 1"=5'

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

NO	DESCRIPTION	DATE	BY
1	As-Built Exp. Joint	6-2005	W.N.
2	As-Built Fence Construction	6-2005	W.N.

THE CONSTRUCTION DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS PREPARED BY THE ENGINEER FOR THIS PROJECT ARE INSTRUMENTS OF SERVICE FOR USE SOLELY WITH RESPECT TO THIS PROJECT AND, UNLESS OTHERWISE PROVIDED, THE ENGINEER SHALL BE DEEMED THE AUTHOR OF SUCH DOCUMENTS AND SHALL RETAIN ALL COMMON LAW, STATUTORY AND OTHER RESERVED RIGHTS, INCLUDING THE COPYRIGHT THEREIN. THE CONTRACTOR, SUBCONTRACTORS, SUPPLIERS, CONSULTANTS AND THE OWNER SHALL NOT COPY, DISCLOSE, TRANSMIT BY ANY MEANS, PUBLISH, ADAPT OR USE BY ANY MEANS FOR ANY PURPOSE WITHOUT THE EXPRESS WRITTEN CONSENT OF THE ENGINEER. ALL PARTIES AGREE AND WILL CAUSE THEIR EMPLOYEES AND AGENTS TO AGREE THAT USE OF THESE DOCUMENTS CONSTITUTES AN AGREEMENT TO THE FOREGOING STATEMENT AND ACKNOWLEDGES THAT ALL PARTIES WILL BE LIABLE FOR ANY DAMAGES RESULTING FROM THE UNAUTHORIZED USE OF THESE DOCUMENTS.

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LAND PLANNERS
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(435) 586-9592
561 W MESQUITE BLVD. STE 4
MESQUITE, NEVADA 89027
(702) 346-5101

ABBOTT WASH CONVEYANCE PLAN AND PROFILE 8

FOR THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA
MESQUITE, NEVADA

SCALE: 20 0 20
SCALE: 1"=20'

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WESTON L. NELSON Exp. 12/31/05 CIVIL No. 14046
12-11-03

WESTON L. NELSON Exp. 12/31/05 CIVIL No. 14046
7-14-05

SCALE:	DRAWN BY:	CHECKED BY:
1"=20'	B.C.	W.N.

PROJECT NO:	DATE:	SHEET NO:
1022-190-05	NOV 2003	10 OF 36

PLOT DATE

CURVE TABLE

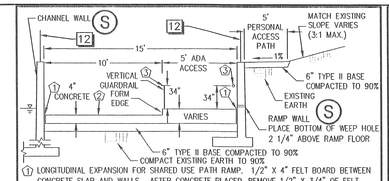
	RADIUS	LENGTH	TANGENT	DELTA
(7)	485.75'	398.17'	203.94'	45°33'01"
(8)	500.00'	397.50'	209.93'	45°33'01"
(9)	514.25'	408.83'	215.91'	45°33'01"
(10) INTENCE	386.52'	184.28'	93.93'	27°19'00"
(11)	60.00'	24.59'	12.47'	23°29'03"
(12)	60.00'	25.97'	13.19'	24°48'08"

FENCE ANGLE POINT TABLE

ANG. PT.	STATION	OFFSET
(1)	49+88.00	20.25' (L)
(2)	49+95.37	14.67' (L)
(3)	49+95.37	28.15' (R)
(4)	49+92.37	31.13' (R)
(5)	48+12±	14.67' (R)
(6)	48+05	21.08' (R)
(7)	51+01.50	14.67' (L)
(8)	51+19	32.08' (L)
(9)	51+01.50	28.15' (R)
(10)	51+04.50	31.13' (R)

SHARED USE PATH RAMP (CITY OF MESQUITE, OPTION A)

NOT TO SCALE



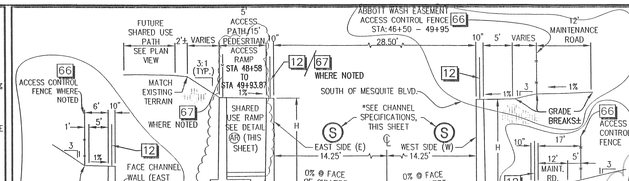
(1) LONGITUDINAL EXPANSION FOR SHARED USE PATH RAMP. 1/2" X 4" FELT BOARD BETWEEN CONCRETE SLAB AND WALLS. AFTER CONCRETE PLACED, REMOVE 1/2" X 3/4" OF FELT BOARD AND REPLACE WITH ELASTOMERIC SEALANT.

(2) TOOL CRACK JOINTS @ 15' O.C.

(3) INSTALL HANDRAILS ON EACH SIDE OF ADA ACCESSIBLE RAMP. HANDRAILS SHALL BE CONSTRUCTED ACCORDING TO CURRANT ADA STANDARDS. MINIMUM CLEARANCE BETWEEN HANDRAILS IS 36".

PROPOSED DRAINAGE CHANNEL

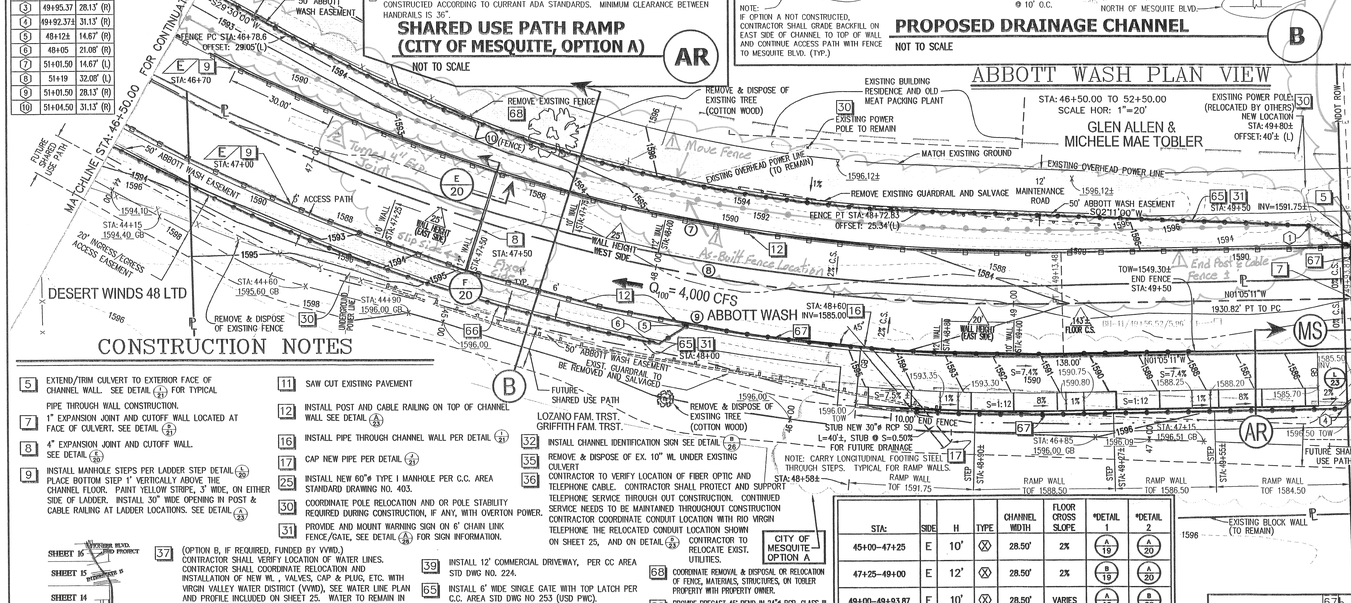
NOT TO SCALE



NOTE:
IF OPTION A NOT CONSTRUCTED, CONTRACTOR SHALL GRADE BACKFILL ON EAST SIDE OF CHANNEL TO TOP OF WALL AND CONTINUE ACCESS PATH WITH FENCE TO MESQUITE BLVD. (TYP.)

ABBOTT WASH PLAN VIEW

STA: 46+50.00 TO 52+50.00
SCALE HOR: 1"=20'


MATCHLINE STA: 45+50.00 FOR CONTINUATION SEE SHEET 10
20' INGRESS/EGRESS EASEMENT
S20°23'00"W
1590
1592
1594
1596
1598
1600
FENCE PC STA: 46+78.6 OFFSET: 29.05'(L)
50' ABBOTT WASH EASEMENT
FUTURE SHARED USE PATH
30.00'
6' ACCESS PATH
STA: 44+15 1594.40 GB
STA: 44+30 1595.60 GB
STA: 44+90 1596.00 GB
20' INGRESS/EGRESS ACCESS EASEMENT
DESERT WINDS 48 LTD
REMOVE EXISTING FENCE
REMOVE & DISPOSE OF EXISTING FENCE
REMOVE & DISPOSE OF EXISTING TREE (COTTON WOOD)
EXISTING BUILDING RESIDENCE AND OLD MEAT PACKING PLANT
EXISTING POWER POLE TO REMAIN
MATCH EXISTING GROUND
EXISTING OVERHEAD POWER LINE
EXISTING OVERHEAD POWER LINE (TO REMAIN)
REMOVE EXISTING GUARDRAIL AND SALVAGE
12' MAINTENANCE ROAD
50' ABBOTT WASH EASEMENT
S02°11'00"W
FENCE PT STA: 48+72.83 OFFSET: 25.34'(L)
EXISTING POWER POLE (RELOCATED BY OTHERS) NEW LOCATION STA: 49+80± OFFSET: 40'± (L)
GLEN ALLEN & MICHELE MAE TOBLER
STA: 46+70
STA: 47+00
STA: 47+50
STA: 48+00
STA: 48+50
STA: 49+50 INV=1591.75±
STA: 50+43 INV=1586.50±
TOW=1549.30± END FENCE STA: 49+50
N01°05'11"W 1930.82' PT TO PC
Q100 = 4,000 CFS
ABBOTT WASH
STA: 48+60 INV=1585.00±
45°
WALL HEIGHT EAST SIDE
WALL HEIGHT WEST SIDE
FLOOR C.S.
TOW=1596.00
STUB NEW 30"ø RCP SD. L=40'±, STUB @ S=0.50% FOR FUTURE DRAINAGE
STA: 48+58±
RAMP WALL TOF 1591.75
RAMP WALL TOF 1588.50
RAMP WALL TOF 1584.50
NOTE: CARRY LONGITUDINAL FOOTING STEEL THROUGH STEPS. TYPICAL FOR RAMP WALLS.
STEP
STA: 48+45 1596.09 GB
STA: 48+65 1596.51 GB
STA: 48+85 1596.09 GB
STA: 49+27± 1596.09 GB
STA: 49+65 1596.09 GB
STA: 49+93.87
STA: 48+100
50' ABBOTT WASH EASEMENT TO BE REMOVED & SALVAGED
EXIST. GUARDRAIL TO BE REMOVED & SALVAGED
REMOVE & DISPOSE OF EXISTING TREE (COTTON WOOD)
FUTURE SHARED USE PATH
LOZANO FAM. TRST.
GRIFFITH FAM. TRST.
10.00' END FENCE
CITY OF MESQUITE OPTION A
EXISTING BLOCK WALL (TO REMAIN)
1596
1597
1598
1599
1600
1601
1602
1603
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1634
1635

ABBOTT WASH PLAN VIEW

STA: 52+50.00 TO 58+50.00
SCALE HOR: 1"=20'

DESERT ROSE SUBDIVISION

CITY OF MESQUITE

LUCERNE MEADOWS LLC

LUCERNE MEADOWS LLC

GRAPEVINE ROAD

ABBOTT WASH

FUTURE SHARED USE PATH

SHARED USE PATH STATIONING

100' ABBOTT WASH EASEMENT

12' ACCESS ROAD

12' MAINTENANCE ROAD

28.50' CHANNEL

5' PERSONAL ACCESS PATH

15' CHANNEL ACCESS RAMP

GRAVEL ACCESS: CONSTRUCT SAME AS MAINTENANCE ROAD

Q_{100} = 3,670 CFS

MATCHLINE STA: 52+50.00 FOR CONTINUATION SEE SHEET 11

MATCHLINE STA: 58+50.00 FOR CONTINUATION SEE SHEET 13

3 Delete Access Road Moved Access Closer To Mesq. Blvd.

Moved Fence

Moved Gate Access Closer To Mesq. Blvd. (See Sheet 11)

As-Built Fence Location

Moved Exp. Joint to STA 54+73 (See Attached Detail)

Moved Exp. Joint

Fixed Slip Slab

2 Added 2" Exp. Joint @ Toe of Ramp (See Attached Detail)

FENCE ANGLE POINT STA: 52+91.30 OFFSET: 45.61'(L)

FENCE ANGLE POINT STA: 53+33.94 OFFSET: 32.25'(L)

FENCE ANGLE POINT STA: 52+87.12 OFFSET: 32.25'(L)

FENCE ANGLE POINT STA: 52+70 OFFSET: 14.67' (R)

FENCE ANGLE POINT STA: 52+76 OFFSET: 21.08' (R)

ANGLE POINT STA: 52+76 OFFSET: 36.08' (R)

FENCE ANGLE POINT STA: 53+73 OFFSET: 21.08'(R)

FENCE ANGLE POINT STA: 56+75 OFFSET: 21.08'(R)

ANGLE POINT STA: 57+36.23 OFFSET: 20.25'(R)

ANGLE POINT STA: 57+36.23 OFFSET: 36.25'(R)

FENCE ANGLE POINT STA: 56+75 OFFSET: 37.08'(R)

36" ø RCP, CLASS III L=25'± CEN. S=6.6%

RIM=1599.56 (6" ABOVE GROUND) INV IN=1593.55 INV OUT=1592.50

EXISTING INV=1593.10

48" RCP, CLASS III S=9.6%

RIM=1598.80± (6" ABOVE GROUND) INV IN=1592.60± INV OUT=1592.00±

EXISTING INV=1592.57

REMOVE EXISTING HEADWALL

N34°55'28"E

STA: 54+46± INV=1590.85±

STA: 54+34± INV=1590.85±

STA: 55+00

RAMP WALL WITH FLOOR TIE TO CHANNEL FLOOR SEE DETAIL

N01°05'11"W 1930.82' PT TO PC

EXTENT OF RAMP WALL TIED TO CHANNEL FLOOR

SLOPE TOP OF WALL TO FLOOR STA: 56+35 TO 55+40

CHANNEL WALL

END CHANNEL ACCESS STA: 56+35± (8.5' WALL)

RAMP WALL NOT TIED TO CHANNEL FLOOR, SEE WALL DETAIL WITH 5' TOE AND NO FLOOR BEYOND TOE

ACCESS RAMP WALL STA: 55+00 TO 56+35± SEE DETAILS

GRADE BREAK

R=15' BOTH SIDES

1599.45± TBC

1599.16 PC

78.00'±

CENTER OF DRIVE STA 57+10± (ABBOTT WASH ALIGNMENT) OFFSET: 83.20'(R)

NOTE: CARRY LONGITUDINAL FOOTING STEEL THROUGH STEPS, TYPICAL FOR RAMP WALLS

BH-8/53+66.43/5.14' RT

BH-9/53+05.43/5.78' RT

BH-7/54+06.40/9.91' RT

BH-6/56+06.30/9.62' RT

BH-5/57+06.26/6.90' RT

GRADING QUANTITIES

STA: 52+50–58+50

CHANNEL EXCAVATION = 8,091 C.Y.
BACKFILL = 6,153 C.Y.
NET CUT (OR FILL) = 1,938 NET CUT

*Channel Excavation, typical for Bedding Conditions shown, includes additional cut where depicted. Backfill accounts for fill behind Channel Walls, and does not include Imported Base Materials. Quantities do not account for shrinkage or subsidence.

REVISIONS			
NO	DESCRIPTION	DATE	BY
1	As-Built Fence Location	6-2005	W.N.
2	As-Built Expansion Joint	6-2005	W.N.
3	As-Built (Misc.)	6-2005	W.N.

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BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS–LAND SURVEYORS–LAND PLANNERS

P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586-9592

561 W MESQUITE BLVD. STE 4
MESQUITE, NEVADA 89027
(702) 346-5101

B8

ABBOTT WASH CONVEYANCE PLAN AND PROFILE 10

FOR

THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA

LEGEND

- SD — = NEW CPP STORM DRAIN WITH SIZE SHOWN
- SD — = EXISTING CPP STORM DRAIN WITH SIZE SHOWN
- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING FLOWLINE IN CHANNEL
- = EXISTING GRADE ℄ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- = ABBOTT WASH EASEMENT
- = EXISTING FENCE, FENCE TYPE VARIES
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q_{100}=HGL)
- = NEW CHAIN LINK FENCE AS NOTED ON PLANS
- = NEW POST AND CABLE RAILING AS NOTED ON PLANS.
- = EXISTING FEATURES OR OTHER AS NOTED ON PLANS
- = ESTIMATED EXCAVATION
- = As-Built Information

3 = CONSTRUCTION NOTE

℄ = PROPERTY LINE

A/23 = CROSS SECTION

FL OF BOX 1547.00 = NEW SPOT ELEVATION

FL OF BOX 1547.00 = EXISTING SPOT ELEVATION

BH-17/8+42.53/7.34' RT = (TEST/BORE LOCATION±/STA:±/OFFSET±) TEST/BORE LOCATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING

SM / CL = SOIL CLASSIFICATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING

E = EMERGENCY ACCESS LADDER AND GATE LOCATION

= MAINTENANCE ROAD/ACCESS PATH

= CHANNEL WALL FOOTING/FLOOR

= CUT-OFF WALL

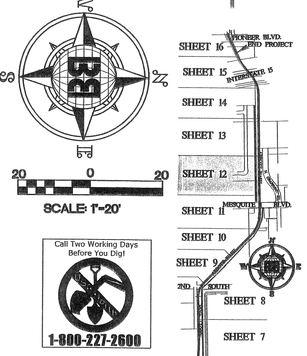
NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

DISCLAIMER:

THE OVERALL GRADING, DRAINAGE SWALES AND OTHER DRAINAGE SYSTEMS DEPICTED ON THIS PLAN ARE SHOWN AS A REPRESENTATION OF MINIMUM DRAINAGE REQUIREMENTS. HOWEVER, IT IS TO BE UNDERSTOOD THAT EROSION MAY AND MOST LIKELY WILL OCCUR ON CUT SLOPES, FILL SLOPES, MINOR DRAINAGE SWALES DIRECTED AT DOWN SLOPES AND/OR RETAINING WALLS, AND MINOR DRAINAGE SWALES DIRECTED TOWARD MORE MAJOR DRAINAGE FACILITIES (I.E.; STREETS, CURBS & GUTTER, STORM DRAIN). IT SHOULD ALSO BE UNDERSTOOD THAT THE DEVELOPER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SOME FORM OF EROSION PROTECTION FOR THE AREAS NOTED ABOVE.

SCALE: 1"=20'

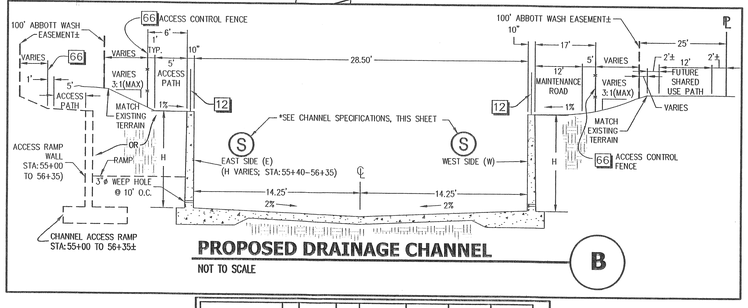
Call Two Working Days Before You Dig!
1-800-227-2600



KEY MAP

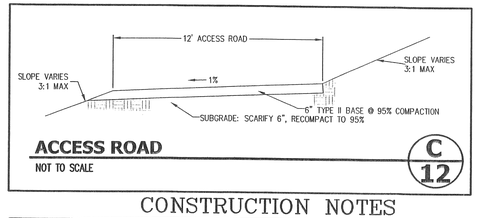
PROPOSED DRAINAGE CHANNEL

NOT TO SCALE — B



ACCESS ROAD

NOT TO SCALE — C 12



CONSTRUCTION NOTES

8 4" EXPANSION JOINT AND CUTOFF WALL, SEE DETAIL E/20

9 INSTALL MANHOLE STEPS PER LADDER STEP DETAIL L/20. PLACE BOTTOM STEP 1' VERTICALLY ABOVE THE CHANNEL FLOOR. PAINT YELLOW STRIPE, 3" WIDE, ON EITHER SIDE OF LADDER. INSTALL 30" WIDE OPENING IN POST & CABLE RAILING AT LADDER LOCATIONS. SEE DETAIL A/23

10 INSTALL 15' WIDE DOUBLE SWING GATE, IN PERIMETER FENCING AT ACCESS RAMP LOCATIONS, PER C.C. AREA STANDARD DRAWING NO. 253. H=6' (USD PWC).

12 INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL SEE DETAIL A/23

16 INSTALL PIPE THROUGH CHANNEL WALL PER DETAIL J/21

31 PROVIDE AND MOUNT WARNING SIGN ON 6' CHAIN LINK FENCE/GATE SEE DETAIL A/28 FOR SIGN INFORMATION.

39 INSTALL 12' COMMERCIAL DRIVEWAY, OPTION A PER CC AREA STD DWG NO. 224

55 INSTALL TYPE III MANHOLE PER CLARK CO. AREA STD. DWG. NO. 406. REFERENCE TYPE 1A MANHOLE (CLARK COUNTY AREA STANDARD DWG NO. 404) FOR PRECAST CONE SECTION & 8" FLAT SLAB PLACEMENT ON TOP OF TYPE III MANHOLE BASE (USD PWC).

65 INSTALL 6' WIDE SINGLE GATE WITH TOP LATCH PER C.C. AREA STD DWG NO 253 (USD PWC).

66 INSTALL CHAIN LINK FENCE H=6' PER C.C. AREA STD DWG NO 252 (USD PWC).

67 INSTALL CHAIN LINK FENCE, H=6', MOUNT FENCE ON TOP OF CONCRETE CHANNEL WALL/HEADWALL SEE DETAIL J/20

CHANNEL SPECIFICATIONS

S

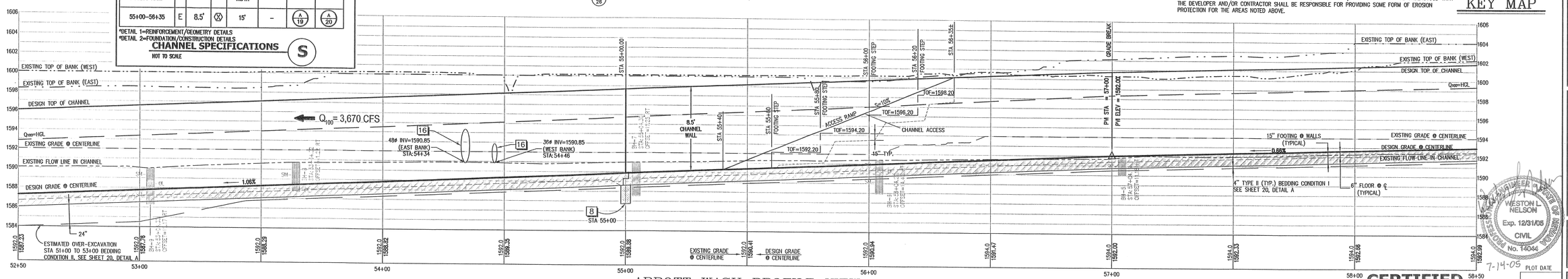
NOT TO SCALE

STA:	SIDE	H	TYPE	CHANNEL WIDTH	FLOOR CROSS SLOPE	*DETAIL 1	*DETAIL 2
51+75–55+00	E	8.5'	⊗	28.50'	2%	A/19	A/20
55+00–55+40	E	0'	⊗	28.5'	2%	SEE PLAN VIEW	B/23
*55+40–66+90	E	8.5'	⊗	28.50'	2%	A/19	A/20
51+75–66+90	W	8.5'	⊗	28.50'	2%	A/19	A/20
ACCESS RAMP				WIDTH			
55+00–56+35	E	8.5'	⊗	15'	–	A/19	A/20

*DETAIL 1=REINFORCEMENT/GEOMETRY DETAILS
*DETAIL 2=FOUNDATION/CONSTRUCTION DETAILS

ABBOTT WASH PROFILE VIEW

STA: 16+50.00 TO 22+50.00
SCALE HOR: 1"=20'
SCALE VER: 1"=5'



PLOT DATE: 7-14-05

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

SCALE:	DRAWN BY:	CHECKED BY:
1"= 20'	BC	WN

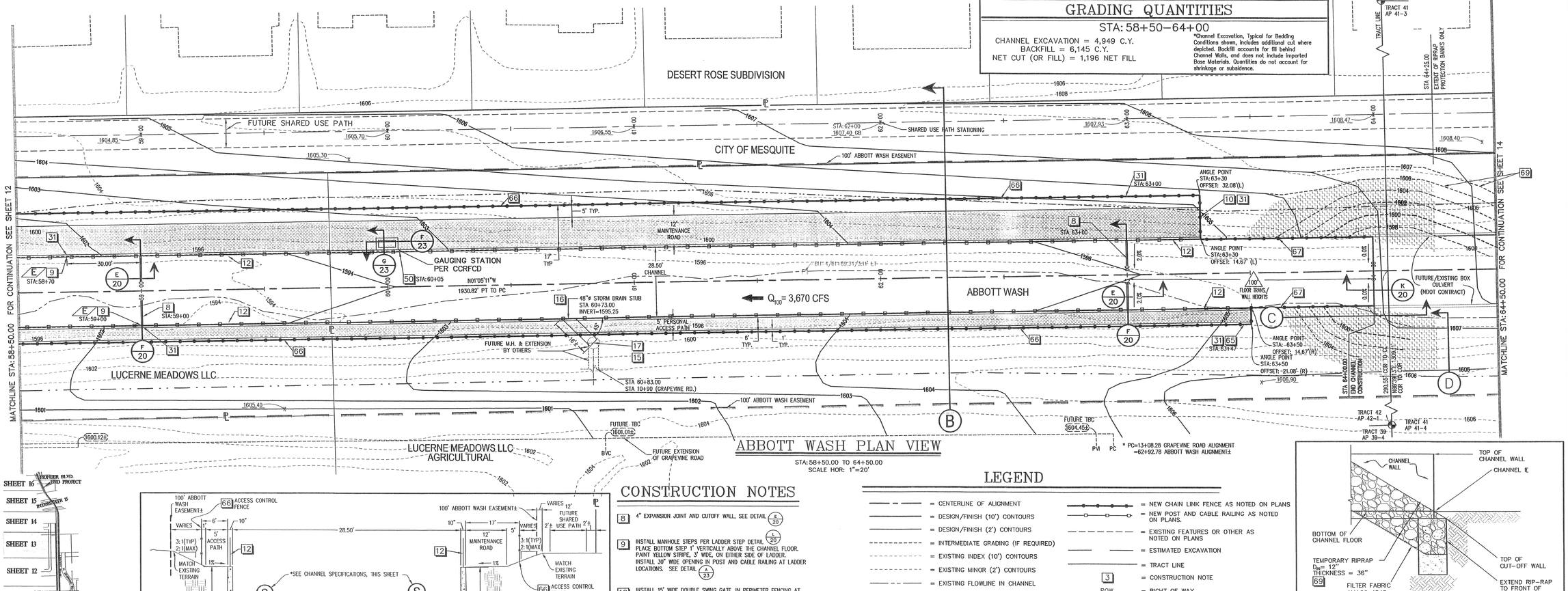
PROJECT NO:	DATE:	SHEET NO:
1029-190-05	NOV 2003	12 OF 26

GRADING QUANTITIES

STA: 58+50–64+00

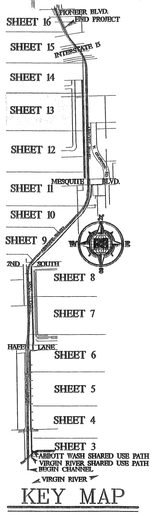
CHANNEL EXCAVATION = 4,949 C.Y.
BACKFILL = 6,145 C.Y.
NET CUT (OR FILL) = 1,196 NET FILL

*Channel Excavation, Typical for Bedding Conditions shown, includes additional cut where depicted. Backfill accounts for fill behind Channel Walls, and does not include Imported Base Materials. Quantities do not account for shrinkage or subsidence.

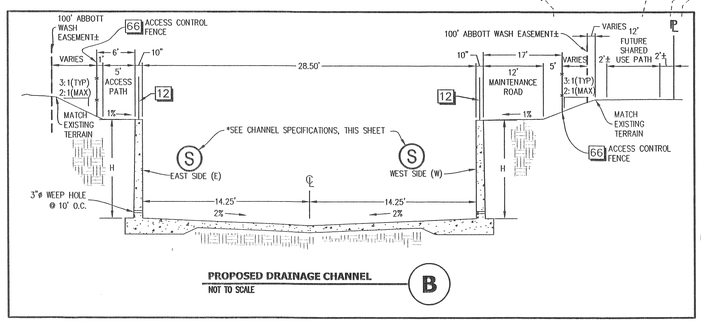


ABBOTT WASH PLAN VIEW

STA: 58+50.00 TO 64+50.00
SCALE HOR: 1"=20'



KEY MAP



PROPOSED DRAINAGE CHANNEL
NOT TO SCALE — B

STA:	SIDE	H	TYPE	CHANNEL WIDTH	FLOOR CROSS SLOPE	*DETAIL 1	*DETAIL 2
55+40–63+00	E	8.5'	ⓧ	28.50'	2%	A/19	A/20
51+75–63+00	W	8.5'	ⓧ	28.50'	2%	A/19	A/20
63+00–64+00	E	10'	ⓧ	28.50'	2%	A/19	A/20
63+00–64+00	W	10'	ⓧ	28.50'	2%	A/19	A/20

*DETAIL 1=REINFORCEMENT/GEOMETRY DETAILS
*DETAIL 2=FOUNDATION/CONSTRUCTION DETAILS

CHANNEL SPECIFICATIONS — S
NOT TO SCALE

ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

DISCLAIMER:
THE OVERALL GRADING, DRAINAGE SWALES AND OTHER DRAINAGE SYSTEMS DEPICTED ON THIS PLAN ARE SHOWN AS A REPRESENTATION OF MINIMUM DRAINAGE REQUIREMENTS. HOWEVER, IT IS TO BE UNDERSTOOD THAT EROSION MAY AND MOST LIKELY WILL OCCUR ON CUT SLOPES, FILL SLOPES, MINOR DRAINAGE SWALES DIRECTED AT DOWN SLOPES AND/OR RETAINING WALLS, AND MINOR DRAINAGE SWALES DIRECTED TOWARD MORE MAJOR DRAINAGE FACILITIES (I.E.: STREETS, CURBS & GUTTER, STORM DRAIN). IT SHOULD ALSO BE UNDERSTOOD THAT THE DEVELOPER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SOME FORM OF EROSION PROTECTION FOR THE AREAS NOTED ABOVE.

CONSTRUCTION NOTES

8 4" EXPANSION JOINT AND CUTOFF WALL, SEE DETAIL (E/20)

9 INSTALL MANHOLE STEPS PER LADDER STEP DETAIL (L/20). PLACE BOTTOM STEP 1' VERTICALLY ABOVE THE CHANNEL FLOOR. PAINT YELLOW STRIPE, 3" WIDE, ON EITHER SIDE OF LADDER. INSTALL 30" WIDE OPENING IN POST AND CABLE RAILING AT LADDER LOCATIONS. SEE DETAIL (A/23)

10 INSTALL 15' WIDE DOUBLE SWING GATE, IN PERIMETER FENCING AT ACCESS RAMP LOCATIONS, PER C.C. AREA STANDARD DRAWING NO. 253. H=6' (USD PWC).

12 INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL SEE DETAIL (A/23)

15 STUB NEW 60"ø RCP CLASS III @ S=0.50% FOR FUTURE DRAINAGE L=16' 48" Typo, 48" called out Above, 48" Installed?

16 INSTALL PIPE THROUGH CHANNEL WALL PER DETAIL (I/21)

17 CAP NEW PIPE PER DETAIL (A/21)

31 PROVIDE AND MOUNT WARNING SIGN ON 6' CHAIN LINK FENCE/GATE SEE DETAIL (A/26) FOR SIGN INFORMATION.

50 PROVIDE PAINTED DEPTH GAUGE ON CHANNEL WALL, SEE DETAIL (I/23)

65 INSTALL 6' WIDE SINGLE GATE WITH TOP LATCH PER C.C. AREA STD DWG NO 253 (USD PWC).

66 INSTALL CHAIN LINK FENCE H=6' PER C.C. AREA STD DWG NO 252 (USD PWC).

67 INSTALL CHAIN LINK FENCE, H=6', MOUNT FENCE ON TOP OF CONCRETE CHANNEL WALL/HEADWALL. SEE DETAIL (J/20).

69 FOR CONDITION WHEN CONTRACTOR COMPLETES CHANNEL IMPROVEMENTS UP TO STA: 64+00 PRIOR TO NDOT CONTRACT, INTERMEDIATE GRADING AND RIPRAP PROTECTION AS NOTED ON PLANS IS REQUIRED. CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES WITH NDOT CONTRACTOR. RIPRAP PROTECTION IS AN ADDITIVE/DEDUCTIVE BID ITEM. SEE SECTION 610 OF TECHNICAL SPECIFICATIONS.

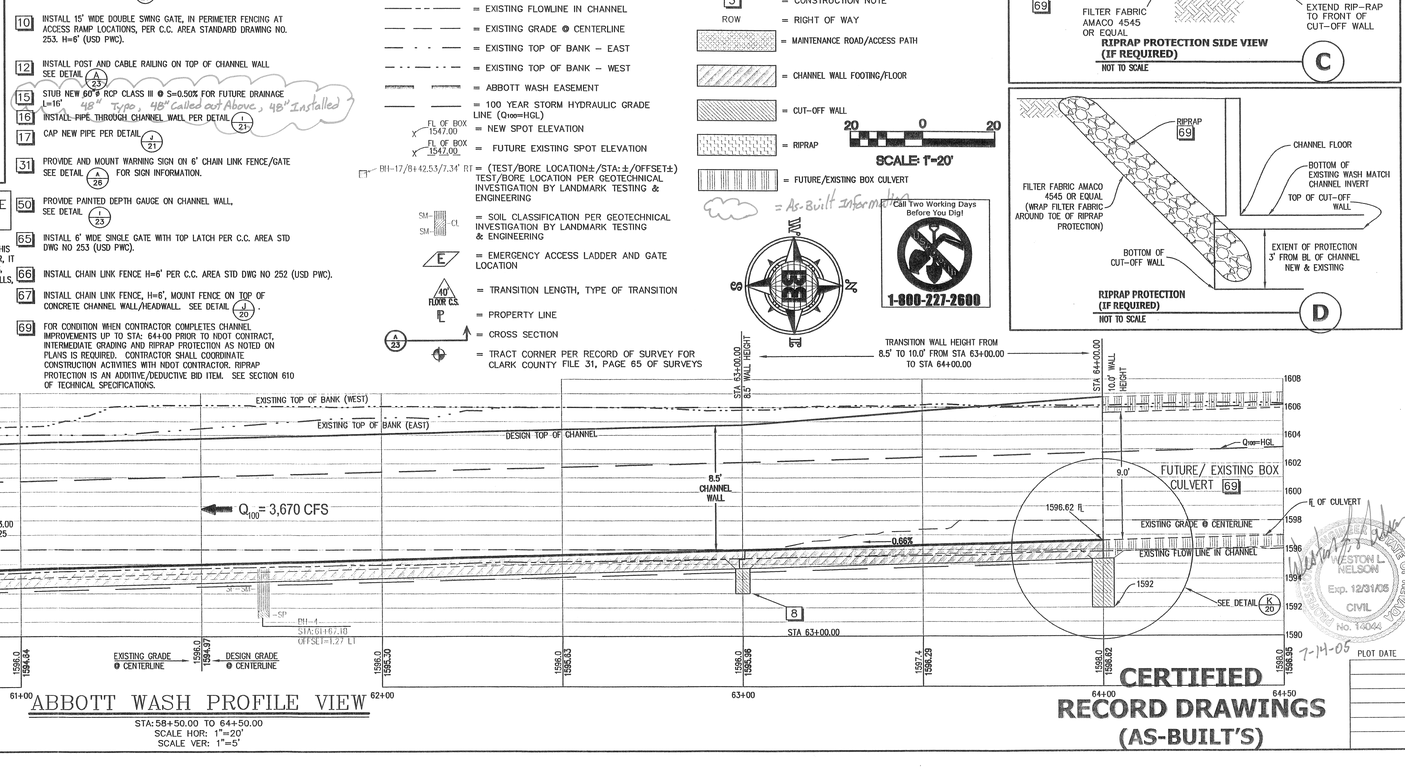
LEGEND

- = CENTERLINE OF ALIGNMENT
- = DESIGN/FINISH (10') CONTOURS
- = DESIGN/FINISH (2') CONTOURS
- = INTERMEDIATE GRADING (IF REQUIRED)
- = EXISTING INDEX (10') CONTOURS
- = EXISTING MINOR (2') CONTOURS
- = EXISTING FLOWLINE IN CHANNEL
- = EXISTING GRADE @ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- = ABBOTT WASH EASEMENT
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q_{100}=HGL)
- = NEW SPOT ELEVATION
- = FUTURE EXISTING SPOT ELEVATION
- = (TEST/BORE LOCATION±/STA: ±/OFFSET±) TEST/BORE LOCATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- = SOIL CLASSIFICATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- = EMERGENCY ACCESS LADDER AND GATE LOCATION
- = TRANSITION LENGTH, TYPE OF TRANSITION
- = PROPERTY LINE
- = CROSS SECTION
- = TRACT CORNER PER RECORD OF SURVEY FOR CLARK COUNTY FILE 31, PAGE 65 OF SURVEYS
- = NEW CHAIN LINK FENCE AS NOTED ON PLANS
- = NEW POST AND CABLE RAILING AS NOTED ON PLANS.
- = EXISTING FEATURES OR OTHER AS NOTED ON PLANS
- = ESTIMATED EXCAVATION
- = TRACT LINE
- = CONSTRUCTION NOTE
- = RIGHT OF WAY
- = MAINTENANCE ROAD/ACCESS PATH
- = CHANNEL WALL FOOTING/FLOOR
- = CUT-OFF WALL
- = RIPRAP
- = FUTURE/EXISTING BOX CULVERT

= As-Built information

SCALE: 1"=20'

Call Two Working Days Before You Dig!
1-800-227-2600



ABBOTT WASH PROFILE VIEW

STA: 58+50.00 TO 64+50.00
SCALE HOR: 1"=20'
SCALE VER: 1"=5'

RIPRAP PROTECTION SIDE VIEW (IF REQUIRED)
NOT TO SCALE — C

RIPRAP PROTECTION (IF REQUIRED)
NOT TO SCALE — D

REVISIONS

NO	DESCRIPTION	DATE	BY

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LAND PLANNERS

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(702) 346-5101

ABBOTT WASH CONVEYANCE PLAN AND PROFILE 11

FOR

THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA

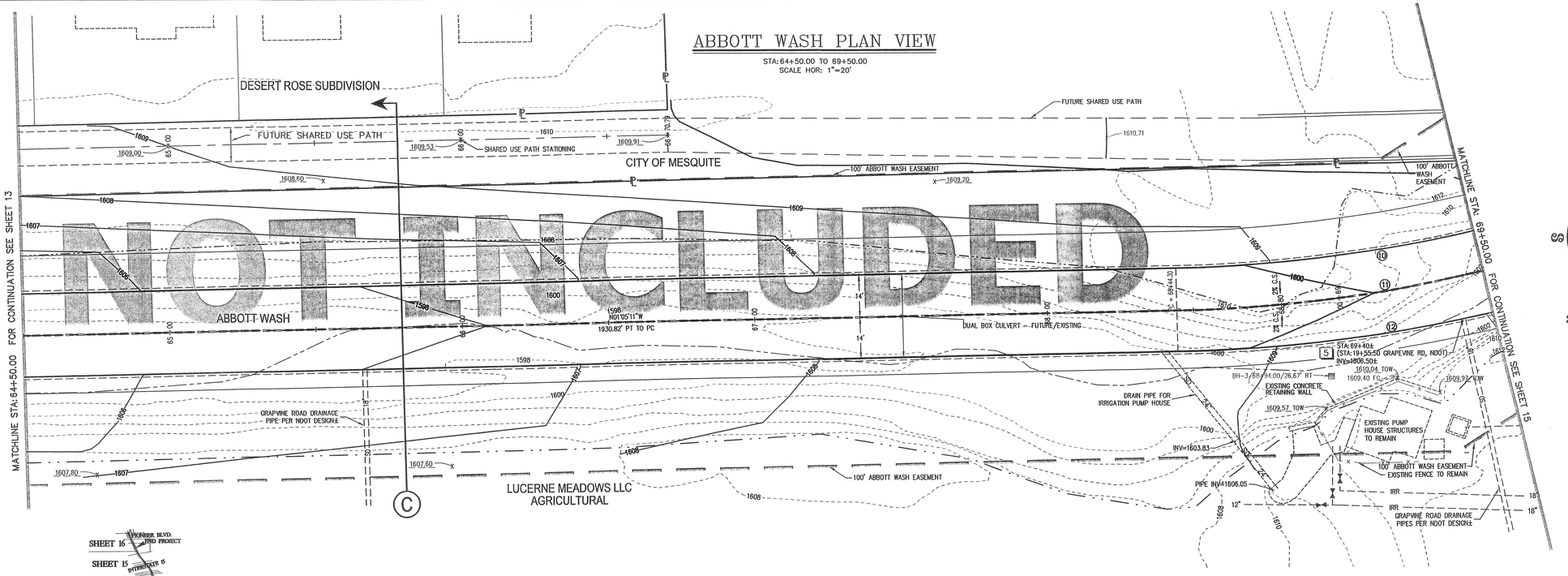


CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

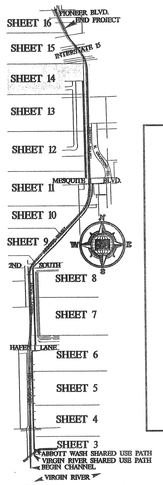
SCALE:	DRAWN BY:	CHECKED BY:
1"=20'	BC	WN
PROJECT NO:	DATE:	SHEET NO:
1029-190-05	NOV 2003	13 OF 26

ABBOTT WASH PLAN VIEW

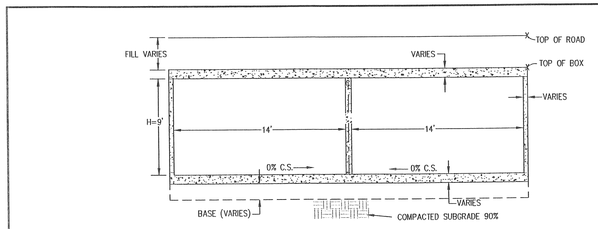
STA: 64+50.00 TO 69+50.00
SCALE HOR: 1"=20'



Call Two Working Days Before You Dig!
1-800-227-2600



KEY MAP



FUTURE BOX CULVERT
NOT INCLUDED (NDOT CONTRACT)
NOT TO SCALE

C

CURVE TABLE

CURVE	RADIUS	LENGTH	TANGENT	DELTA
⑩	485.75'	317.42'	164.61'	37°26'26"
⑪	500.00'	326.73'	169.44'	37°26'26"
⑫	514.25'	336.04'	174.27'	37°26'26"

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

DISCLAIMER:

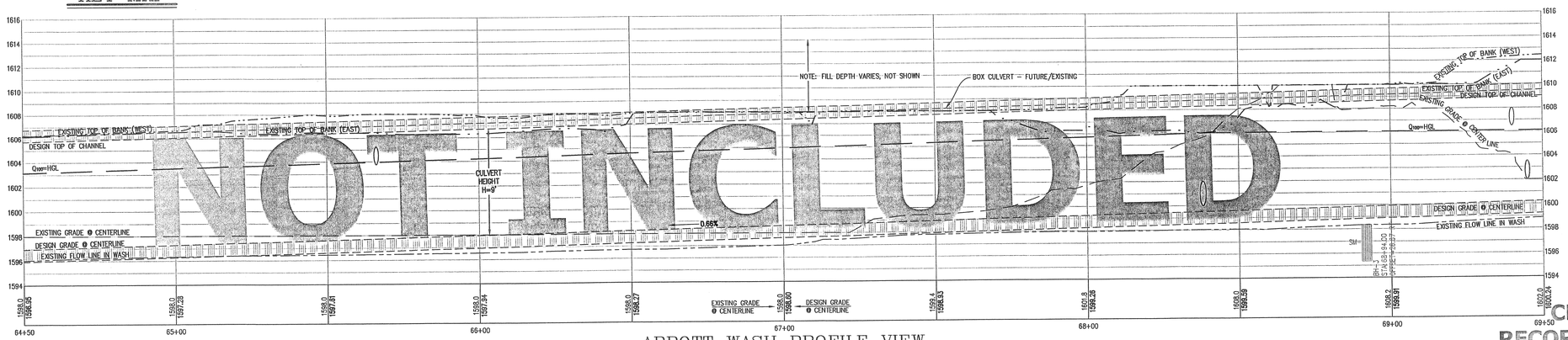
THE OVERALL GRADING, DRAINAGE SWALES AND OTHER DRAINAGE SYSTEMS DEPICTED ON THIS PLAN ARE SHOWN AS A REPRESENTATION OF MINIMUM DRAINAGE REQUIREMENTS. HOWEVER, IT IS TO BE UNDERSTOOD THAT EROSION MAY AND MOST LIKELY WILL OCCUR ON CUT SLOPES, FILL SLOPES, MINOR DRAINAGE SWALES DIRECTED AT DOWN SLOPES AND/OR RETAINING WALLS, AND MINOR DRAINAGE SWALES DIRECTED TOWARD MORE MAJOR DRAINAGE FACILITIES (I.E.: STREETS, CURBS & GUTTER, STORM DRAIN). IT SHOULD ALSO BE UNDERSTOOD THAT THE DEVELOPER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SOME FORM OF EROSION PROTECTION FOR THE AREAS NOTED ABOVE.

LEGEND

- SD —— = NEW STORM DRAIN
- — SD — — = EXISTING STORM DRAIN
- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING FLOWLINE IN CHANNEL
- = EXISTING GRADE ℄ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- = ABBOTT WASH EASEMENT
- x —— = EXISTING FENCE, FENCE TYPE VARIES
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q100=HGL)
- = FUTURE/EXISTING FACILITIES
- [3] = CONSTRUCTION NOTE
- ℄ = PROPERTY LINE
- A/28 = CROSS SECTION
- FL OF BOX 1547.00 = NEW SPOT ELEVATION
- FL OF BOX 1547.00 = EXISTING SPOT ELEVATION
- BH-17/8+42.53/7.34' RT = (TEST/BORE LOCATION±/STA:±/OFFSET±) TEST/BORE LOCATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- SM—CL / SM = SOIL CLASSIFICATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- ③ = CURVE NUMBER
- = FUTURE/EXISTING BOX CULVERT

ABBOTT WASH PROFILE VIEW

STA: 64+50.00 TO 69+50.00
SCALE HOR: 1"=20'
SCALE VER: 1"=5'



NOT INCLUDED

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

PLOT DATE

REVISIONS NO	DESCRIPTION	DATE	BY

THE INFORMATION CONTAINED ON THE DRAWING IS FOR EXCLUSIVE USE ON THIS PROJECT ONLY AND SHALL NOT BE USED BY ANY PERSON OR ENTITY FOR ANY OTHER PROJECT WITHOUT THE EXPRESSED WRITTEN CONSENT OF BULLOCH BROTHERS ENGINEERING, PC. ANY UNAUTHORIZED USE SHALL BE AT THE USERS SOLE RISK AND WITHOUT LIABILITY TO BULLOCH BROTHERS ENGINEERING, PC.

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(702) 346-5101

B8

ABBOTT WASH CONVEYANCE
PLAN AND PROFILE 12
FOR
THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA

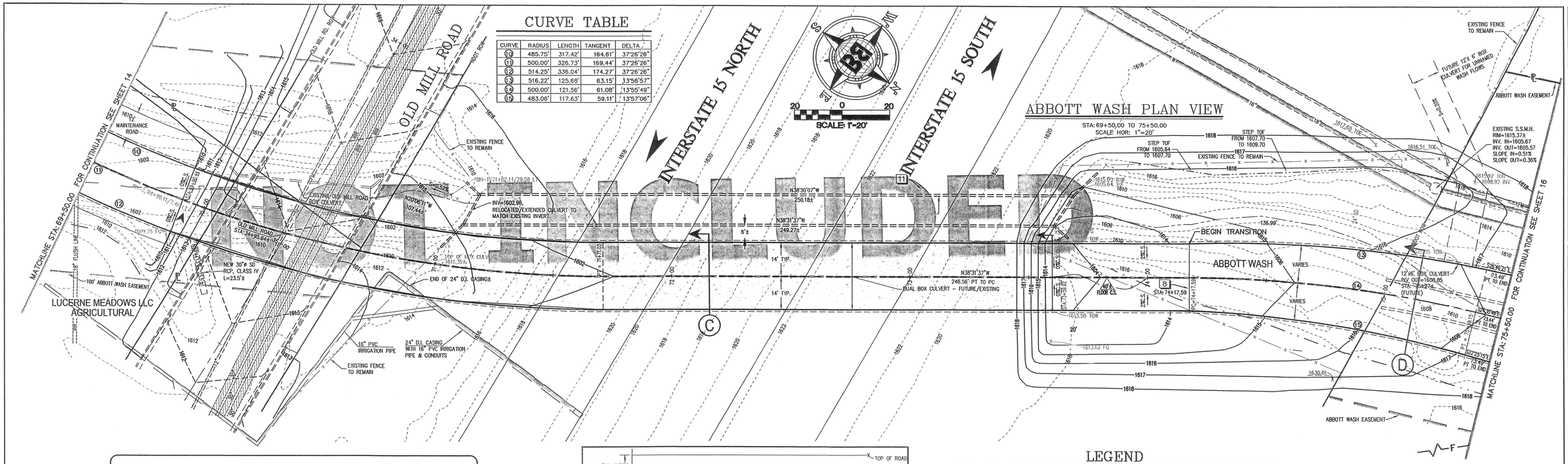
WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
12-11-03

WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
7-14-05

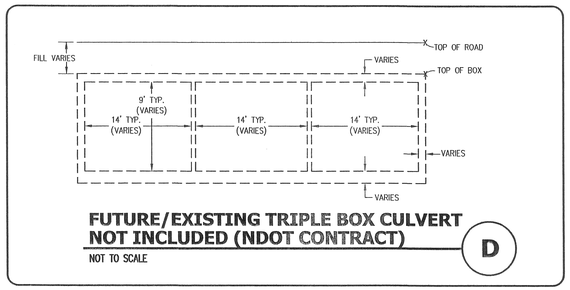
SCALE:	DRAWN BY:	CHECKED BY:
AS NOTED	JRH	WN
PROJECT NO:	DATE:	SHEET NO:
1029-190-05	NOV 2003	14 OF 26

CURVE TABLE

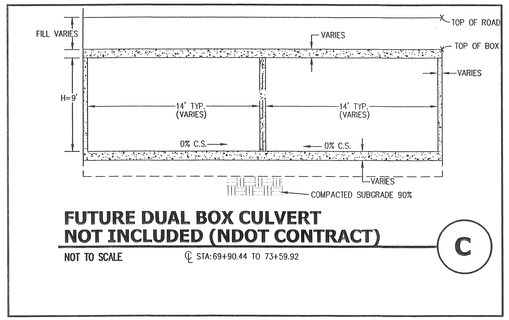
CURVE	RADIUS	LENGTH	TANGENT	DELTA
10	485.75'	317.42'	164.61'	37°26'26"
11	500.00'	326.73'	169.44'	37°26'26"
12	514.25'	336.04'	174.27'	37°26'26"
13	516.22'	125.68'	63.15'	13°56'57"
14	500.00'	121.56'	61.08'	13°55'49"
15	483.06'	117.63'	59.11'	13°57'06"



NOT INCLUDED



FUTURE/EXISTING TRIPLE BOX CULVERT
NOT INCLUDED (NDOT CONTRACT) — **D**
NOT TO SCALE



FUTURE DUAL BOX CULVERT
NOT INCLUDED (NDOT CONTRACT) — **C**
NOT TO SCALE ℄ STA: 69+90.44 TO 73+59.92

LEGEND

- IRR = EXISTING IRRIGATION LINE WITH SIZE SHOWN
- SS = EXISTING PVC SEWER LINE WITH SIZE SHOWN
- SD = EXISTING CPP STORM DRAIN WITH SIZE SHOWN
- FM = EXISTING FORCE MAIN SEWER LINE
- W = EXISTING WATER LINE WITH SIZE SHOWN
- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING FLOWLINE IN CHANNEL
- = EXISTING GRADE ℄ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- F = APPROXIMATE LIMITS OF FILL AREA REQUIRED FOR GRAPEVINE ROAD OVERPASS
- = ABBOTT WASH EASEMENT
- x = EXISTING FENCE, FENCE TYPE VARIES
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q_{100}=HGL)
- = FUTURE/EXISTING FACILITIES

- = EXISTING MANHOLE
- = EXISTING ASPHALT
- 3 = CONSTRUCTION NOTE
- ROW = RIGHT OF WAY
- ℄ = PROPERTY LINE
- B = CROSS SECTION
- FL OF BOX 1547.00 = NEW SPOT ELEVATION
- FL OF BOX 1547.00 = EXISTING SPOT ELEVATION
- BH-17/B+42.53/7.34' RT = (TEST/BORE LOCATION±/STA:±/OFFSET±) TEST/BORE LOCATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- SM–CL = SOIL CLASSIFICATION PER GEOTECHNICAL INVESTIGATION BY LANDMARK TESTING & ENGINEERING
- ③ = CURVE NUMBER
- = FUTURE EXISTING BOX CULVERT

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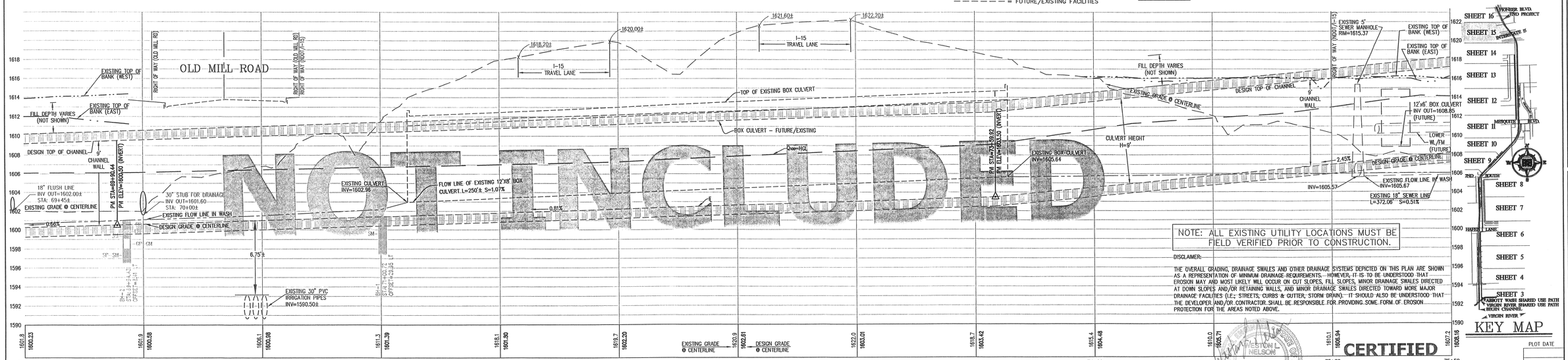

NOT INCLUDED

ABBOTT WASH PROFILE VIEW

STA: 69+50.00 TO 75+50.00
SCALE HOR: 1"=20'
SCALE VER: 1"=5'

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

DISCLAIMER:
THE OVERALL GRADING, DRAINAGE SWALES AND OTHER DRAINAGE SYSTEMS DEPICTED ON THIS PLAN ARE SHOWN AS A REPRESENTATION OF MINIMUM DRAINAGE REQUIREMENTS. HOWEVER, IT IS TO BE UNDERSTOOD THAT EROSION MAY AND MOST LIKELY WILL OCCUR ON CUT SLOPES, FILL SLOPES, MINOR DRAINAGE SWALES DIRECTED AT DOWN SLOPES AND/OR RETAINING WALLS, AND MINOR DRAINAGE SWALES DIRECTED TOWARD MORE MAJOR DRAINAGE FACILITIES (I.E.; STREETS, CURBS & GUTTER, STORM DRAIN). IT SHOULD ALSO BE UNDERSTOOD THAT THE DEVELOPER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING SOME FORM OF EROSION PROTECTION FOR THE AREAS NOTED ABOVE.

KEY MAP

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

NO	DESCRIPTION	DATE	BY

REVISIONS

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LAND PLANNERS
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ABBOTT WASH CONVEYANCE
PLAN AND PROFILE 13
FOR
THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA

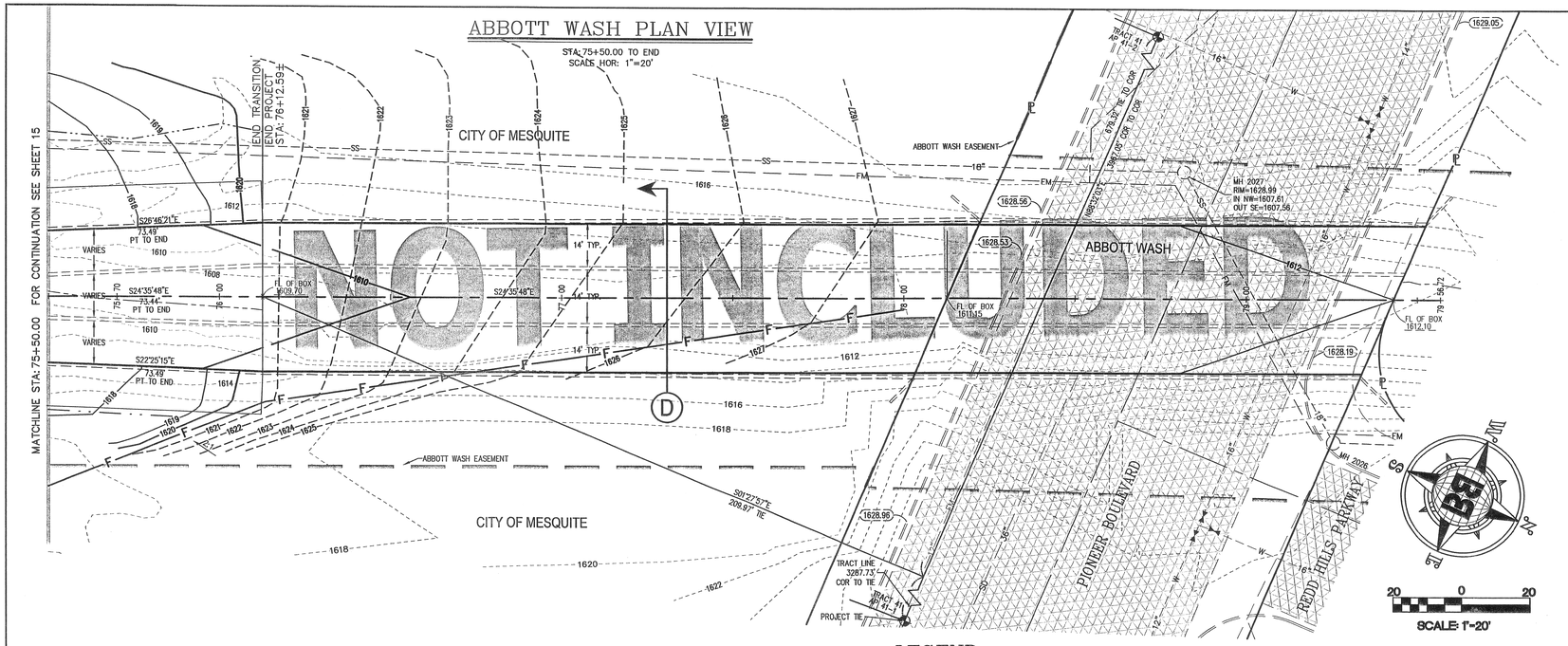
SCALE:	DRAWN BY:	CHECKED BY:
AS NOTED	JRH	WRS

PROJECT NO:	DATE:	SHEET NO:
1029-99-05	NOV 2003	15 OF 26

PLOT DATE

ABBOTT WASH PLAN VIEW

STA: 75+50.00 TO END
SCALE HOR: 1"=20'



LEGEND

- SS = EXISTING PVC SEWER LINE WITH SIZE SHOWN
- SD = EXISTING STORM DRAIN WITH SIZE SHOWN
- FM = EXISTING FORCE MAIN SEWER LINE
- E = EXISTING ELECTRICAL SERVICE
- W = EXISTING WATER LINE WITH SIZE SHOWN
- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING FLOWLINE IN CHANNEL
- = EXISTING GRADE @ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- F = APPROXIMATE LIMITS OF FILL AREA REQUIRED FOR GRAPEVINE ROAD OVERPASS
- = ABBOTT WASH EASEMENT
- = 100 YEAR STORM HYDRAULIC GRADE LINE (Q100=HGL)
- = EXISTING MANHOLE
- = EXISTING ASPHALT
- = TRACT LINE
- 3 = CONSTRUCTION NOTE
- ℄ = PROPERTY LINE
- D = CROSS SECTION
- = TRACT CORNER PER RECORD OF SURVEY FOR CLARK COUNTY FILE 31, PAGE 65 OF SURVEYS
- FL OF BOX 1547.00 = NEW SPOT ELEVATION
- FL OF BOX 1547.00 = EXISTING SPOT ELEVATION
- = FUTURE/EXISTING BOX CULVERT

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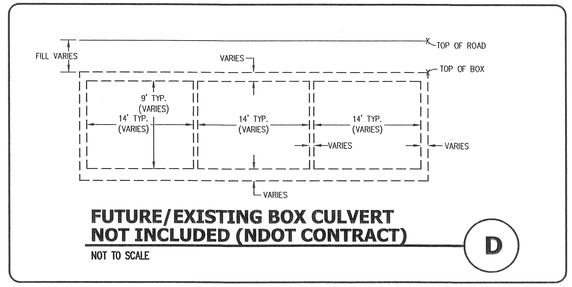

FUTURE/EXISTING BOX CULVERT NOT INCLUDED (NDOT CONTRACT) — D

NOT TO SCALE

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

DISCLAIMER:

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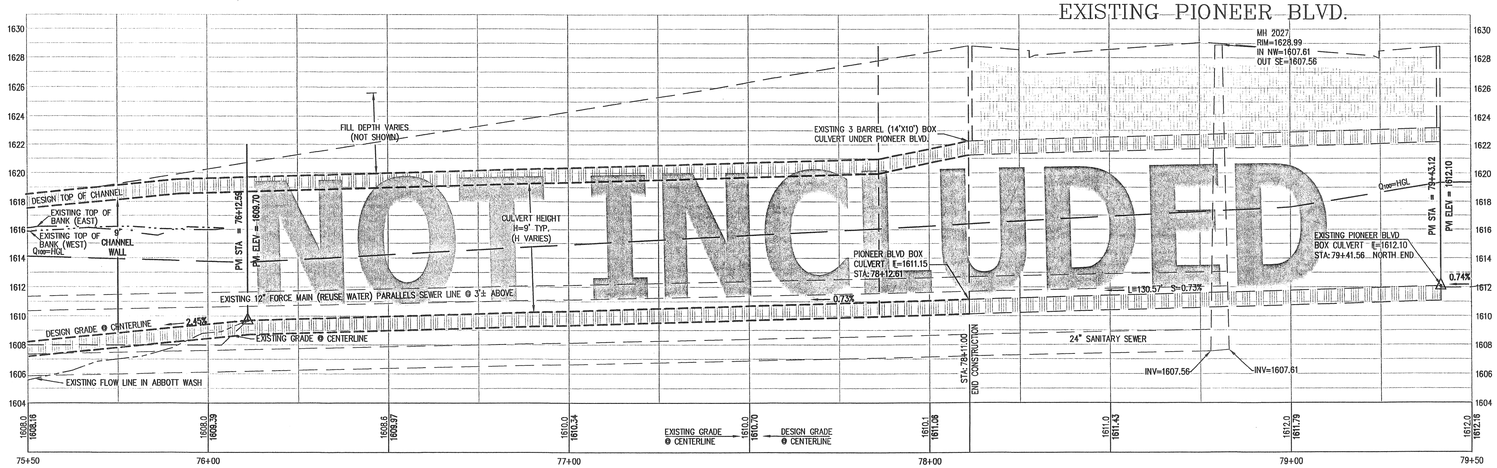
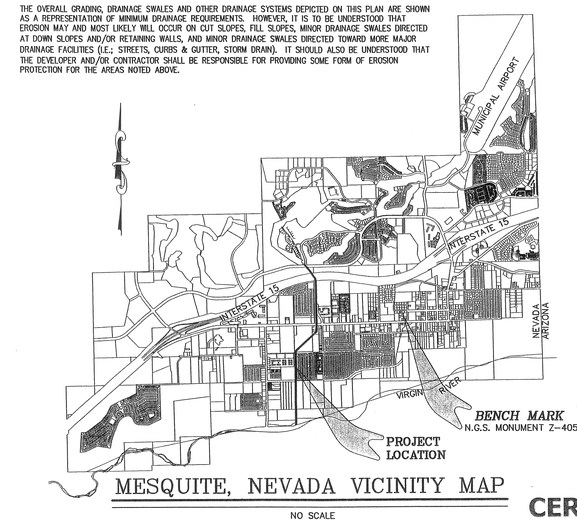
EXISTING PIONEER BLVD.



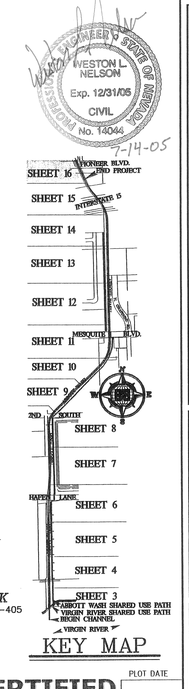
ABBOTT WASH PROFILE VIEW

STA: 75+50.00 TO END
SCALE HOR: 1"=20'
SCALE VER: 1"=5'



MESQUITE, NEVADA VICINITY MAP

NO SCALE
BENCH MARK BASED ON NGVD 1929, NGS MONUMENT Z-405
ELEV. = 1595.65
TOP OF STAINLESS STEEL ROD IN CASING SET BELOW GROUND AT SOUTHEAST CORNER OF LDS CHURCH PROPERTY, NORTH SIDE OF MESQUITE BOULEVARD, WEST SIDE OF TOWN WASH.



KEY MAP

NO	DESCRIPTION	DATE	BY

REVISIONS

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MESQUITE, NEVADA 89027
(702) 346-5101

WESTON L. NELSON — Exp. 12/31/05 — CIVIL — No. 14044 — 7-14-05

WESTON L. NELSON — Exp. 12/31/05 — CIVIL — No. 14044 — 12-11-03

ABBOTT WASH CONVEYANCE PLAN AND PROFILE 14

FOR

THE CITY OF MESQUITE

MESQUITE, CLARK CO., NEVADA

MESQUITE, NEVADA

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

PLOT DATE

SCALE:	DRAWN BY:	CHECKED BY:
NTS	JRH	W.N.

PROJECT NO:	DATE:	SHEET NO:
1029-190-05	NOV 2003	16 OF 26

LEGEND

- SS = NEW DUCTILE IRON SEWER LINE WITH SIZE SHOWN
- SS = EXISTING PVC SEWER LINE WITH SIZE SHOWN
- ES = NEW EFFLUENT SIPHON
- ES = EXISTING EFFLUENT SIPHON
- FM = EXISTING FORCE MAIN SEWER LINE
- E = EXISTING ELECTRICAL SERVICE
- W = EXISTING 3/4" WATER SERVICE
- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = EXISTING GRADE @ CENTERLINE
- = EXISTING FENCE, FENCE TYPE VARIES
- = NEW MANHOLE
- = EXISTING MANHOLE
- = BOX CULVERT
- = SHARED USE PATH PER DESIGN
- = TRACT LINE
- = PROPERTY LINE
- = CROSS SECTION
- = TRACT CORNER PER RECORD OF SURVEY FOR CLARK COUNTY FILE 31, PAGE 65 OF SURVEYS
- FL OF BOX 1547.00 = NEW SPOT ELEVATION
- FL OF BOX 1547.00 = EXISTING SPOT ELEVATION
- = As-Built Information

CONTRACTOR TO RELOCATE EXISTING UTILITIES

NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

DISCLAIMER:

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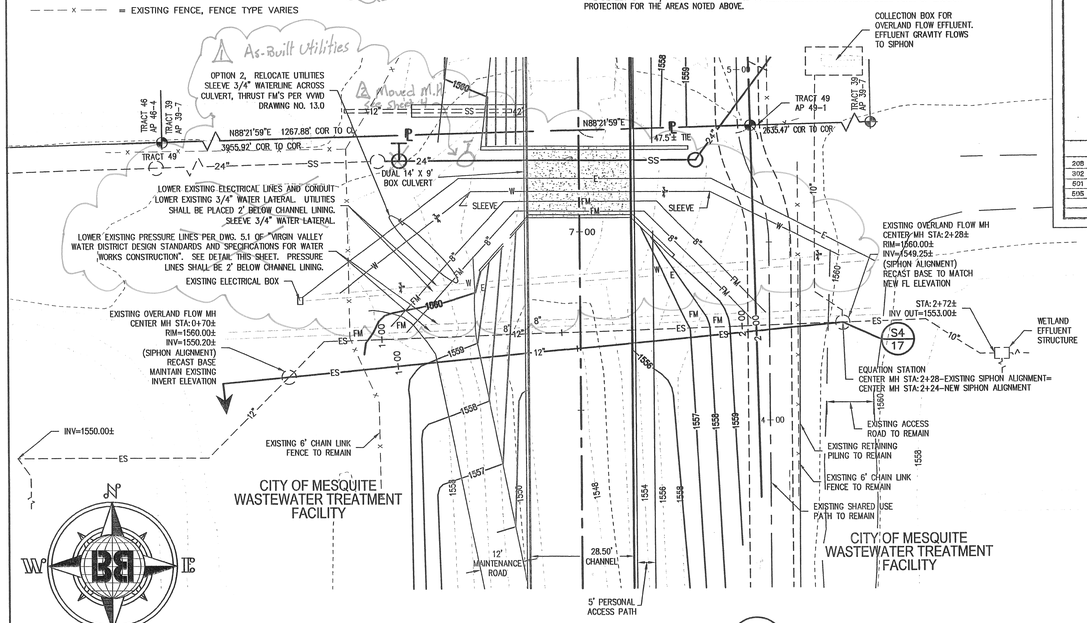
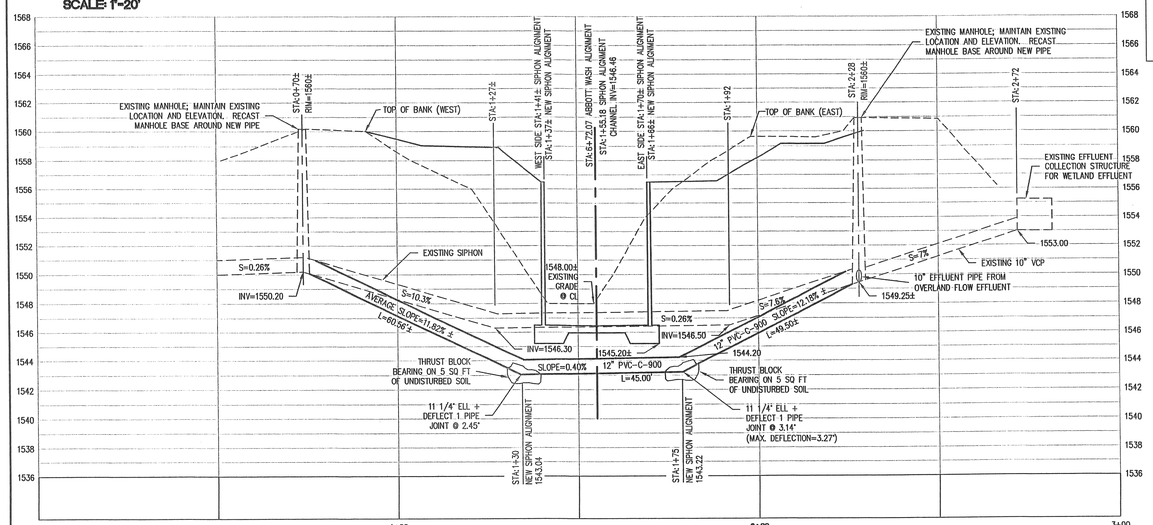


EFFLUENT SIPHON PLAN VIEW

NOT TO SCALE — STA:0+00.00 TO 2+00.00, SCALE HOR: 1"=20' — S4 / 17



EFFLUENT SIPHON PROFILE VIEW

NOT TO SCALE — STA:0+00.00 TO 3+00.00, SCALE HOR: 1"=20', SCALE VER: 1"=5' — S4 / 17

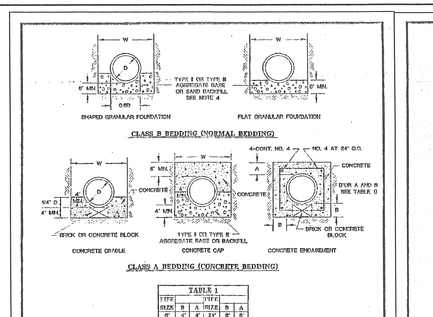


TABLE I					
PIPE SIZE	B	A	PIPE SIZE	B	A
6"	4"	4"	24"	8"	6"
8"	4"	4"	27"	8"	6"
10"	4"	4"	30"	8"	6"
12"	4"	4"	33"	8"	6"
15"	4"	4"	36"	8"	6"
18"	5"	5"	39"	8"	6"
21"	5"	6"	42"	10"	6"

D = OUTSIDE DIAMETER OF PIPE
W = OUTSIDE DIAMETER OF PIPE + 24" MAXIMUM

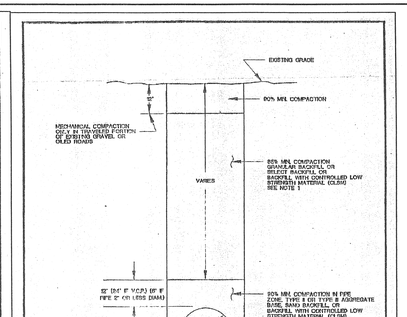
NOTES:
1. PIPE BEDDING TO BE COMPACTED TO AT LEAST 90% OF MAXIMUM DENSITY.
2. REQUIRED THICKNESS OF BEDDING MATERIAL TO BE CONSTRUCTED UNDER THE BARREL SUBGRADE TO BE EXCAVATED TO PROVIDE 3" CLEARANCE UNDER THE BELL.
3. OTHER BEDDING METHODS MAY BE ACCEPTED ON APPROVED.
4. CRUSHED ROCK MAY BE USED FOR PIPE BEDDING ONLY IF MATERIAL USE HAS BEEN SPECIFICALLY APPROVED BY THE GOVERNING AGENCY.

SPECIFICATION REFERENCE	
208	TRENCH EXCAVATION & BACKFILL
302	AGGREGATE BASE COURSES
501	CONCRETE
505	REINFORCEMENT STEEL

UNIFORM STANDARD DRAWINGS CLARK COUNTY AREA

PIPE TRENCH BEDDING METHODS

DATE 5-17-01 | DWG. NO. 505 | PAGE NO. 125



NOTES:
1. NO STONES OR LUMPS GREATER THAN 3" DIAMETER IN TRENCH 8" OR LESS IN WIDTH.
2. TRENCH WIDTH WIDENS, AND PIPE ZONE REQUIREMENTS FOR UTILITY INSTALLATIONS SHALL CONFORM TO THE RESPECTIVE AGENCY REQUIREMENTS.
3. CRUSHED ROCK MAY BE USED FOR PIPE BEDDING ONLY IF MATERIAL USE HAS BEEN SPECIFICALLY APPROVED BY THE GOVERNING AGENCY. SEE STANDARD DRAWING NO. 505 FOR PIPE BEDDING METHODS.
4. LAS VEGAS VALLEY WATER DISTRICT REQUIRES PIPE BEDDING AND BACKFILL WITHIN THE PIPE ZONE TO BE OF THE SAME MATERIAL.

SPECIFICATION REFERENCE	
208	TRENCH EXCAVATION & BACKFILL
302	AGGREGATE BASE COURSES

UNIFORM STANDARD DRAWINGS CLARK COUNTY AREA

TRENCH BACKFILL - UNPAVED AREAS AND AREAS OUTSIDE EXISTING OR FUTURE PROPOSED STREET RIGHT-OF-WAY

DATE 5-17-01 | DWG. NO. 502 | PAGE 122

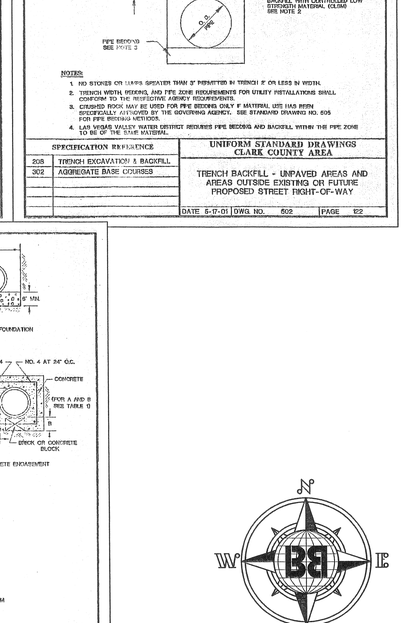


TABLE I					
PIPE SIZE	B	A	PIPE SIZE	B	A
6"	4"	4"	24"	8"	6"
8"	4"	4"	27"	8"	6"
10"	4"	4"	30"	8"	6"
12"	4"	4"	33"	8"	6"
15"	4"	4"	36"	8"	6"
18"	5"	5"	39"	8"	6"
21"	5"	6"	42"	10"	6"

D = OUTSIDE DIAMETER OF PIPE
W = OUTSIDE DIAMETER OF PIPE + 24" MAXIMUM

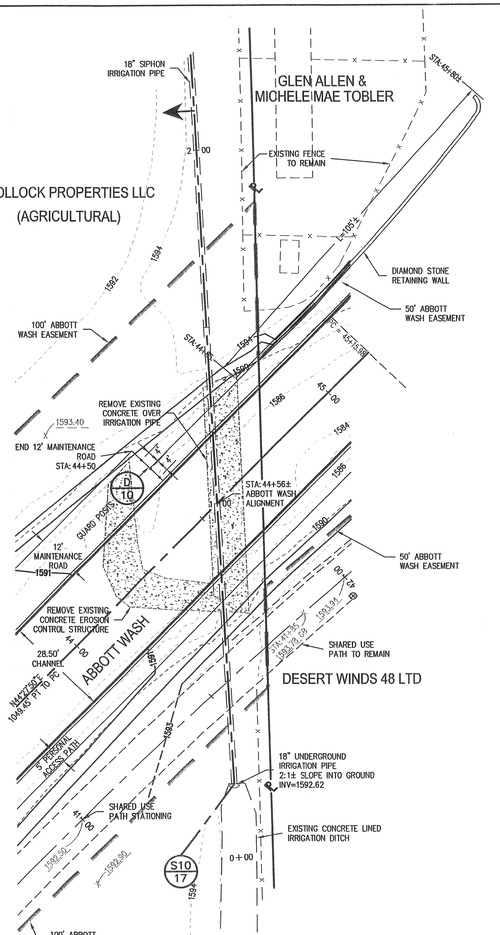
NOTES:
1. PIPE BEDDING TO BE COMPACTED TO AT LEAST 90% OF MAXIMUM DENSITY.
2. REQUIRED THICKNESS OF BEDDING MATERIAL TO BE CONSTRUCTED UNDER THE BARREL SUBGRADE TO BE EXCAVATED TO PROVIDE 3" CLEARANCE UNDER THE BELL.
3. OTHER BEDDING METHODS MAY BE ACCEPTED ON APPROVED.
4. CRUSHED ROCK MAY BE USED FOR PIPE BEDDING ONLY IF MATERIAL USE HAS BEEN SPECIFICALLY APPROVED BY THE GOVERNING AGENCY.

SPECIFICATION REFERENCE	
208	TRENCH EXCAVATION & BACKFILL
302	AGGREGATE BASE COURSES
501	CONCRETE
505	REINFORCEMENT STEEL

UNIFORM STANDARD DRAWINGS CLARK COUNTY AREA

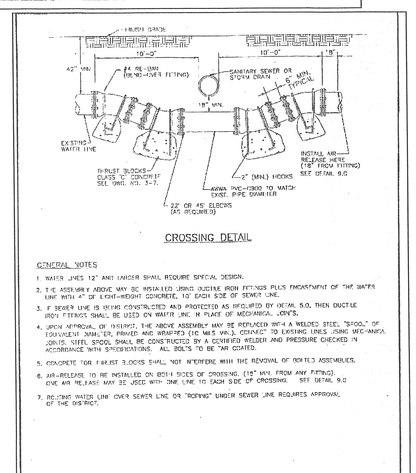
PIPE TRENCH BEDDING METHODS

DATE 5-17-01 | DWG. NO. 505 | PAGE NO. 125



IRRIGATION SIPHON PLAN VIEW

NOT TO SCALE — STA:0+00.00 TO 2+50.00, SCALE HOR: 1"=20' — S10 / 17



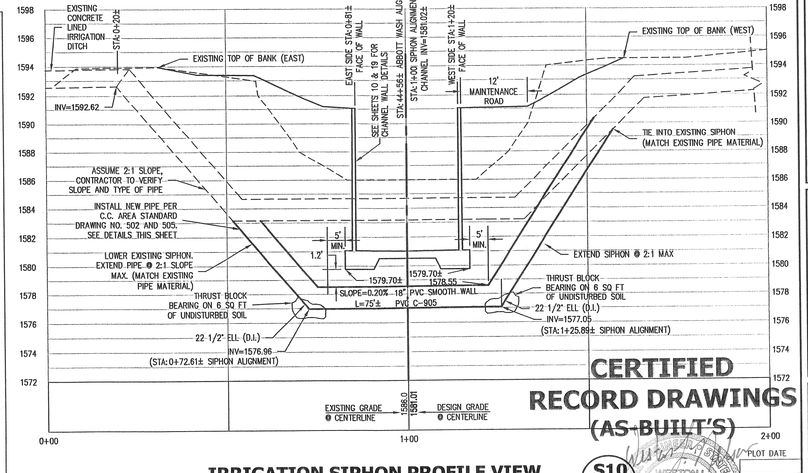
CROSSING DETAIL

GENERAL NOTES

1. WATER LINES 12" AND LARGER SHALL REQUIRE SPECIAL DESIGN.
2. THE ASSEMBLY ABOVE MAY BE INSTALLED USING DUCTILE IRON FITTINGS PLUS ENCASEMENT OF THE JOINTS LINE WITH 4" OF LIGHT-WEIGHT CONCRETE, 10' EACH SIDE OF SEWER LINE.
3. IF SEWER LINE IS BEING CONSTRUCTED AND PROTECTED AS REQUIRED BY DETAIL 5.0, THEN DUCTILE IRON FITTINGS SHALL BE USED ON WATER LINE IN PLACE OF MECHANICAL "JOYS".
4. UPON APPROVAL OF DISTRICT, THE ABOVE ASSEMBLY MAY BE REPLACED WITH A WELDED STEEL "SPOOL" OF EQUIVALENT DIAMETER, PRIMED AND WRAPPED (AS WAS WAS) CONNECT TO EXISTING LINES USING MECHANICAL JOINTS. STEEL SPOOL SHALL BE CONSTRUCTED BY A CERTIFIED WELDER AND PRESSURE CHECKED IN ACCORDANCE WITH SPECIFICATIONS. ALL BOLTS TO BE "AR COATED.
5. CONCRETE FOR THRUST BLOCKS SHALL NOT INTERFERE WITH THE REMOVAL OF JOINTS ASSEMBLIES.
6. AIR-RELEASE TO BE INSTALLED ON BOTH SIDES OF CROSSING. (1") MIN. FROM ANY FITTING). ONE AIR RELEASE MAY BE USED WITH ONE LINE TO EACH SIDE OF CROSSING. SEE DETAIL 9.0
7. ANCHING WATER LINE OVER SEWER LINE OR "DOWING" UNDER SEWER LINE REQUIRES APPROVAL OF THE DISTRICT.

NO.	REVISION	DATE	STANDARD DETAIL FOR WATER WORKS CONSTRUCTION	SECTION V.V.W.D.
			LOWERING WATER MAINS	DRAWING NO. S.1
				DATE JUNE 2000

REVISED 6/17/00



IRRIGATION SIPHON PROFILE VIEW

NOT TO SCALE — STA:0+00.00 TO 2+50.00, SCALE HOR: 1"=20', SCALE VER: 1"=5' — S10 / 17

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

WESTON L. NELSON Exp. 12/31/03 CIVIL No. 14044 — 12-11-03

WESTON L. NELSON Exp. 12/31/05 CIVIL No. 14044 — 7-14-05

REVISIONS			
NO	DESCRIPTION	DATE	BY
1	As-Built Utilities	6-2005	W.N.
2	As-Built Contour Grades Mod.	6-2005	W.N.

THE INFORMATION CONTAINED IN THE DRAWING IS THE SOLE PROPERTY OF BULLOCH BROTHERS ENGINEERING INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF BULLOCH BROTHERS ENGINEERING INC. IS PROHIBITED. ANY USE OF THESE PLANS FOR ANY PROJECT OTHER THAN THE ONE FOR WHICH THEY WERE PREPARED IS PROHIBITED. ANY MODIFICATIONS TO THESE PLANS WITHOUT THE WRITTEN CONSENT OF BULLOCH BROTHERS ENGINEERING INC. WILL RELIEVE BULLOCH BROTHERS ENGINEERING INC. OF ALL LIABILITY ARISING FROM SUCH MODIFICATIONS.

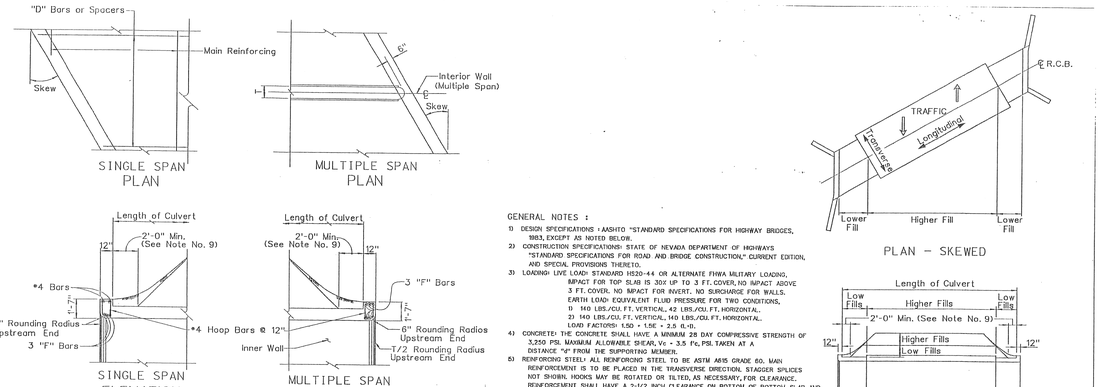
BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
P.O. BOX 3174 CEDAR CITY, UTAH 84720
361 W MESQUITE BLVD, STE 4 MESQUITE, NEVADA 89027
(435) 586-9592 (702) 346-5101

ABBOTT WASH CONVEYANCE SIPHONS FOR THE CITY OF MESQUITE MESQUITE, CLARK CO., NEVADA

MESQUITE, NEVADA

SCALE: NTS	DRAWN BY: JRH	CHECKED BY: W.N.
PROJECT NO: 1029-90-05	DATE: NOV 2003	SHEET NO: 17 OF 25

PLOT DATE



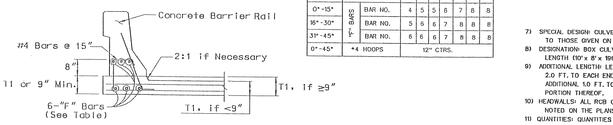
GENERAL NOTES :

1) DESIGN SPECIFICATIONS : AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 1983, EXCEPT AS NOTED BELOW.
2) CONSTRUCTION SPECIFICATIONS: STATE OF NEVADA DEPARTMENT OF HIGHWAYS "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION," CURRENT EDITION, AND SPECIAL PROVISIONS THERETO.
3) LOADING: LIVE LOAD: STANDARD HS20-44 OR ALTERNATE FHWA MILITARY LOADING, IMPACT FOR TOP SLAB IS 30% UP TO 3 FT. COVER, NO IMPACT ABOVE 3 FT. COVER. NO IMPACT FOR INVERT. NO SURCHARGE FOR WALLS.
EARTH LOAD: EQUIVALENT FLUID PRESSURE FOR TWO CONDITIONS,
1) 140 LBS./CU. FT. VERTICAL, 42 LBS./CU. FT. HORIZONTAL.
2) 140 LBS./CU. FT. VERTICAL, 140 LBS./CU. FT. HORIZONTAL.
LOAD FACTORS: 1.50 + 1.5E + 2.5 0.-0.
4) CONCRETE: THE CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3,250 PSI. MAXIMUM ALLOWABLE SHEAR, Vc = 3.5 √f'c, PSI. TAKEN AT A DISTANCE "d" FROM THE SUPPORTING MEMBER.
5) REINFORCING STEEL: ALL REINFORCING STEEL TO BE ASTM A615 GRADE 60. MAIN REINFORCEMENT IS TO BE PLACED IN THE TRANSVERSE DIRECTION. STAGGER SPLICES NOT SHOWN. HOOKS MAY BE ROTATED OR TILTED, AS NECESSARY, FOR CLEARANCE. REINFORCEMENT SHALL HAVE A 2-1/2 INCH CLEARANCE ON BOTTOM OF BOTTOM SLAB AND 2 INCH CLEARANCE ON REMAINDER OF STRUCTURE AND ITS APPURTENANCES UNLESS OTHERWISE NOTED ON THE PLANS.
6) FOUNDATION PRESSURE: THE RCB CULVERTS ARE DESIGNED TO THE FOLLOWING SOIL BEARING PRESSURES:

COVER HEIGHTS	10 FT.	20 FT.
RCB HEIGHT	TON/SQ.FT.	
6 FT.	1.0	1.6
8 FT.	1.1	1.7
10 FT.	1.2	1.8
12 FT.	1.3	1.9
14 FT.	1.4	2.0

7) SPECIAL DESIGN CULVERTS WITH CONDITIONS, LOADING, OR SIZES DISSIMILAR TO THOSE GIVEN ON THESE RCB CULVERT SHEETS MAY REQUIRE A SPECIAL DESIGN.
8) DESIGNATION: BOX CULVERTS ARE SHOWN ON PLANS AS SPAN TIMES HEIGHT TIMES LENGTH (10'x 8'x 106' RCB).
9) ADDITIONAL LENGTH: LENGTH OF CULVERT SHALL BE INCREASED AS FOLLOWS: ADD 2.0 FT. TO EACH END WHEN COVER AT SHOULDER IS 0.0 TO 5.0 FEET. ADD AN ADDITIONAL 1.0 FT. TO EACH END FOR EACH SUCCEEDING 5.0 FT. OF COVER OR PORTION THEREOF.
10) HEADWALLS: ALL RCB CULVERTS SHALL HAVE TYPE I HEADWALLS UNLESS OTHERWISE NOTED ON THE PLANS.
11) QUANTITIES: QUANTITIES DO NOT INCLUDE "d" BARS , NOR SPLICES IN BARS ,NOR TEMPERATURE BARS FOR EXPOSED TOP SLAB, NOR CONCRETE OR REINFORCEMENT FOR PARAPETS OR PAVING LEDGES.
12) THREE OR MORE CELLS: FOR CULVERTS WITH MORE THAN TWO CELLS, USE DIMENSIONS AND REINFORCEMENT FOR THE "DOUBLE BOX CULVERT" AND ADJUST THE QUANTITIES ACCORDINGLY.

SKEWED PARAPETS								
SKEW ANGLE		SPAN	5	6	7	8	10	12	14
0°-15°	BAR	BAR NO.	4	5	5	6	7	8	8
16°-30°	BAR	BAR NO.	5	6	6	7	8	8	8
31°-45°	BAR	BAR NO.	6	6	6	7	8	8	8
0°-45°	*4 HOOPS		12" CTRS.						



PARAPET DETAILS

COPING REINFORCING INCLUDED IN THE HEADWALL QUANTITIES

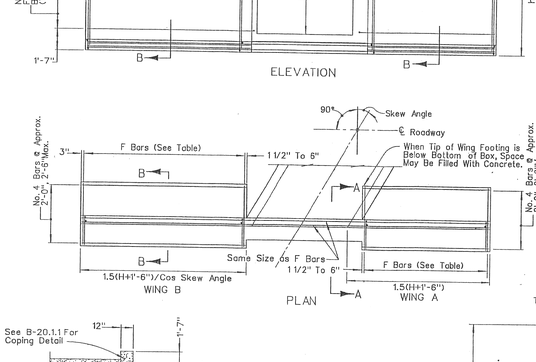
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

R.C.B., CULVERTS,
GENERAL NOTES

B-20.1.1 (502) (505)	
CHIEF BRIDGE ENGR.	ADOPTED-11/73 REVISION 9/00

NDOT CULVERT GENERAL (A 18)

NOT TO SCALE

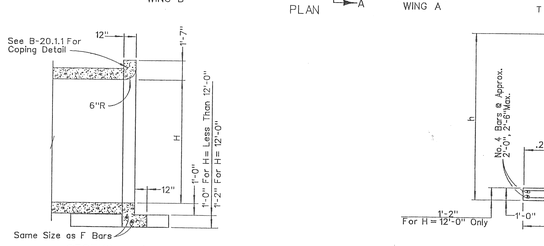


TABLE

H = HEIGHT IN INCHES	TB = INCHES	G BARS SIZE NO.	G BARS SPACE IN.	F BARS SIZE NO.	F BARS SPACE IN.
3	8	5	9 1/2	4	12
4	8	5	9 1/2	4	12
5	8	5	9 1/2	4	12
6	10	7	10	4	6 1/2
7	12	5	7 1/2	5	7 1/2
8	12	7	6 1/2	6	8
9	12	4	7	6	7 1/2
10	12	6	6 1/2	8	10
12	12	9	7	8	8 1/2

NOTES:

1. FOR GENERAL NOTES SEE SHEET B-20.1.1
2. FOR QUANTITIES SEE SHEET B-20.1.4.1



SHEET 1 OF 2

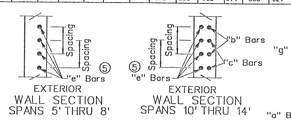
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS
TYPE II HEADWALLS

B-20.1.4 (502) (505)	
CHIEF BRIDGE DESIGN ENGR.	ADOPTED: 11/78 REVISION 9/02

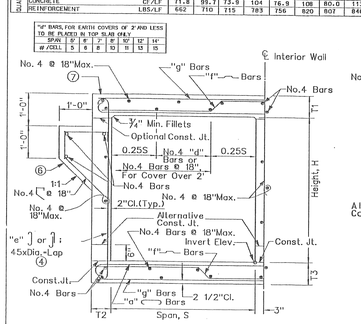
SPAN		3				4				5				6				7				8			
HEIGHT	FT.	5				5				5				6				7				8			
MAXIMUM EARTH COVER	FT.	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
TOP SLAB	INCH	7	7 1/2	7	7 1/2	7	7 1/2	7	7 1/2	7	7 1/2	7	7 1/2	7	7 1/2	7	7 1/2	7	7 1/2	7	7 1/2	8	8	8	8
EXTERIOR WALLS	INCH	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8
INVERT	INCH	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8
SPACING	INCH	11	12	11	12	11	12	11	12	11	12	11	12	11	12	11	12	11	12	11	12	11	12	11	12
"a"	BAR NO.	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7
"b"	BAR NO.	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6
"c"	BAR NO.	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6
"d"	BAR NO.	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
"e"	DIMENSION "A" FT.-INCH	2-3	2-3	2-3	2-3	2-7	2-7	2-7	2-7	2-11	2-11	2-11	2-11	3-3	3-3	3-3	3-3	3-7	3-7	3-7	3-7	4-0	4-0	4-0	4-0
"f"	DIMENSION "B" FT.-INCH	4-10	4-10	4-10	4-10	5-2	5-2	5-2	5-2	5-6	5-6	5-6	5-6	5-10	5-10	5-10	5-10	6-2	6-2	6-2	6-2	6-6	6-6	6-6	6-6
(1)	DIMENSION "C" FT.-INCH	3-3	3-3	3-3	3-3	3-7	3-7	3-7	3-7	4-0	4-0	4-0	4-0	4-4	4-4	4-4	4-4	4-8	4-8	4-8	4-8	5-1	5-1	5-1	5-1
	CONCRETE CY./LF.	3.9	4.0	4.0	4.1	4.5	4.6	4.6	4.7	5.1	5.2	5.2	5.3	5.8	5.9	5.9	6.0	6.4	6.5	6.5	6.6	7.1	7.2	7.2	7.3
	REINFORCEMENT LBS./LF.	74	74	77	77	85	85	89	89	96	96	101	101	109	109	114	114	121	121	126	126	134	134	137	137

SPAN		9				10				11				12			
HEIGHT	FT.	9				10				11				12			
MAXIMUM EARTH COVER	FT.	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
TOP SLAB	INCH	8	8 1/2	8	8 1/2	8	8 1/2	8	8 1/2	8	8 1/2	8	8 1/2	8	8 1/2	8	8 1/2
EXTERIOR WALLS	INCH	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
INVERT	INCH	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
SPACING	INCH	11	12	11	12	11	12	11	12	11	12	11	12	11	12	11	12
"a"	BAR NO.	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
"b"	BAR NO.	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"c"	BAR NO.	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"d"	BAR NO.	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
"e"	DIMENSION "A" FT.-INCH	4-3	4-3	4-3	4-3	4-7	4-7	4-7	4-7	4-11	4-11	4-11	4-11	5-3	5-3	5-3	5-3
"f"	DIMENSION "B" FT.-INCH	6-10	6-10	6-10	6-10	7-2	7-2	7-2	7-2	7-6	7-6	7-6	7-6	7-10	7-10	7-10	7-10
(1)	DIMENSION "C" FT.-INCH	5-5	5-5	5-5	5-5	5-9	5-9	5-9	5-9	6-1	6-1	6-1	6-1	6-5	6-5	6-5	6-5
	CONCRETE CY./LF.	7.8	7.9	7.9	8.0	8.5	8.6	8.6	8.7	9.2	9.3	9.3	9.4	9.9	10.0	10.0	10.1
	REINFORCEMENT LBS./LF.	662	710	715	783	756	820	802	846	833	873	881	958	884	978	1002	1110

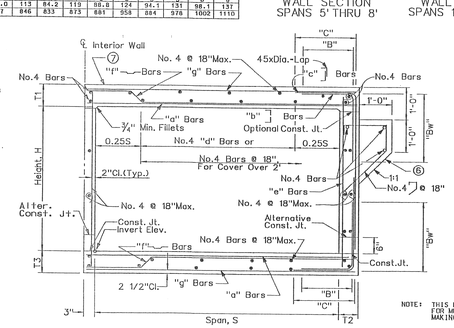


"d" BARS FOR EARTH COVERS OF 2' AND LESS TO BE PLACED IN TOP SLAB ONLY

SPAN	5'	6'	7'	8'	10'	12'	14'
# /CELL	5	6	8	10	13	15	15



TYPICAL SECTION - SPANS 5' THRU 8'



TYPICAL SECTION - SPANS 10' THRU 14'

NOTE: THIS PLAN SHEET MAY BE USED FOR MULTIPLE CELL CULVERTS BY MAKING NECESSARY ADJUSTMENTS.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DOUBLE
RCB CULVERTS

B-20.1.3 (502)	
CHIEF BRIDGE DESIGN ENGR.	ADOPTED: 11/78 REVISION 3-3/82

STEEL NDOT CULVERT (B 18)

NOT TO SCALE

NOTES:

① FOR BOXES WITH SPAN OR HEIGHT LESS THAN ANY OF THOSE SHOWN IN TABLE, USE NEXT GREATER SIZE BOX CONCRETE DIMENSIONS AND REINFORCEMENT. MAKE NECESSARY CHANGES IN BAR LENGTHS AND QUANTITIES.

② FOR BOXES WITH SPAN OR HEIGHT OR COVER GREATER THAN THOSE SHOWN IN TABLES, A SPECIAL DESIGN IS REQUIRED.

③ QUANTITIES ARE APPROXIMATE AND FOR DESIGN PURPOSES ONLY.

④ IT IS PERMISSIBLE TO ELIMINATE THE 180° HOOKS ON EVERY OTHER "e" BAR.

⑤ "e" BARS ARE AT HALF SPACING.

⑥ PROVIDE PAVING NOTCH WHEN TOP IS EXPOSED AND WHERE P.C.C. PAVEMENT OR APPROACH SLAB IS USED. ADJUST THE QUANTITIES.

⑦ WHEN TOP IS EXPOSED, THE TOP SLAB CONCRETE SHALL BE "EA", f'c=4500 PSI. OR "A", f'c=4000 PSI. AS DETERMINED BY THE ENGINEER. IF "EA" CONCRETE IS TO BE USED, THE TOP SLAB REINFORCING STEEL SHALL HAVE AN EPOXY COATING.

① - QUANTITIES SHOWN ARE FOR TWO HEADWALLS AT THE INLET AND OUTLET

SPAN	HEIGHT	CUBIC YARDS OF CONCRETE AND POUNDS OF REINFORCING FOR TWO TYPE II HEADWALLS ①																HEIGHT	SPAN
		SINGLE BOX				DOUBLE BOX								TRIPLE BOX					
		0°SKEW		15°SKEW		30°SKEW		45°SKEW		0°SKEW		15°SKEW		30°SKEW		45°SKEW		0°SKEW		15°SKEW		30°SKEW		45°SKEW			
		CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.		
	3	9.4	871	9.4	888	10.2	947	11.5	1,073	11.4	991	11.6	1,013	12.4	1,085	14.3	1,243									3	
5	4	12.6	1,141	12.8	1,163	13.5	1,237	15.6	1,399	14.8	1,261	15.0	1,287	16.3	1,376	18.6	1,568	16.8	1,367	17.0	1,397	18.5	1,498	21.4	1,718	4	5
	5	15.9	1,615	16.2	1,707	17.2	1,813	19.8	2,054	18.6	1,785	18.9	1,831	19.9	1,962	22.9	2,256	20.6	1,901	20.8	1,941	22.3	2,074	25.6	2,364	5	
	3	9.8	886	9.8	903	10.6	963	12.1	1,094	12.2	1,093	12.2	1,119	13.2	1,204	15.3	1,389									3	
6	4	13.2	1,155	13.2	1,178	14.1	1,256	16.2	1,419	15.4	1,368	15.6	1,397	16.7	1,495	19.4	1,714	17.0	1,536	18.0	1,572	19.6	1,693	22.8	1,957	4	6
	5	16.8	1,630	17.1	1,722	18.2	1,830	20.9	2,055	19.6	1,880	19.9	1,935	21.2	2,051	24.5	2,360	22.4	2,070	22.8	2,116	24.5	2,269	28.2	2,615	5	
	7	25.8	2,538	26.2	2,635	27.9	2,799	32.0	3,144	30.0	2,888	30.5	2,961	32.5	3,139	37.5	3,611	34.3	3,167	34.9	3,237	37.5	3,472	43.2	4,002	7	
	3	10.2	900	10.2	918	11.0	980	12.5	1,114																	3	
7	4	13.8	1,170	13.8	1,193	14.7	1,270	16.9	1,435																	4	7
	5	17.2	1,704	17.3	1,736	18.3	1,846	20.9	2,085																	5	
	6	25.2	2,612	25.3	2,665	26.0	2,822	31.7	3,181																	6	
	4	14.4	1,184	14.4	1,207	15.3	1,287	17.6	1,451	16.1	1,256	16.4	1,288	17.4	1,386	20.3	1,615	17.8	1,410	18.1	1,446	19.7	1,572	22.9	1,837	4	
	5	18.0	1,718	18.0	1,751	19.1	1,864	21.8	2,109	20.0	1,860	20.3	1,900	21.5	2,020	25.1	2,350	22.1	1,960	22.5	2,000	24.3	2,153	28.3	2,519	5	
8	6	26.4	2,626	26.7	2,679	28.2	2,853	32.1	3,193	29.8	2,831	30.1	2,881	32.0	3,062	37.2	3,542	32.4	3,121	33.1	3,244	35.5	3,487	40.5	3,919	6	8
	7	32.4	3,582	32.7	3,650	34.6	3,878	39.0	4,305																	7	
	8	40.4	4,379	40.8	4,460	43.3	4,737	48.8	5,264	43.8	4,067	44.2	4,147	46.5	4,426	53.7	5,019	47.0	4,341	47.6	4,421	50.9	4,727	58.3	5,392	8	
	4	15.0	1,198	15.0	1,221	15.9	1,305	18.3	1,472	16.8	1,274	17.1	1,307	18.1	1,406	21.1	1,638	18.5	1,430	18.8	1,466	20.5	1,601	23.8	1,863	4	
	5	18.8	1,743	18.8	1,777	19.9	1,891	22.7	2,140	20.9	1,887	21.2	1,928	22.5	2,049	26.2	2,384	23.1	1,988	23.5	2,029	25.4	2,185	29.6	2,556	5	
10	6	27.6	2,662	27.9	2,717	29.5	2,893	33.5	3,239	31.2	2,871	31.5	2,922	33.5	3,106	38.9	3,594	33.9	3,167	34.6	3,290	37.2	3,534	42.4	4,054	6	10
	7	33.4	3,729	33.8	3,799	35.7	4,033	40.3	4,506	37.6	4,015	37.9	4,068	40.3	4,323	46.8	4,982	40.8	4,411	41.6	4,550	44.8	4,910	51.0	5,629	7	
	8	41.8	4,797	42.2	4,881	44.4	5,173	50.0	5,773	47.0	5,159	47.4	5,214	50.4	5,540	58.5	6,371	51.0	5,682	52.0	5,814	56.0	6,286	63.7	7,206	8	
	4	49.8	5,697	50.2	5,791	53.1	6,144	59.8	6,909																	4	
	5	61.0	8,335	61.5	8,450	65.2	9,016	73.5	10,168	65.2	9,100	65.8	9,185	70.2	9,813	79.2	11,169	69.6	9,537	70.4	9,728	75.2	10,372	85.4	11,774	5	
	4	15.4	1,221	15.6	1,255	16.6	1,344	19.1	1,520	17.6	1,292	17.8	1,326	18.9	1,426	21.9	1,664	19.4	1,451	19.7	1,491	21.5	1,643	24.9	1,917	4	
	5	18.8	1,775	18.9	1,810	20.0	1,934	22.8	2,187	21.0	1,920	21.3	1,965	22.6	2,085	26.4	2,427	23.2	2,023							5	
	6	28.0	2,683	28.2	2,734	29.9	2,908	33.9	3,281	32.2	3,127	32.6	3,190	34.5	3,389	39.5	3,869									6	
12	7	34.6	3,651	34.8	3,691	36.9	3,911	41.8	4,369	41.3	4,566	41.8	4,641	43.6	4,842	49.3	5,398	47.5	6,042	43.0	5,444	43.8	5,569	47.0	6,001	7	12
	8	42.0	5,050	42.1	5,143	44.8	5,479	50.6	6,142	49.6	6,056	49.9	6,107	51.2	6,305	57.1	7,009	51.2	6,705	51.7	6,756	52.6	6,870	56.1	7,351	8	
	5	50.4	5,722	50.8	5,828	53.8	6,187	60.6	6,959	59.2	6,728	59.8	6,865	61.4	7,046	67.4	7,781	60.0	7,577	60.8	7,641	62.0	7,805	67.2	8,299	5	
	6	61.8	8,580	62.3	8,703	65.8	9,227	74.1	10,350	72.6	9,991	73.4	10,107	75.4	10,367	82.1	11,313	74.4	10,491	74.7	10,541	76.2	10,781	82.6	11,675	6	
	7	73.8	11,172	74.0	11,263	78.6	11,965	88.5	13,284	86.8	13,254	87.7	13,384	90.2	13,750	98.4	14,955	89.2	14,022	89.5	14,063	91.4	14,347	98.9	15,403	7	
	8	86.0	13,172	86.2	13,263	91.6	13,963	103.1	15,682	101.2	15,624	102.2	15,773	105.1	16,211	114.7	17,618	104.0	16,535	104.3	16,581	106.5	16,903	115.3	18,161	8	
	4	18.0	2,939	18.2	2,972	19.4	3,172	22.3	3,643	20.6	3,365	20.8	3,402	22.0	3,600	25.7	4,200	22.7	3,711	23.0	3,760	24.7	4,037	29.1	4,756	4	
	5	22.0	3,594	22.1	3,630	23.6	3,858	27.2	4,444	25.2	4,116	25.4	4,150	26.8	4,380	31.3	5,116	27.7	4,526	28.0	4,581	30.1	4,918	35.4	5,784	5	
	6	26.0	4,248	26.1	4,288	27.9	4,559	32.1	5,245	29.8	4,867	30.0	4,898	31.7	5,178	37.0	6,044	32.7	5,341	33.1	5,406	35.5	5,800	41.8	6,824	6	
	7	30.0	4,902	30.1	4,945	32.2	5,259	37.0	6,045	34.4	5,618	34.6	5,654	36.6	5,976	42.7	6,972	37.7	6,157	38.2	6,241	41.0	6,693	48.2	7,873	7	
	8	34.0	5,556	34.1	5,606	36.5	5,960	41.9	6,846	39.0	6,369	39.2	6,406	41.5	6,774	48.4	7,900	42.7	6,973	43.3	7,072	46.5	7,591	54.6	8,918	8	

ANGLE	COSINE
0°	1.0000
15°	0.9659
30°	0.8660
45°	0.7071

QUANTITIES FOR ADDITIONAL CELLS

CONCRETE FOR TWO TYPE II HEADWALLS FOR EACH ADDITIONAL CELL (CU. YARDS) (ADD THIS QUANTITY TO THE QUANTITY FOR A DOUBLE BOX)

FOR HEIGHT(H) LESS THAN 12ft. [8.56ft²(SPAN(ft)•0.67(ft))/COS SKEW ANGLE

FOR HEIGHT(H) EQUAL TO OR GREATER THAN 12ft. [9.23ft²(SPAN(ft)•0.67(ft))/COS SKEW ANGLE

REINFORCING FOR TWO TYPE II HEADWALLS FOR EACH ADDITIONAL CELL (POUNDS) (ADD THIS QUANTITY TO THE QUANTITY FOR A DOUBLE BOX)

FOR HEIGHT(H) LESS THAN OR EQUAL TO 7ft. [16.69lb/ft(SPAN(ft)•0.67(ft))/COS SKEW ANGLE

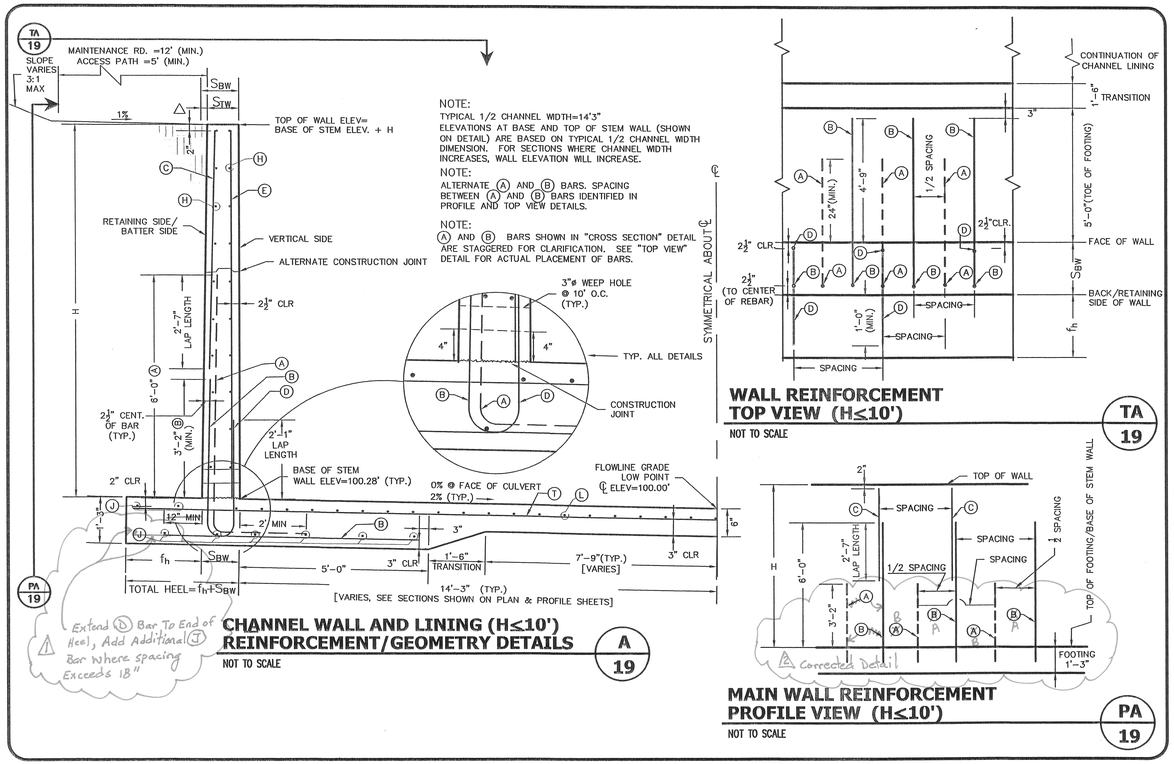
FOR HEIGHT(H) EQUAL TO OR GREATER THAN 10ft. [42.72lb/ft(SPAN(ft)•0.67(ft))/COS SKEW ANGLE



STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS
TYPE II HEADWALLS

| B-20



CHANNEL WALL AND LINING (H≤10') REINFORCEMENT/GEOMETRY DETAILS

NOT TO SCALE

A 19

WALL REINFORCEMENT TOP VIEW (H≤10')

NOT TO SCALE

TA 19

MAIN WALL REINFORCEMENT PROFILE VIEW (H≤10')

NOT TO SCALE

PA 19

LEGEND

- S_{BW} = STEM WALL BASE WIDTH
- S_{TW} = STEM WALL TOP WIDTH
- △ = BATTER
- f_h = HEEL WIDTH BEHIND STEM WALL
- f_h+S_{BW} = TOTAL HEEL WIDTH
- H = WALL HEIGHT
- (V) = TYPE OF WALL
- (A) = BAR IDENTIFICATION
- = As-Built Information

REINFORCEMENT & DIMENSION TABLE

H= 8.5' & 9.0' : TYPE (V)

REBAR ID.	S_{BW} (IN)	S_{TW} (IN)	△ (IN)	f_h (FT–IN)	BAR #	SPACING (IN)	MINIMUM LAP (FT–IN)	MINIMUM LENGTH (FT–IN)
(A)	12"	10"	2"	1'–6"	#5	10"	2'–7"	10'–0"
(B)	12"	10"	2"	1'–6"	#5	10"	2'–7"	10'–0"
(C)	12"	10"	2"	1'–6"	#5	10"	2'–7"	5'–0"
(D)	12"	10"	2"	1'–6"	#4	12"	2'–1"	5'–0"
*(E)	12"	10"	2"	1'–6"	#4	12"	2'–1"	8'–4" (8.5) / (9) 8'–10"
(H)	12"	10"	2"	1'–6"	#4	12"	2'–1"	CONTINUOUS
(J)	12"	10"	2"	1'–6"	#4	18"	2'–1"	CONTINUOUS
(L)	12"	10"	2"	1'–6"	#5	10"	2'–7"	CONTINUOUS
(T)	12"	10"	2"	1'–6"	#5	12"	2'–7"	CONTINUOUS

H= 8.5' & 9.0' : TYPE (X)

REBAR ID.	S_{BW} (IN)	S_{TW} (IN)	△ (IN)	f_h (FT–IN)	BAR #	SPACING (IN)	MINIMUM LAP (FT–IN)	MINIMUM LENGTH (FT–IN)
(A)	14"	10"	4"	1'–10"	#5	8"	2'–7"	10'–0"
(B)	14"	10"	4"	1'–10"	#5	8"	2'–7"	10'–0"
(C)	14"	10"	4"	1'–10"	#5	8"	2'–7"	5'–0"
(D)	14"	10"	4"	1'–10"	#4	12"	2'–1"	5'–0"
(E)	14"	10"	4"	1'–10"	#4	12"	2'–1"	8'–4" (8.5) / (9) 8'–10"
(H)	14"	10"	4"	1'–10"	#4	12"	2'–1"	CONTINUOUS
(J)	14"	10"	4"	1'–10"	#4	18"	2'–1"	CONTINUOUS
(L)	14"	10"	4"	1'–10"	#5	10"	2'–7"	CONTINUOUS
(T)	14"	10"	4"	1'–10"	#5	12"	2'–7"	CONTINUOUS

H= 10' : TYPE (V)

REBAR ID.	S_{BW} (IN)	S_{TW} (IN)	△ (IN)	f_h (FT–IN)	BAR #	SPACING (IN)	MINIMUM LAP (FT–IN)	MINIMUM LENGTH (FT–IN)
(A)	12"	10"	2"	2'–0"	#6	10"	3'–1"	10'–0"
(B)	12"	10"	2"	2'–0"	#6	10"	3'–1"	10'–0"
(C)	12"	10"	2"	2'–0"	#5	10"	2'–7"	6'–8"
(D)	12"	10"	2"	2'–0"	#4	12"	2'–1"	5'–0"
(E)	12"	10"	2"	2'–0"	#4	12"	2'–1"	9'–10"
(H)	12"	10"	2"	2'–0"	#4	12"	2'–1"	CONTINUOUS
(J)	12"	10"	2"	2'–0"	#4	18"	2'–1"	CONTINUOUS
(L)	12"	10"	2"	2'–0"	#5	10"	2'–7"	CONTINUOUS
(T)	12"	10"	2"	2'–0"	#5	12"	2'–7"	CONTINUOUS

H= 10' : TYPE (X)

REBAR ID.	S_{BW} (IN)	S_{TW} (IN)	△ (IN)	f_h (FT–IN)	BAR #	SPACING (IN)	MINIMUM LAP (FT–IN)	MINIMUM LENGTH (FT–IN)
(A)	14"	10"	4"	2'–4"	#6	8"	3'–1"	10'–0"
(B)	14"	10"	4"	2'–4"	#6	8"	3'–1"	10'–0"
(C)	14"	10"	4"	2'–4"	#5	8"	2'–7"	6'–8"
(D)	14"	10"	4"	2'–4"	#4	12"	2'–1"	5'–0"
(E)	14"	10"	4"	2'–4"	#4	12"	2'–1"	9'–10"
(H)	14"	10"	4"	2'–4"	#4	12"	2'–1"	CONTINUOUS
(J)	14"	10"	4"	2'–4"	#4	18"	2'–1"	CONTINUOUS
(L)	14"	10"	4"	2'–4"	#5	10"	2'–7"	CONTINUOUS
(T)	14"	10"	4"	2'–4"	#5	12"	2'–7"	CONTINUOUS

H= 12' : TYPE (V)

REBAR ID.	S_{BW} (IN)	S_{TW} (IN)	△ (IN)	f_h (FT–IN)	BAR #	SPACING (IN)	MINIMUM LAP (FT–IN)	MINIMUM LENGTH (FT–IN)
(A)	14"	10"	4"	2'–4"	#6	8"	3'–1"	7'–6"
(B)	14"	10"	4"	2'–4"	#6	8"	3'–1"	10'–10"
(C1)	14"	10"	4"	2'–4"	#5	8"	2'–7"	7'–7"
(C2)	14"	10"	4"	2'–4"	#5	8"	2'–7"	11'–10"
(D)	14"	10"	4"	2'–4"	#4	12"	2'–1"	3'–6"
(E)	14"	10"	4"	2'–4"	#4	12"	2'–1"	11'–10"
(H)	14"	10"	4"	2'–4"	#4	12"	2'–1"	CONTINUOUS
(J)	14"	10"	4"	2'–4"	#4	18"	2'–1"	CONTINUOUS
(L)	14"	10"	4"	2'–4"	#5	10"	2'–7"	CONTINUOUS
(T)	14"	10"	4"	2'–4"	#5	12"	2'–7"	CONTINUOUS

H= 12' : TYPE (X)

REBAR ID.	S_{BW} (IN)	S_{TW} (IN)	△ (IN)	f_h (FT–IN)	BAR #	SPACING (IN)	MINIMUM LAP (FT–IN)	MINIMUM LENGTH (FT–IN)
(A)	15"	10"	5"	2'–9"	#7	8"	3'–7"	7'–6"
(B)	15"	10"	5"	2'–9"	#7	8"	3'–7"	10'–10"
(C1)	15"	10"	5"	2'–9"	#5	8"	2'–7"	7'–7"
(C2)	15"	10"	5"	2'–9"	#5	8"	2'–7"	11'–10"
(D)	15"	10"	5"	2'–9"	#4	12"	2'–1"	3'–6"
(E)	15"	10"	5"	2'–9"	#4	12"	2'–1"	11'–10"
(H)	15"	10"	5"	2'–9"	#4	12"	2'–1"	CONTINUOUS
(J)	15"	10"	5"	2'–9"	#4	18"	2'–1"	CONTINUOUS
(L)	15"	10"	5"	2'–9"	#5	10"	2'–7"	CONTINUOUS
(T)	15"	10"	5"	2'–9"	#5	12"	2'–7"	CONTINUOUS

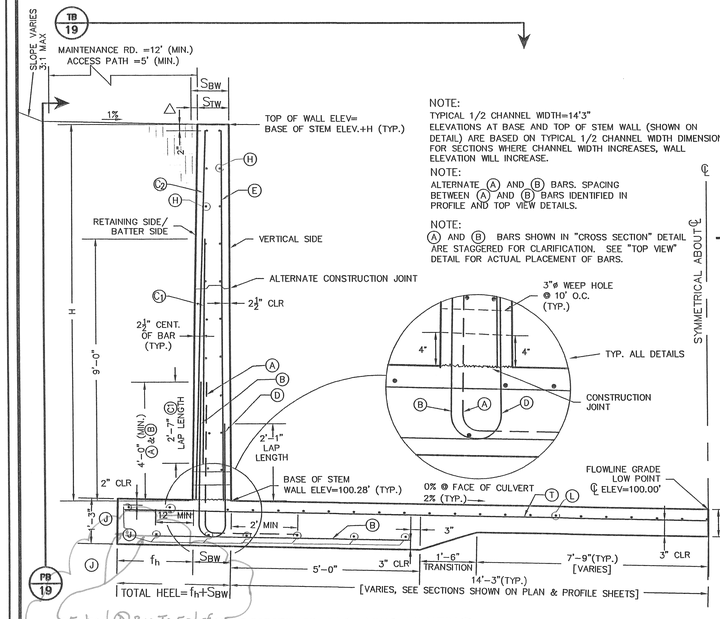
H= 15' : TYPE (V)

REBAR ID.	S_{BW} (IN)	S_{TW} (IN)	△ (IN)	f_h (FT–IN)	BAR #	SPACING (IN)	MINIMUM LAP (FT–IN)	MINIMUM LENGTH (FT–IN)
(A)	16"	10"	6"	3'–8"	#8	11"	4'–1"	8'–7"
(B)	16"	10"	6"	3'–8"	#8	11"	4'–1"	11'–5"
(C1)	16"	10"	6"	3'–8"	#6	11"	3'–1"	6'–8"
(C2)	16"	10"	6"	3'–8"	#6	11"	3'–1"	10'–0"
(C3)	16"	10"	6"	3'–8"	#5	11"	2'–7"	6'–8"
(D)	16"	10"	6"	3'–8"	#5	12"	2'–7"	6'–2"
(E)	16"	10"	6"	3'–8"	#4	12"	2'–1"	14'–3"
(H)	16"	10"	6"	3'–8"	#4	12"	2'–1"	CONTINUOUS
(J)	16"	10"	6"	3'–8"	#4	18"	2'–1"	CONTINUOUS
(L)	16"	10"	6"	3'–8"	#5	10"	2'–7"	CONTINUOUS
(T)	16"	10"	6"	3'–8"	#5	12"	2'–7"	CONTINUOUS
(T2)	16"	10"	6"	3'–8"	#4	12"	N/A	7'–4"

H= 15' : TYPE (X)

REBAR ID.	S_{BW} (IN)	S_{TW} (IN)	△ (IN)	f_h (FT–IN)	BAR #	SPACING (IN)	MINIMUM LAP (FT–IN)	MINIMUM LENGTH (FT–IN)
(A)	18"	10"	8"	3'–8"	#8	9"	4'–1"	8'–7"
(B)	18"	10"	8"	3'–8"	#8	9"	4'–1"	11'–5"
(C1)	18"	10"	8"	3'–8"	#6	9"	3'–1"	6'–8"
(C2)	18"	10"	8"	3'–8"	#6	9"	3'–1"	10'–0"
(C3)	18"	10"	8"	3'–8"	#5	9"	2'–7"	6'–8"
(D)	18"	10"	8"	3'–8"	#5	12"	2'–7"	6'–2"
(E)	18"	10"	8"	3'–8"	#4	12"	2'–1"	14'–3"
(H)	18"	10"	8"	3'–8"	#4	12"	2'–1"	CONTINUOUS
(J)	18"	10"	8"	3'–8"	#4	18"	2'–1"	CONTINUOUS
(L)	18"	10"	8"	3'–8"	#5	10"	2'–7"	CONTINUOUS
(T)	18"	10"	8"	3'–8"	#5	12"	2'–7"	CONTINUOUS
(T2)	18"	10"	8"	3'–8"	#4	12"	N/A	7'–4"

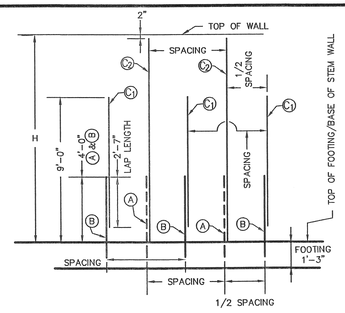
* 8.5 = WALL HEIGHT, 8'–4" = REBAR MINIMUM LENGTH



CHANNEL WALL AND LINING (10'<H≤12') REINFORCEMENT/GEOMETRY DETAILS

NOT TO SCALE

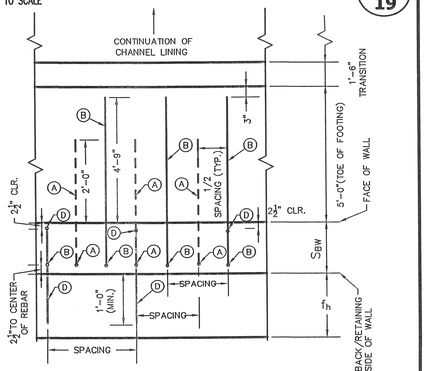
B 19



MAIN WALL REINFORCEMENT PROFILE VIEW (10'<H≤12')

NOT TO SCALE

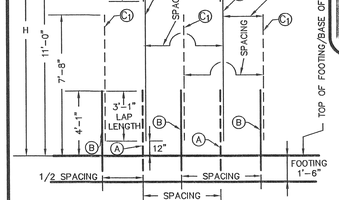
PB 19



MAIN WALL REINFORCEMENT TOP VIEW (10'<H≤12')

NOT TO SCALE

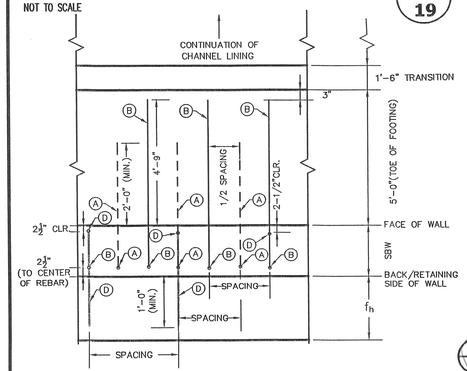
TB 19



MAIN WALL REINFORCEMENT PROFILE VIEW (12'<H≤15')

NOT TO SCALE

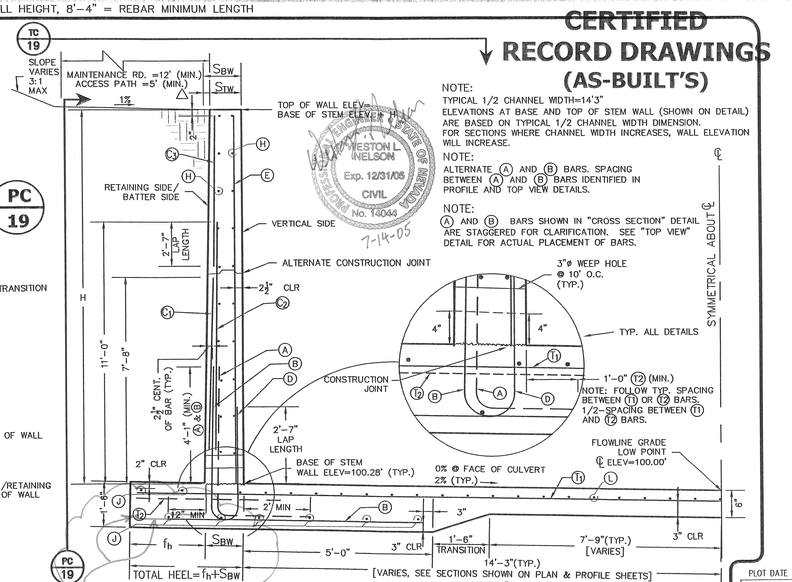
PC 19



MAIN WALL REINFORCEMENT TOP VIEW (12'<H≤15')

NOT TO SCALE

TC 19



CHANNEL WALL AND LINING (12'<H≤15') REINFORCEMENT/GEOMETRY DETAILS

NOT TO SCALE

C 19

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

WESTON L. NIELSON Exp. 12/31/05 CIVIL No. 10044 7-14-05

WESTON L. NIELSON Exp. 12/31/05 CIVIL No. 10044 12-11-03

REVISIONS

NO	DESCRIPTION	DATE	BY
1	As-Built (D) Bars Added	6-2005	W.N.
2	Corrected Detail	6-2005	W.N.

THE INFORMATION CONTAINED ON THIS DRAWING IS THE SOLE PROPERTY OF BULLOCH BROTHERS ENGINEERING INC. ANY REUSE WITHOUT THE WRITTEN PERMISSION OF BULLOCH BROTHERS ENGINEERING INC. FOR ANY PURPOSE OTHER THAN THE SPECIFIC PROJECT FOR WHICH IT WAS PREPARED WILL BE AT USER'S SOLE RISK AND WITHOUT LIABILITY TO BULLOCH BROTHERS ENGINEERING INC.

BULLOCH BROTHERS ENGINEERING INC.
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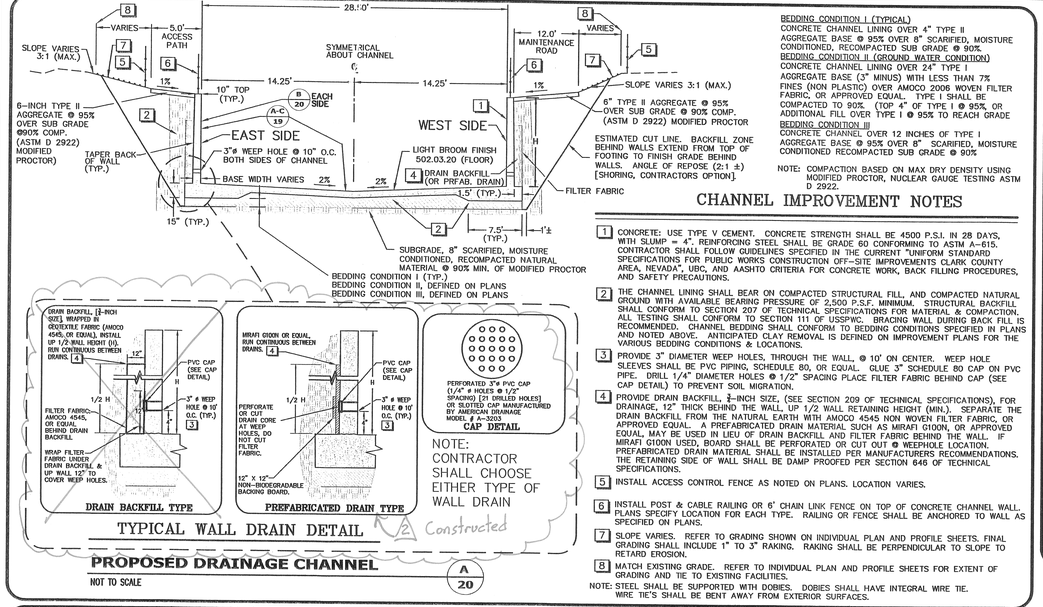
B8

ABBOTT WASH CONVEYANCE
GENERAL DETAILS (CHANNEL WALLS)
FOR
THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA

SCALE	NTS
DRAWN BY	JRH
CHECKED BY	W.N.
PROJECT NO	109-90-05
DATE	NOV 2003
SHEET NO	9 OF 25
PLOT DATE	



PROPOSED DRAINAGE CHANNEL

NOT TO SCALE — A/20

CHANNEL IMPROVEMENT NOTES

1. CONCRETE: USE TYPE V CEMENT. CONCRETE STRENGTH SHALL BE 4500 P.S.I. IN 28 DAYS, WITH SLUMP = 4". REINFORCING STEEL SHALL BE GRADE 60 CONFORMING TO ASTM A-615. CONTRACTOR SHALL FOLLOW GUIDELINES SPECIFIED IN THE CURRENT "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS CLARK COUNTY AREA, NEVADA", UBC, AND AASHTO CRITERIA FOR CONCRETE WORK, BACK FILLING PROCEDURES, AND SAFETY PRECAUTIONS.
2. THE CHANNEL LINING SHALL BEAR ON COMPACTED STRUCTURAL FILL, AND COMPACTED NATURAL GROUND WITH AVAILABLE BEARING PRESSURE OF 2,500 P.S.F. MINIMUM. STRUCTURAL BACKFILL SHALL CONFORM TO SECTION 207 OF TECHNICAL SPECIFICATIONS FOR MATERIAL & COMPACTION. ALL TESTING SHALL CONFORM TO SECTION 111 OF USSPWC. BRACING WALL DURING BACK FILL IS RECOMMENDED. CHANNEL BEDDING SHALL CONFORM TO BEDDING CONDITIONS SPECIFIED IN PLANS AND NOTED ABOVE. ANTICIPATED CLAY REMOVAL IS DEFINED ON IMPROVEMENT PLANS FOR THE VARIOUS BEDDING CONDITIONS & LOCATIONS.
3. PROVIDE 3" DIAMETER WEEP HOLES, THROUGH THE WALL, @ 10' ON CENTER. WEEP HOLE SLEEVES SHALL BE PVC PIPING, SCHEDULE 80, OR EQUAL. GLUE 3" SCHEDULE 80 CAP ON PVC PIPE. DRILL 1/4" DIAMETER HOLES @ 1/2" SPACING PLACE FILTER FABRIC BEHIND CAP (SEE CAP DETAIL) TO PREVENT SOIL MIGRATION.
4. PROVIDE DRAIN BACKFILL, ¾-INCH SIZE, (SEE SECTION 209 OF TECHNICAL SPECIFICATIONS), FOR DRAINAGE, 12" THICK BEHIND THE WALL, UP 1/2 WALL RETAINING HEIGHT (MIN.). SEPARATE THE DRAIN BACKFILL FROM THE NATURAL EARTH WITH AMOCO 4545 NON WOVEN FILTER FABRIC, OR APPROVED EQUAL. A PREFABRICATED DRAIN MATERIAL SUCH AS MIRAFI G100N, OR APPROVED EQUAL, MAY BE USED IN LIEU OF DRAIN BACKFILL AND FILTER FABRIC BEHIND THE WALL. IF MIRAFI G100N USED, BOARD SHALL BE PERFORATED OR CUT OUT @ WEEPHOLE LOCATION. PREFABRICATED DRAIN MATERIAL SHALL BE INSTALLED PER MANUFACTURERS RECOMMENDATIONS. THE RETAINING SIDE OF WALL SHALL BE DAMP PROOFED PER SECTION 646 OF TECHNICAL SPECIFICATIONS.
5. INSTALL ACCESS CONTROL FENCE AS NOTED ON PLANS. LOCATION VARIES.
6. INSTALL POST & CABLE RAILING OR 6' CHAIN LINK FENCE ON TOP OF CONCRETE CHANNEL WALL. PLANS SPECIFY LOCATION FOR EACH TYPE. RAILING OR FENCE SHALL BE ANCHORED TO WALL AS SPECIFIED ON PLANS.
7. SLOPE VARIES. REFER TO GRADING SHOWN ON INDIVIDUAL PLAN AND PROFILE SHEETS. FINAL GRADING SHALL INCLUDE 1" TO 3" RAKING. RAKING SHALL BE PERPENDICULAR TO SLOPE TO RETARD EROSION.
8. MATCH EXISTING GRADE. REFER TO INDIVIDUAL PLAN AND PROFILE SHEETS FOR EXTENT OF GRADING AND TIE TO EXISTING FACILITIES.

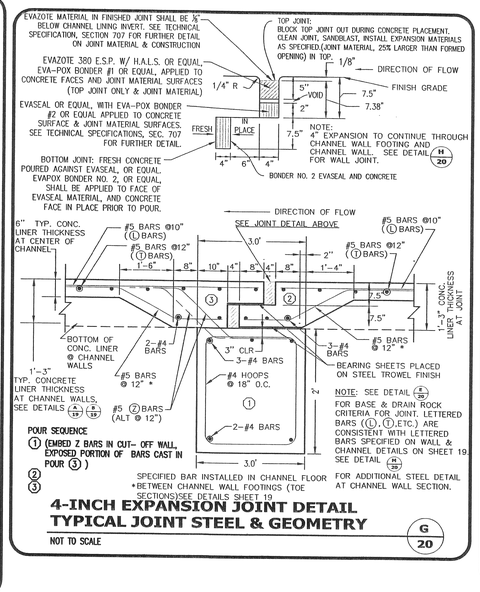
NOTE: STEEL SHALL BE SUPPORTED WITH DOBIES. DOBIES SHALL HAVE INTEGRAL WIRE TIE. WIRE TIE'S SHALL BE BENT AWAY FROM EXTERIOR SURFACES.

BEDDING CONDITION I (TYPICAL)
CONCRETE CHANNEL LINING OVER 4" TYPE II AGGREGATE BASE @ 95% OVER 8" SCARIFIED, MOISTURE CONDITIONED, RECOMPACTED SUB GRADE @ 90%

BEDDING CONDITION II (GROUND WATER CONDITION)
CONCRETE CHANNEL LINING OVER 24" TYPE I AGGREGATE BASE (3" MINUS) WITH LESS THAN 7% FINES (NON PLASTIC) OVER AMOCO 2006 WOVEN FILTER FABRIC, OR APPROVED EQUAL. TYPE I SHALL BE COMPACTED TO 80% (TOP 4" OF TYPE I @ 95%, OR ADDITIONAL FILL OVER TYPE I @ 95% TO REACH GRADE

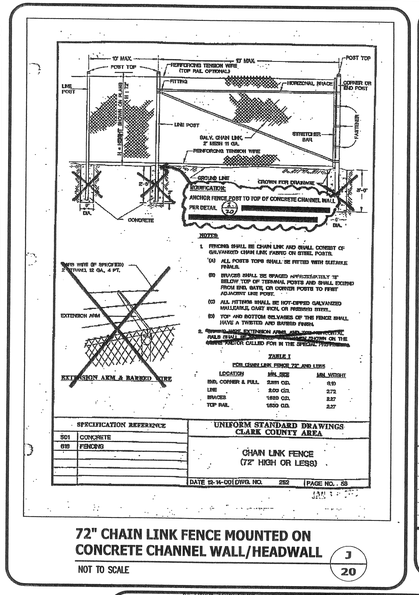
BEDDING CONDITION III
CONCRETE CHANNEL OVER 12 INCHES OF TYPE I AGGREGATE BASE @ 95% OVER 8" SCARIFIED, MOISTURE CONDITIONED RECOMPACTED SUB GRADE @ 90%

NOTE: COMPACTION BASED ON MAX DRY DENSITY USING MODIFIED PROCTOR, NUCLEAR GAUGE TESTING ASTM D 2922.



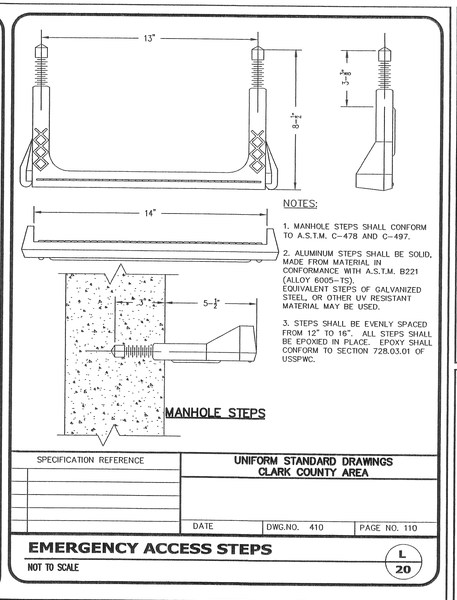
4-INCH EXPANSION JOINT DETAIL TYPICAL JOINT STEEL & GEOMETRY

NOT TO SCALE — G/20



72" CHAIN LINK FENCE MOUNTED ON CONCRETE CHANNEL WALL/HEADWALL

NOT TO SCALE — J/20



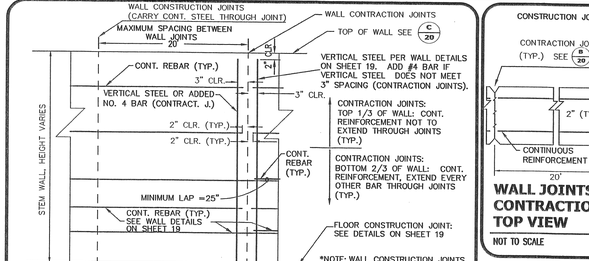
NOTES:

1. MANHOLE STEPS SHALL CONFORM TO A.S.T.M. C-478 AND C-497.
2. ALUMINUM STEPS SHALL BE SOLID, MADE FROM MATERIAL IN CONFORMANCE WITH A.S.T.M. B221 (ALLOY 6005-T5). EQUIVALENT STEPS OF GALVANIZED STEEL, OR OTHER UV RESISTANT MATERIAL MAY BE USED.
3. STEPS SHALL BE EVENLY SPACED FROM 12" TO 16". ALL STEPS SHALL BE EPOXIED IN PLACE. EPOXY SHALL CONFORM TO SECTION 728.03.01 OF USSPWC.

SPECIFICATION REFERENCE — UNIFORM STANDARD DRAWINGS CLARK COUNTY AREA
DATE — DWG.NO. 410 — PAGE NO. 110

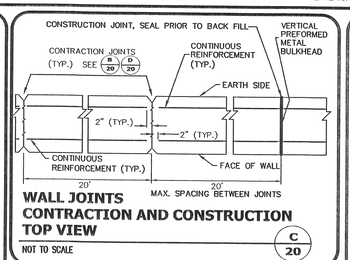
EMERGENCY ACCESS STEPS

NOT TO SCALE — L/20



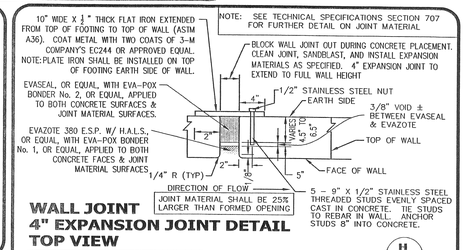
WALL JOINTS CONTRACTION AND CONSTRUCTION

NOT TO SCALE — B/20



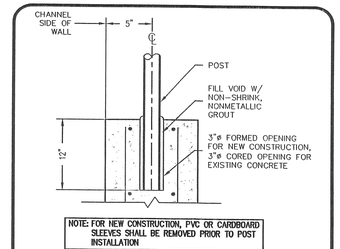
WALL JOINTS CONTRACTION AND CONSTRUCTION TOP VIEW

NOT TO SCALE — C/20



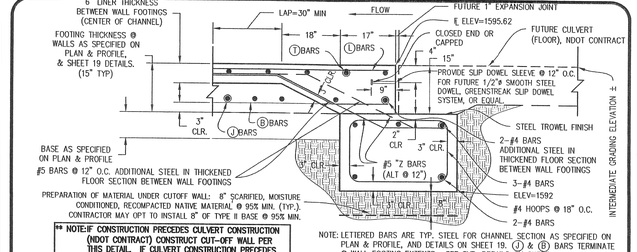
WALL JOINT 4" EXPANSION JOINT DETAIL TOP VIEW

NOT TO SCALE — H/20



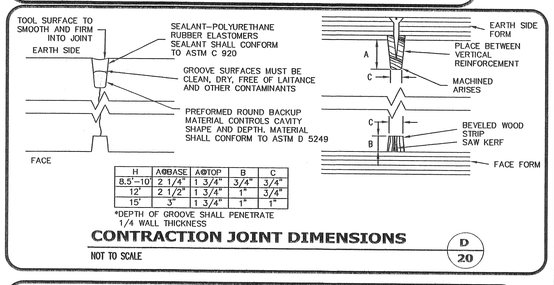
POST EMBEDMENT

NOT TO SCALE — REF.: NDOT DETAIL B-25.1.4 — I/20



CUT-OFF WALL @ STA 64+00

NOT TO SCALE — K/20

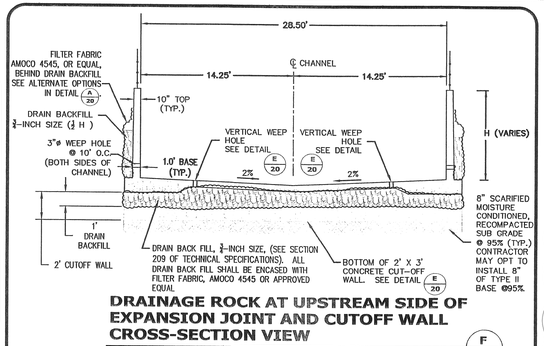


H	A@BASE	A@TOP	B	C
8.5'-10'	2 1/4"	1 3/4"	3/4"	3/4"
12'	2 1/2"	1 3/4"	1"	3/4"
15'	3"	1 3/4"	1"	1"

*DEPTH OF GROOVE SHALL PENETRATE 1/4 WALL THICKNESS

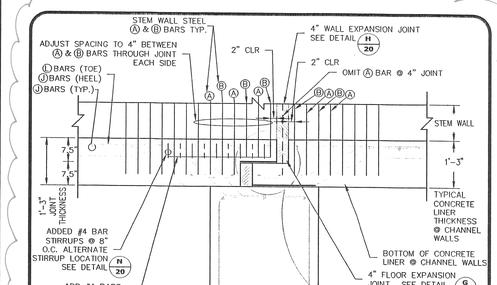
CONTRACTION JOINT DIMENSIONS

NOT TO SCALE — D/20



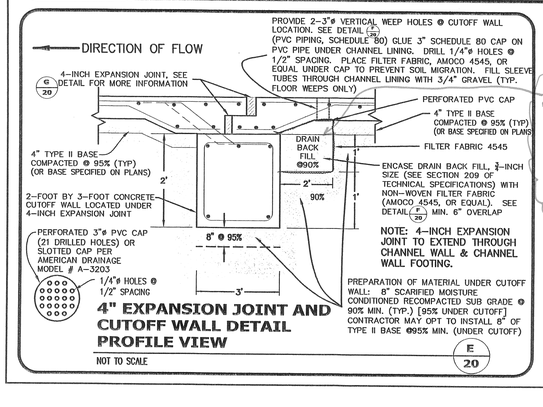
DRAINAGE ROCK AT UPSTREAM SIDE OF EXPANSION JOINT AND CUTOFF WALL CROSS-SECTION VIEW

NOT TO SCALE — F/20



4-INCH EXPANSION JOINT AT STEM WALL AND THICKENED FOOTING FOR CHANNEL WALLS

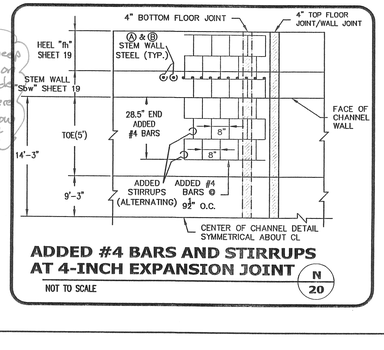
NOT TO SCALE — Constructed — M/20



4" EXPANSION JOINT AND CUTOFF WALL DETAIL PROFILE VIEW

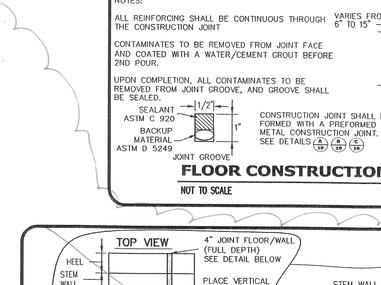
NOT TO SCALE — E/20

Drain Backfill & Weep Constructed on Upstream Side of Joint Wheen As-Builts show Turned Joint



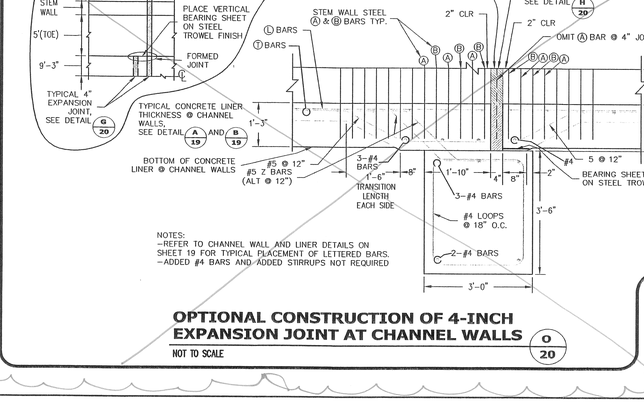
ADDED #4 BARS AND STIRRUPS AT 4-INCH EXPANSION JOINT

NOT TO SCALE — N/20



FLOOR CONSTRUCTION JOINTS

NOT TO SCALE — P/20



OPTIONAL CONSTRUCTION OF 4-INCH EXPANSION JOINT AT CHANNEL WALLS

NOT TO SCALE — O/20

= As-Built Information

REVISIONS			
NO	DESCRIPTION	DATE	BY
1	As-Built 4" Expansion Joint	6-2005	W.N.
2	As-Built Drain Backfill	6-2005	W.N.

BULLOCH BROTHERS ENGINEERING INC.
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CEDAR CITY, UTAH 84720
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CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

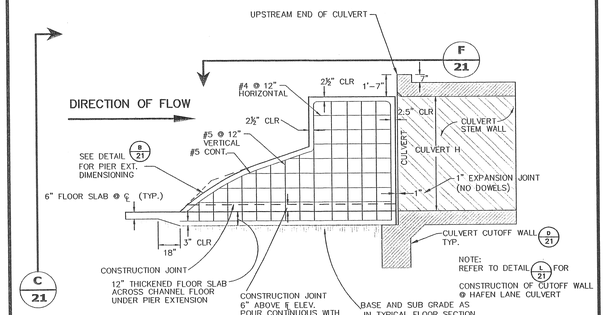
ABBOTT WASH CONVEYANCE GENERAL DETAILS FOR THE CITY OF MESQUITE MESQUITE, CLARK CO., NEVADA

WESTON L. NELSON Exp. 12/31/05 CIVIL No. 13043 — 7-14-05

WESTON L. NELSON Exp. 12/31/05 CIVIL — 12-11-05

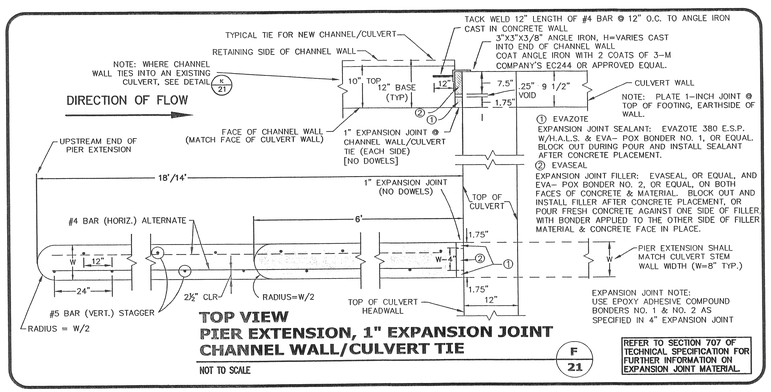
SCALE	DRAWN BY	CHECKED BY
NTS	B.C.	W.N.
PROJECT NO.	DATE	SHEET NO.
1029-90-05	NOV 2005	20 OF 26

PLOT DATE



PIER EXTENSION - STEEL DETAIL AT NORTH END OF CULVERTS PROFILE VIEW

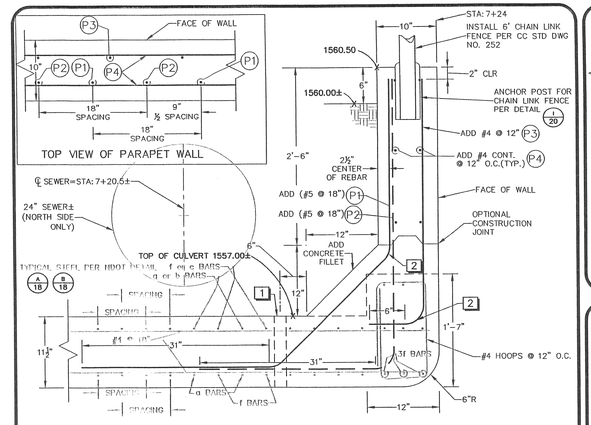
NOT TO SCALE — A 21



TOP VIEW PIER EXTENSION, 1" EXPANSION JOINT CHANNEL WALL/CULVERT TIE

NOT TO SCALE — F 21

REFER TO SECTION 707 OF TECHNICAL SPECIFICATION FOR FURTHER INFORMATION ON EXPANSION JOINT MATERIAL

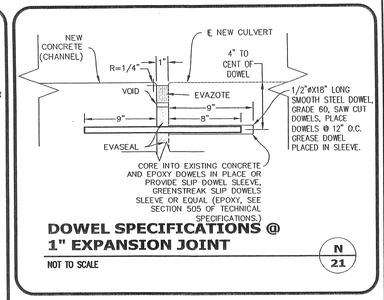


REVISED END OF CULVERT WITH PARAPET WALL

NOT TO SCALE — G 21

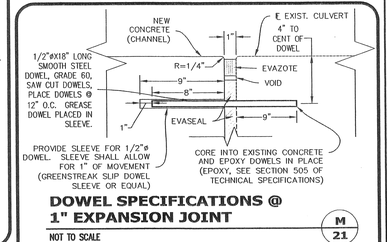
1 2" ø PVC PIPE @ 4' O.C. PLACE HEAVY DUTY SCREEN AND FILTER FABRIC OVER OPENING TO PREVENT SOIL MIGRATION. DRAINAGE OPENINGS SOUTH SIDE OF CULVERT ONLY.

2 MINIMUM BEND RADIUS FOR REBAR=6 BAR DIAMETERS (TYPICAL).



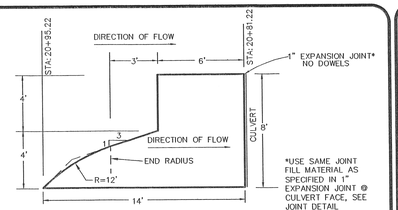
DOWEL SPECIFICATIONS @ 1" EXPANSION JOINT

NOT TO SCALE — N 21



DOWEL SPECIFICATIONS @ 1" EXPANSION JOINT

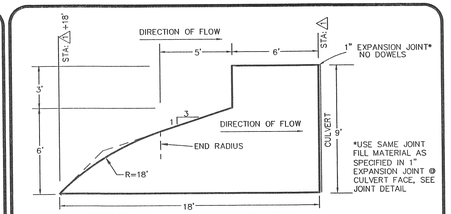
NOT TO SCALE — M 21



GEOMETRY-HAFEN LANE CULVERT BRIDGE PIER EXTENSION PROFILE VIEW

NOT TO SCALE — B 21

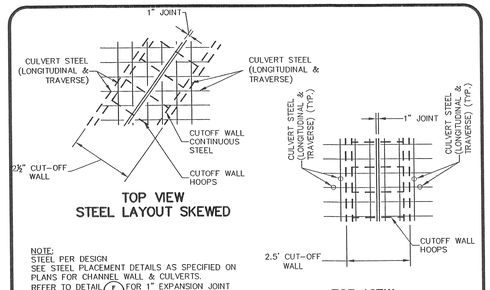
USE FOR HAFEN LN. CULVERT ONLY
UPSTREAM SIDE ONLY
STA:20+81.22



GEOMETRY-OTHER CULVERTS BRIDGE PIER EXTENSION PROFILE VIEW

NOT TO SCALE — B 21

USE FOR FOLLOWING CULVERTS	STA:
MESQUITE BLVD.	51+02.00
2ND SOUTH	34+18.44
SEWER TREATMENT ACCESS	7+24.00

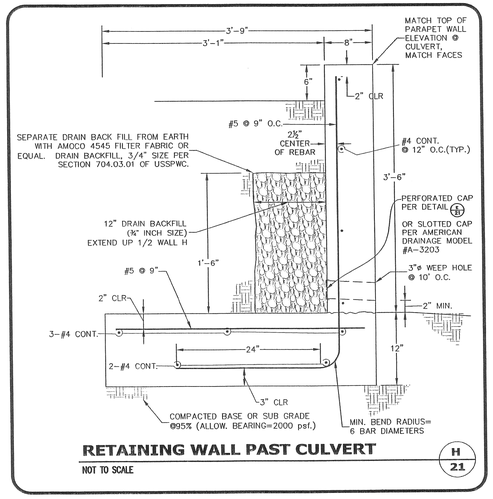


NOTE: STEEL PER DESIGN. SEE STEEL PLACEMENT DETAILS AS SPECIFIED ON PLANS FOR CHANNEL WALL & CULVERTS. REFER TO DETAIL F 21 FOR 1" EXPANSION JOINT LOCATED @ CHANNEL WALL/CULVERT WALL SECTION. (PIER EXTENSION REQUIRED @ UPSTREAM END ONLY)

MODIFIED-END-OF-CULVERT-DETAIL

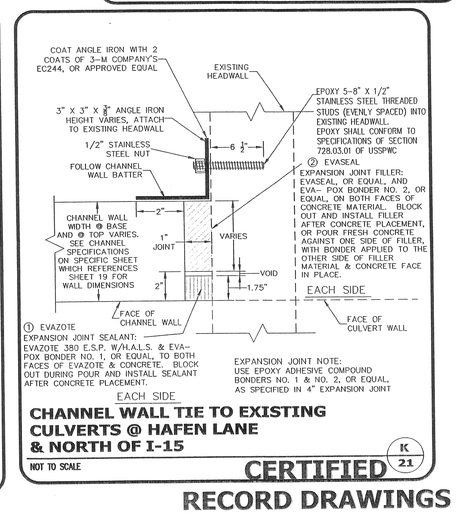
INSTALL 1/2"ø SMOOTH STEEL DOWELS @ 12" O.C. ACROSS JOINT. PROVIDE CAPPED SLEEVE (GREENSTREAK, TWO COMPONENT, SPEED DOWEL SYSTEM, OR EQUAL), TO ACCEPT 1/2"ø X 18" SMOOTH STEEL DOWELS (GRADE 60). STEEL DOWELS SHALL BE SAWCUT, PRIOR TO FINAL POUR, SLIP STEEL DOWELS INTO SLEEVES AND ADJUST STEEL DOWELS TO ALLOW FOR 1" OF MOVEMENT. DOWELS SHALL BE INSTALLED THROUGH JOINT FILLER MATERIAL. PORTION OF DOWEL PLACED IN SLEEVE SHALL BE GREASED.

6' CHAIN-LINK FENCE, OR OTHER, AS NOTED ON PLAN & PROFILE SHEETS.
ANCHOR POST AS NOTED ON PLAN & PROFILE SHEETS
FLOW DOWNSTREAM END
FLOW UPSTREAM END
CULVERT HEIGHT



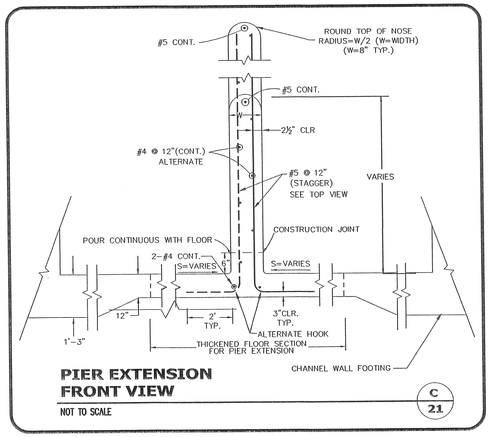
RETAINING WALL PAST CULVERT

NOT TO SCALE — H 21



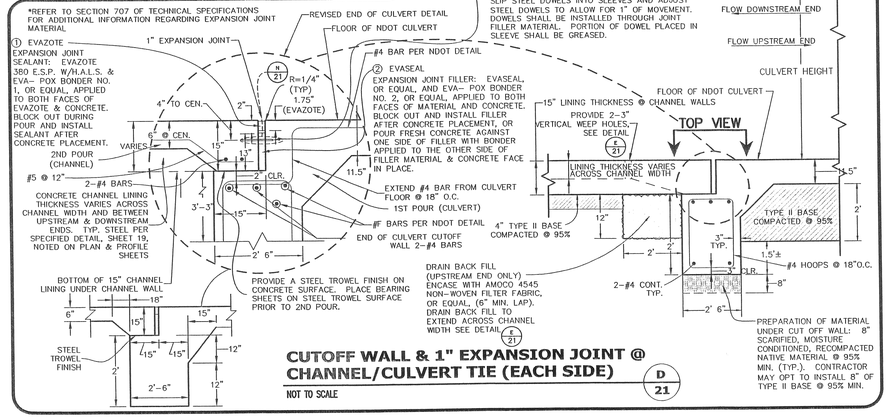
CHANNEL WALL TIE TO EXISTING CULVERTS @ HAFEN LANE & NORTH OF I-15

NOT TO SCALE — K 21



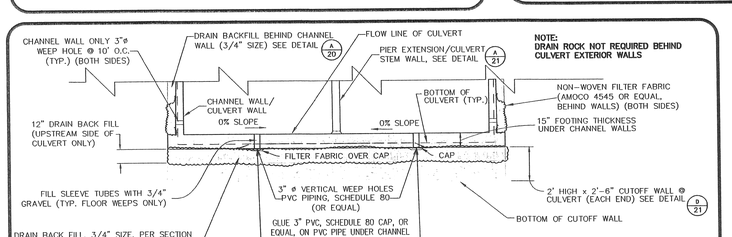
PIER EXTENSION FRONT VIEW

NOT TO SCALE — C 21



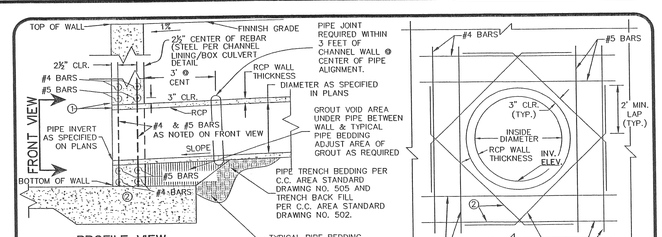
CUTOFF WALL & 1" EXPANSION JOINT @ CHANNEL/CULVERT TIE (EACH SIDE)

NOT TO SCALE — D 21



CUTOFF WALL, DRAIN ROCK AT CHANNEL WALL/CULVERT ENDS CROSS-SECTION

NOT TO SCALE — E 21

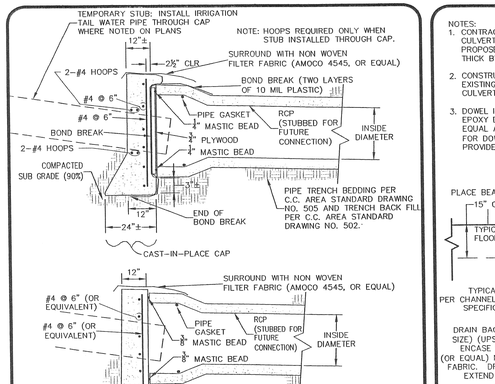


① INSTALLATION NOTE: PIPE SHALL BE SAWCUT FOR 45INSTALLATION ANGLE AND LENGTH SPECIFIED. END OF PIPE SHALL BE FLUSH WITH FACE OF CHANNEL WALL. STUB PIPE THROUGH FORMS AND CAST INTO WALL DURING CONCRETE PLACEMENT, OR PROVIDE ANNULAR BLOCK OUT OPENING THROUGH CHANNEL WALL. ANNULAR SPACE SHALL BE FILLED SOLID WITH NONSHRINK GROUT.

② ALL REINFORCEMENT SHOWN IS IN ADDITION TO NORMAL WALL REINFORCEMENT (FOR BOTH CHANNEL FACE, AND EARTH SIDE REINFORCEMENT MATS). ADDITIONAL REINFORCEMENT SHALL TIED TO NORMAL WALL REINFORCEMENT (BOTH FACES).

PIPE THROUGH WALL DETAIL: FRONT AND PROFILE VIEWS

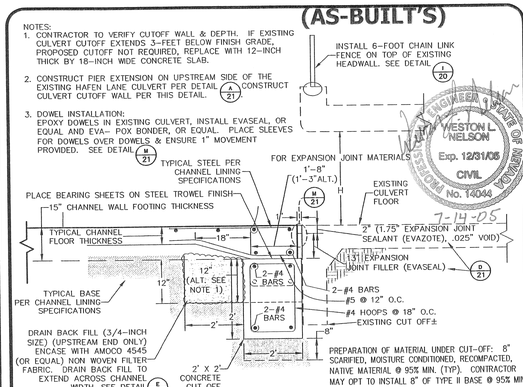
NOT TO SCALE — I 21



PIPE CAP DETAIL

NOT TO SCALE — J 21

NOTES:
1. CONTRACTOR TO VERIFY CUTOFF WALL & DEPTH. IF EXISTING CULVERT CUTOFF EXTENDS 3-FEET BELOW FINISH GRADE, PROPOSED CUTOFF NOT REQUIRED, REPLACE WITH 12-INCH THICK BY 18-INCH WIDE CONCRETE SLAB.
2. CONSTRUCT PIER EXTENSION ON UPSTREAM SIDE OF THE EXISTING HAFEN LANE CULVERT PER DETAIL A 21 CONSTRUCT CULVERT CUTOFF WALL PER THIS DETAIL.
3. DOWEL INSTALLATION: EPOXY DOWELS IN EXISTING CULVERT, INSTALL EVASEAL, OR EQUAL AND EVA- POX BONDER, OR EQUAL. PLACE SLEEVES FOR DOWELS OVER DOWELS & ENSURE 1" MOVEMENT PROVIDED. SEE DETAIL M 21



CHANNEL FLOOR TIE TO EXISTING CULVERT @ HAFEN LANE

NOT TO SCALE — L 21

WESTON L NIELSON — Exp. 12/31/05 — CIVIL — No. 14044 — 7-14-05

WESTON L NIELSON — Exp. 12/31/06 — CIVIL — No. 14044 — 12-11-06

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

REVISIONS		
NO	DESCRIPTION	DATE

BY

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ABBOTT WASH CONVEYANCE GENERAL DETAILS

FOR

THE CITY OF MESQUITE

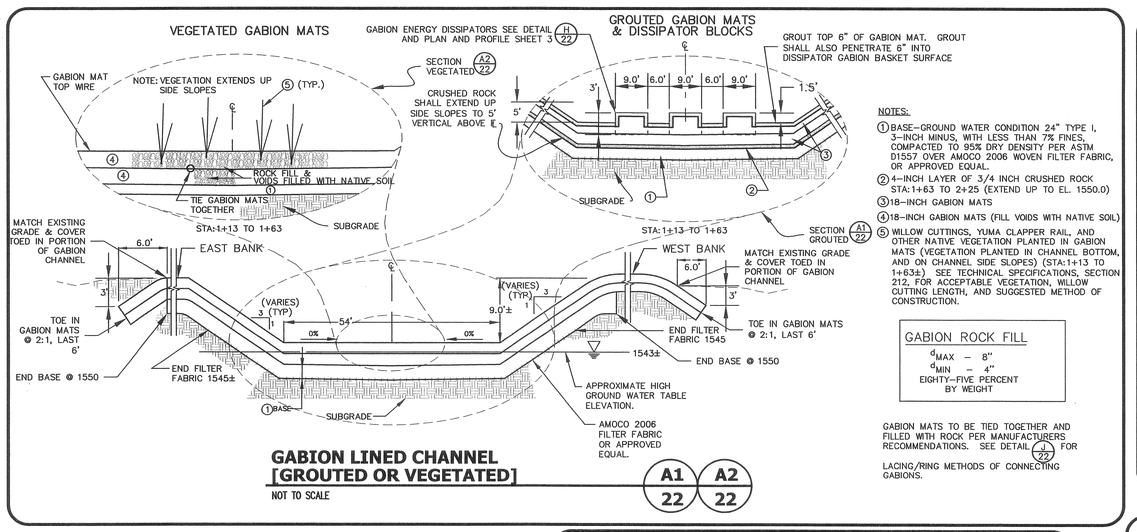
MESQUITE, CLARK CO., NEVADA

MESQUITE, NEVADA

SCALE	DRAWN BY	CHECKED BY
NTS	B.C.	W.N.

PROJECT NO	DATE	SHEET NO
1029-90-05	NOV 2005	21 OF 26

PLOT DATE



GABION LINED CHANNEL [GROUTED OR VEGETATED]

NOT TO SCALE

A1 22 | A2 22

NOTES:

(1) BASE – GROUND WATER CONDITION 24" TYPE I, 3-INCH MINUS, WITH LESS THAN 7% FINES, COMPACTED TO 95% DRY DENSITY PER ASTM D1557 OVER AMOCO 2006 WOVEN FILTER FABRIC, OR APPROVED EQUAL.

(2) 4-INCH LAYER OF 3/4 INCH CRUSHED ROCK STA:1+63 TO 2+25 (EXTEND UP TO EL. 1550.0)

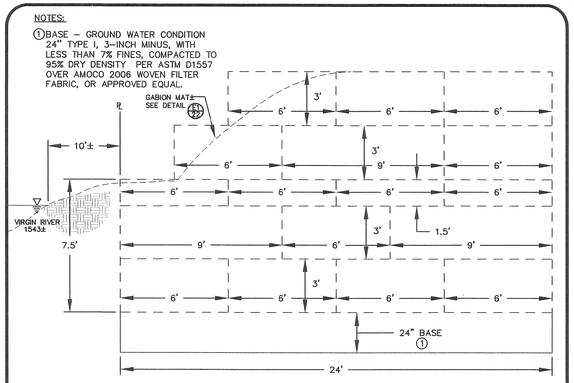
(3) 18-INCH GABION MATS

(4) 18-INCH GABION MATS (FILL VOIDS WITH NATIVE SOIL)

(5) WILLOW CUTTINGS, YUMA CLAPPER RAIL, AND OTHER NATIVE VEGETATION PLANTED IN GABION MATS (VEGETATION PLANTED IN CHANNEL BOTTOM, AND ON CHANNEL SIDE SLOPES) (STA:1+13 TO 1+63±) SEE TECHNICAL SPECIFICATIONS, SECTION 212, FOR ACCEPTABLE VEGETATION, WILLOW CUTTING LENGTH, AND SUGGESTED METHOD OF CONSTRUCTION.

GABION ROCK FILL
d_{MAX} – 8"
d_{MIN} – 4"
EIGHTY–FIVE PERCENT BY WEIGHT

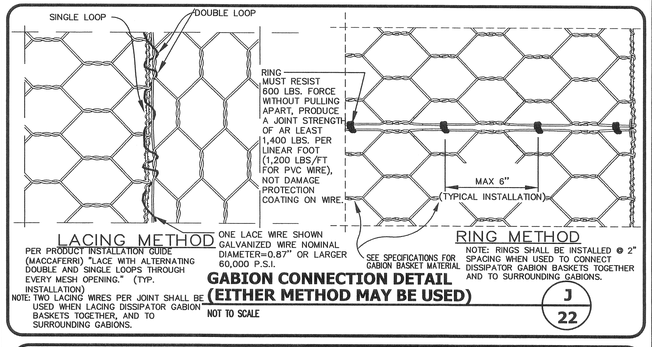
GABION MATS TO BE TIED TOGETHER AND FILLED WITH ROCK PER MANUFACTURERS RECOMMENDATIONS. SEE DETAIL (J/22) FOR LACING/RING METHODS OF CONNECTING GABIONS.



CUTOFF WALL EXTENSION CROSS-SECTION 2

NOT TO SCALE

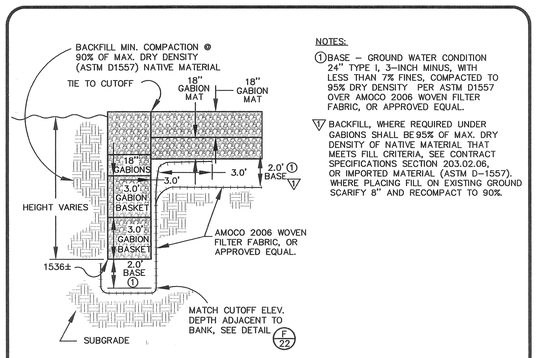
E2 22



GABION CONNECTION DETAIL (EITHER METHOD MAY BE USED)

NOT TO SCALE

J 22



NOTES:

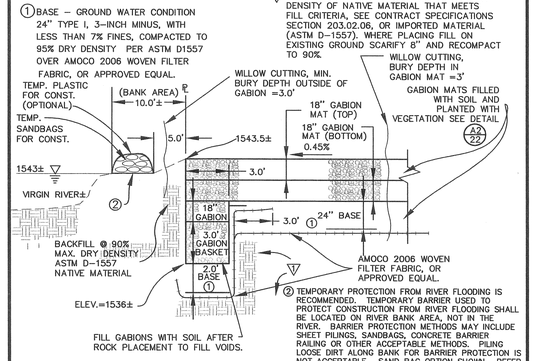
(1) BASE – GROUND WATER CONDITION 24" TYPE I, 3–INCH MINUS, WITH LESS THAN 7% FINES, COMPACTED TO 95% DRY DENSITY PER ASTM D1557 OVER AMOCO 2006 WOVEN FILTER FABRIC, OR APPROVED EQUAL.

(V) BACKFILL, WHERE REQUIRED UNDER GABIONS SHALL BE 95% OF MAX. DRY DENSITY OF NATIVE MATERIAL THAT MEETS FILL CRITERIA, SEE CONTRACT SPECIFICATIONS SECTION 203.02.06, OR IMPORTED MATERIAL (ASTM D–1557). WHERE PLACING FILL ON EXISTING GROUND SCARIFY 8" AND RECOMPACT TO 90%.

CUTOFF WALL EXTENSION INTO BANK CROSS-SECTION 1

NOT TO SCALE

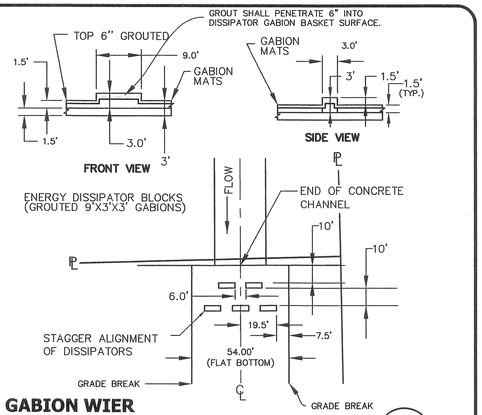
E1 22



GABION MATS/ CUT OFF WALL CHANNEL CENTER TIE TO RIVER (VEGETATED)

NOT TO SCALE

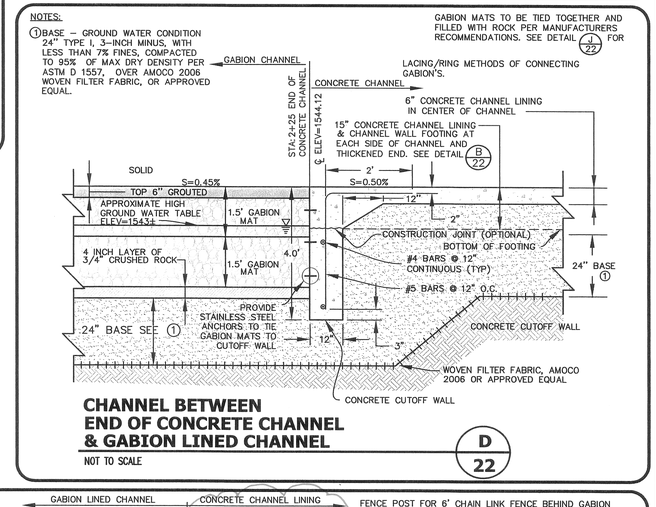
G 22



GABION WIER ENERGY DISSIPATORS

NOT TO SCALE

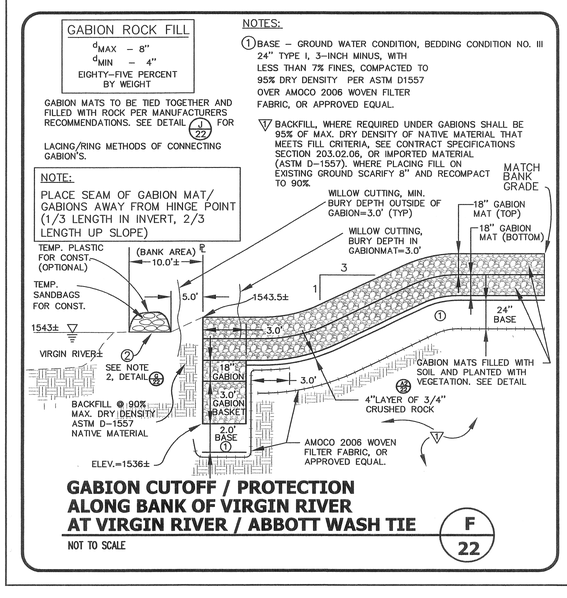
H 22



CHANNEL BETWEEN END OF CONCRETE CHANNEL & GABION LINED CHANNEL

NOT TO SCALE

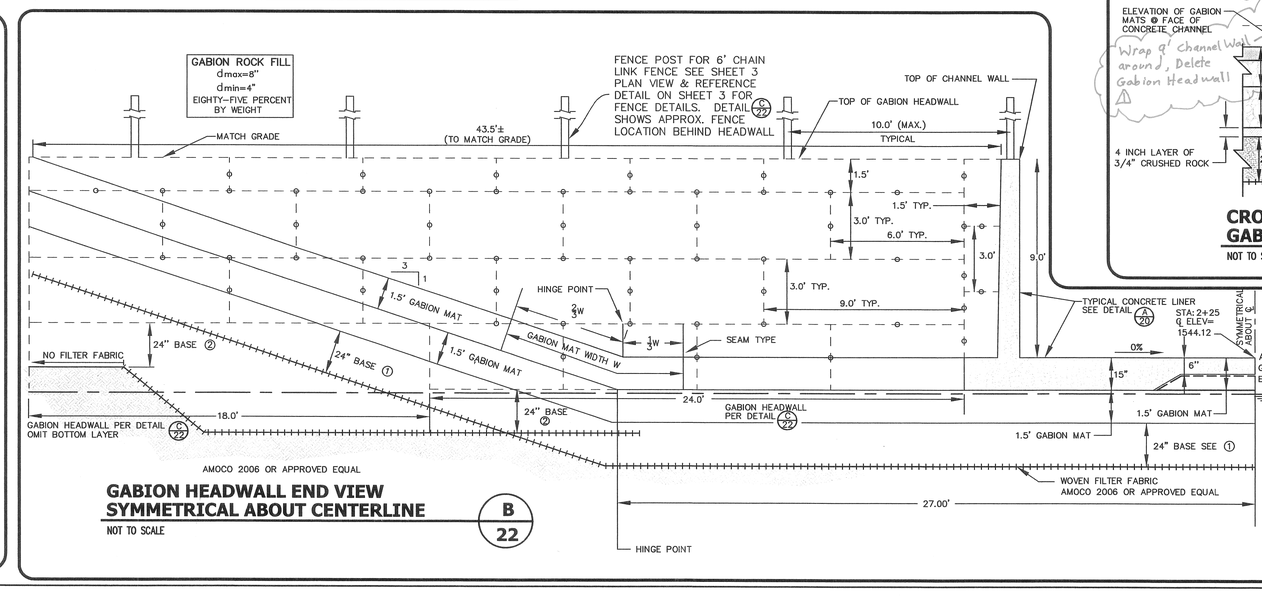
D 22



GABION CUTOFF / PROTECTION ALONG BANK OF VIRGIN RIVER AT VIRGIN RIVER / ABBOTT WASH TIE

NOT TO SCALE

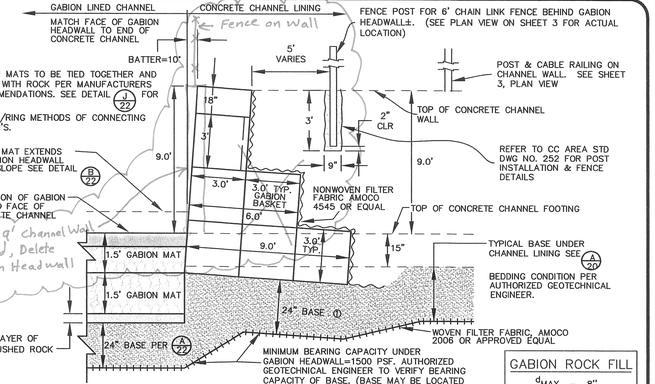
F 22



GABION HEADWALL END VIEW SYMMETRICAL ABOUT CENTERLINE

NOT TO SCALE

B 22



CROSS SECTION VIEW GABION HEADWALL

NOT TO SCALE

C 22

REVISIONS

NO	DESCRIPTION	DATE	BY
1	As-Built Updated	6-2005	JRH

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ABBOTT WASH CONVEYANCE GENERAL DETAILS (GABIONS)

FOR

THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA
MESQUITE, NEVADA

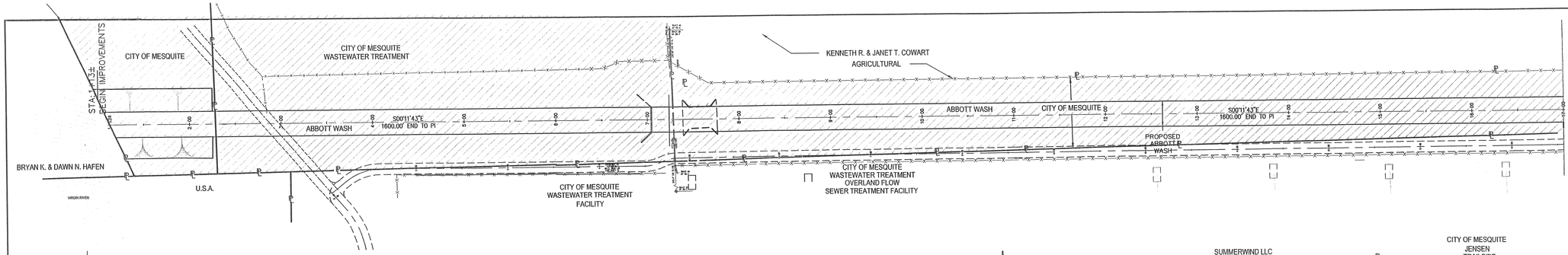
WESTON L. NELSON Exp. 12/31/03 CIVIL No. 14044 STATE OF NEVADA
12-11-03

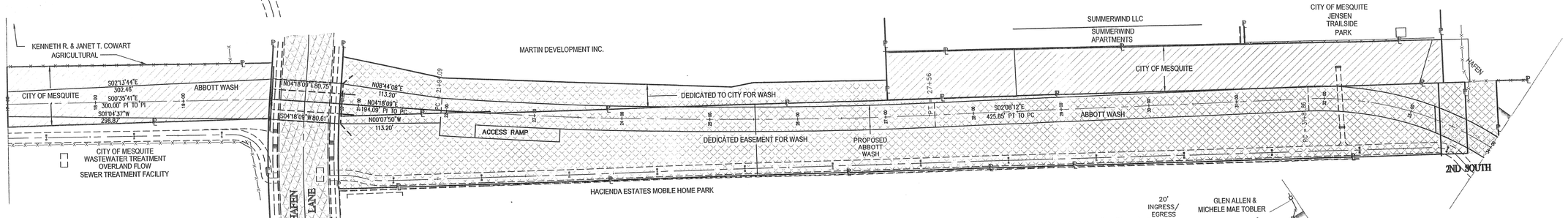
WESTON L. NELSON Exp. 12/31/05 CIVIL No. 14044 STATE OF OKLAHOMA
7-14-05

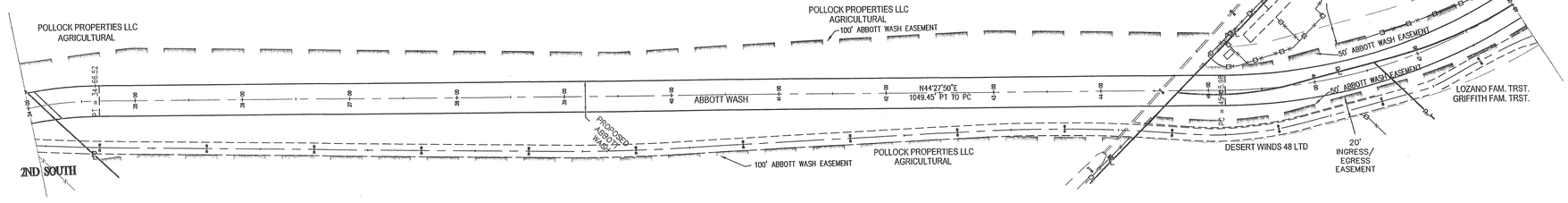
PLOT DATE

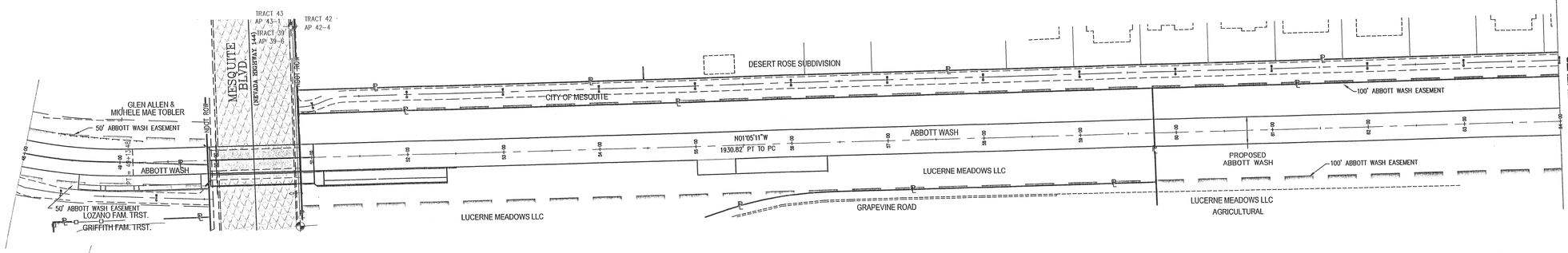
SCALE: NTS	DRAWN BY: JRH	CHECKED BY: WN
PROJECT NO: 102-90-05	DATE: NOV 2003	SHEET NO: 22 OF 26

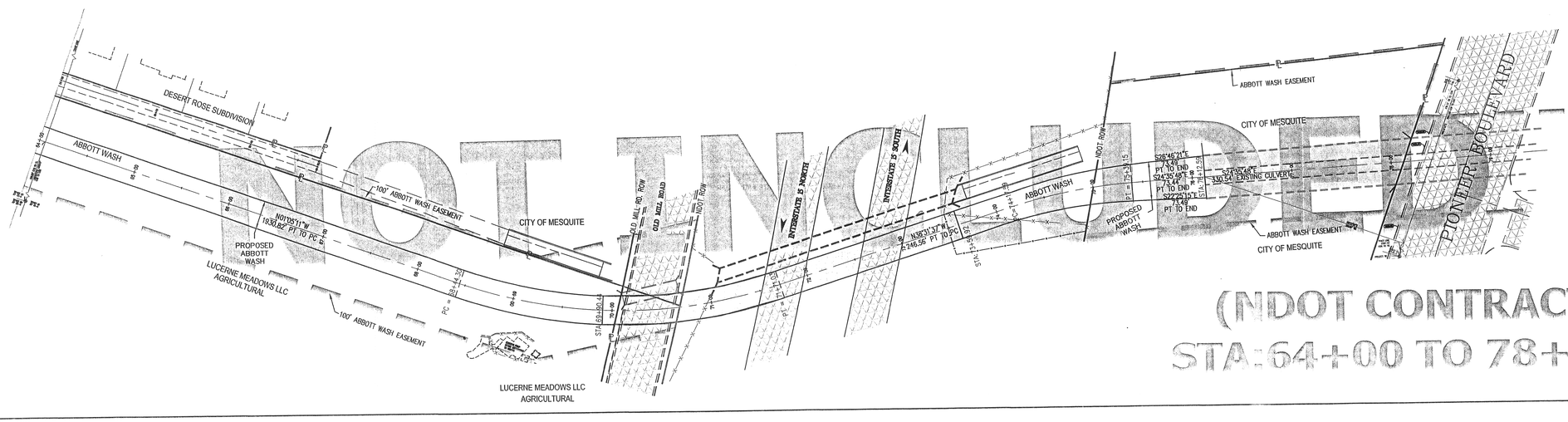
CERTIFIED RECORD DRAWINGS (AS-BUILT'S)











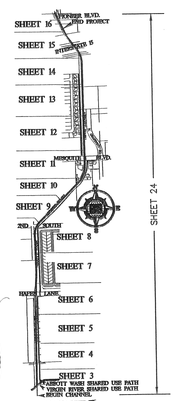
NOT INCLUDED

(NDOT CONTRACT)

STA 64+00 TO 78+12±

LEGEND

- = CENTERLINE OF ALIGNMENT
- = ABBOTT WASH EASEMENT
- = DEDICATED FOR WASH IMPROVEMENTS
- = EXISTING STREETS
- = CITY OF MESQUITE PROPERTY
- = SHARED USE PATH PER DESIGN
- = PROPERTY LINE



KEY MAP

CERTIFIED
RECORD DRAWINGS
(AS-BUILT'S)

PLOT DATE

REVISIONS NO	DESCRIPTION	DATE	BY

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MESQUITE, NEVADA 89027
(702) 346-3101

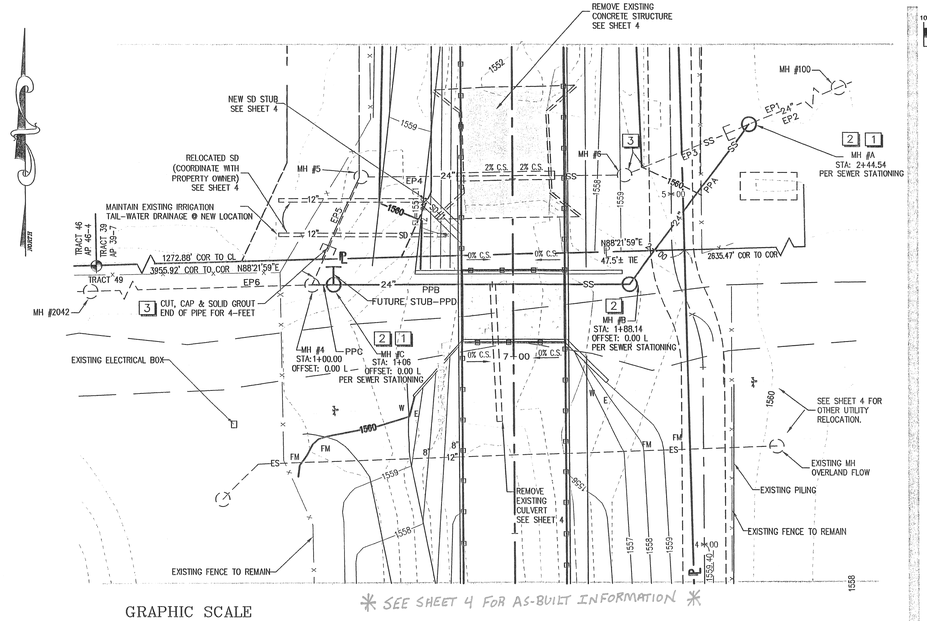
BBI

ABBOTT WASH CONVEYANCE EXISTING EASEMENTS FOR THE CITY OF MESQUITE MESQUITE, CLARK CO., NEVADA

MESQUITE, NEVADA

SCALE	DRAWN BY	CHECKED BY
1"=60'	JRH	W.N.

PROJECT NO	DATE	SHEET NO
102-90-05	NOV 2003	24 OF 26

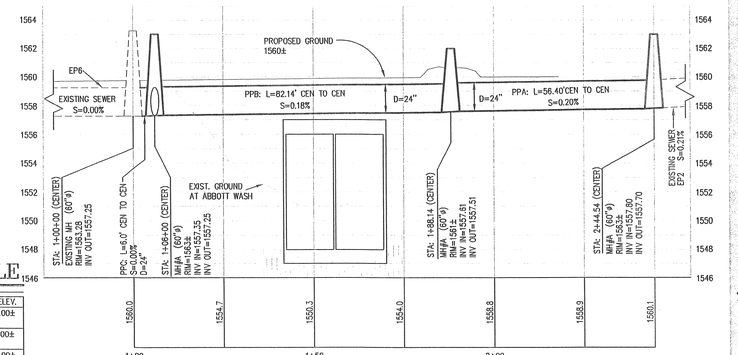


GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

SEWER LINE PLAN VIEW

STA:1+00 TO STA: 2+44.54
SCALE HOR: 1"=20'



SEWER LINE PROFILE

STA:1+00.00 TO STA:2+44.54
SCALE HOR: 1"=20'
SCALE VER: 1"=5'

SEWER MANHOLE TABLE

MANHOLE #	INVERT IN	INVERT OUT	RIM ELEV.
NEW #A	1557.80 (NE)	1557.70 (SW)	1563.00±
NEW #B	1557.61 (NE)	1557.51 (W)	1561.00±
NEW #C	1557.35 (E)	1557.25 (W)	1563.00±
EXISTING #2042	1557.30 (E)	1557.25 (W)	1561.64
EXISTING #4	1557.25 (NE)	1557.25 (W)	1563.28
EXISTING #5	1557.69 (E)	1557.69 (SW)	1563.42
EXISTING #6	1557.73 (NE)	1557.68 (W)	1562.85
EXISTING #100	1558.50 (NE)	1558.48 (SW)	1563.13

SANITARY SEWER PIPE/SD PIPE

PIPE ID	BEARING	DISTANCE	SLOPE %	DIAMETER	MATERIAL
PPA	N36°01'05"E	56.40± C TO C	0.20±	24"	DI CLASS
PPB	N89°48'17"E	82.14' C TO C	0.18	24"	DI CLASS
PPC	N89°48'17"E	6.00' C TO C	0.00	24"	DI CLASS
PPD	N00°11'43"W	5.00' C TO CMP	0.50	24"	DI CLASS
EP1	N67°14'02"E	364.00' C TO C	0.21	24"	–
EP2	N67°14'02"E	326.50' C TO C	0.21	24"	–
EP3	N67°14'02"E	37.50' C TO C	0.21	24"	–
EP4	N89°29'38"E	73.03' C TO C	0.01	24"	–
EP5	N23°59'45"E	33.67' C TO C	1.31	24"	–
EP6	N88°19'05"E	111.24' C TO C	0.00	24"	–
SD1	PERP. TO WASH	32.00'	0.50	42"	RCP CLASS
SD2	PERP. TO WASH	16.00'	0.50	42"	RCP CLASS

LEGEND

- SS = NEW DUCTILE IRON SEWER LINE WITH SIZE SHOWN
- SS = EXISTING PVC SEWER LINE WITH SIZE SHOWN
- SD = NEW CPP STORM DRAIN WITH SIZE SHOWN
- SD = EXISTING CPP STORM DRAIN WITH SIZE SHOWN
- ES = EXISTING EFFLUENT SIPHON
- FM = EXISTING FORCE MAIN SEWER LINE
- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- x = EXISTING FENCE, FENCE TYPE VARIES
- = NEW FENCE AS NOTED ON PLANS
- = NEW MANHOLE
- = EXISTING MANHOLE
- = BOX CULVERT
- = EXISTING FEATURES OR OTHER AS NOTED ON PLANS
- = TRACT LINE
- 3 = CONSTRUCTION NOTE
- ROW = PROPERTY LINE

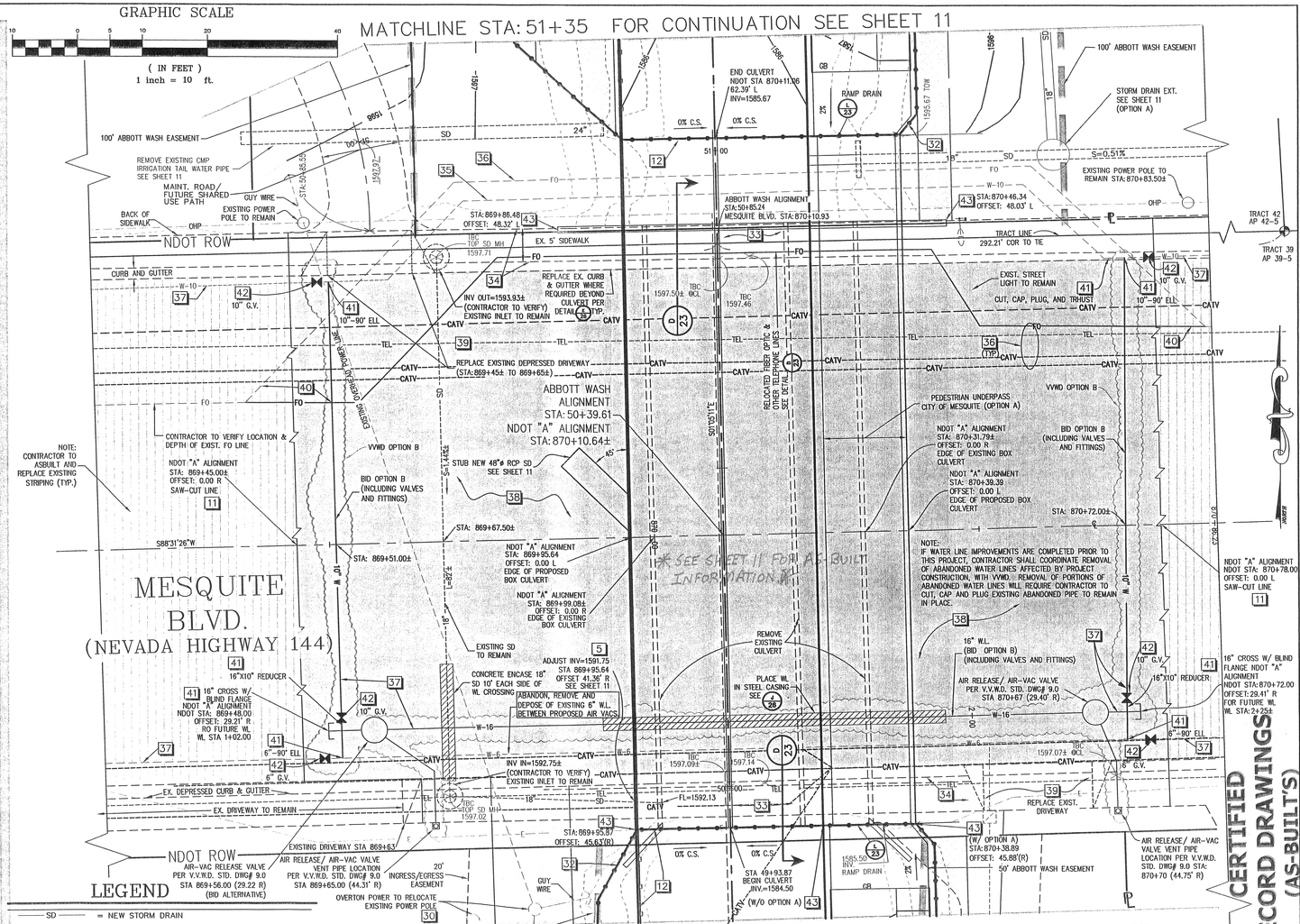
CONSTRUCTION NOTES

1. COORDINATE CONNECTION WITH THE CITY OF MESQUITE SANITATION DEPARTMENT. EXISTING SEWER TO REMAIN IN SERVICE UNTIL NEW SEWER IS IN PLACE AND READY FOR CONNECTION AT EACH END.
2. INSTALL NEW 60" STANDARD ECCENTRIC SEWER MANHOLE PER C.C. SANITATION DISTRICT "DESIGN & CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS", STANDARD DRAWING NO. SD-1 COORDINATE RIM ELEVATION WITH THE CITY OF MESQUITE SANITATION DEPARTMENT. MANHOLES SHALL CONSTRUCTED OF CORROSION RESISTANT MATERIALS. SEE SECTION 630 OF TECHNICAL SPECIFICATIONS.
3. CONTRACTOR TO REMOVE EXISTING SEWER AND SEWER MANHOLES FROM NEW MH #A TO EXISTING MH #4, CONTRACTOR SHALL CUT, CAP & SOLID GROUT EXISTING PIPE 5' OUT FROM UPSTREAM SIDE OF MH#A AND DOWNSTREAM SIDE OF NEW MH#A

GRAPHIC SCALE

(IN FEET)
1 inch = 10 ft.

MATCHLINE STA: 51+35 FOR CONTINUATION SEE SHEET 11

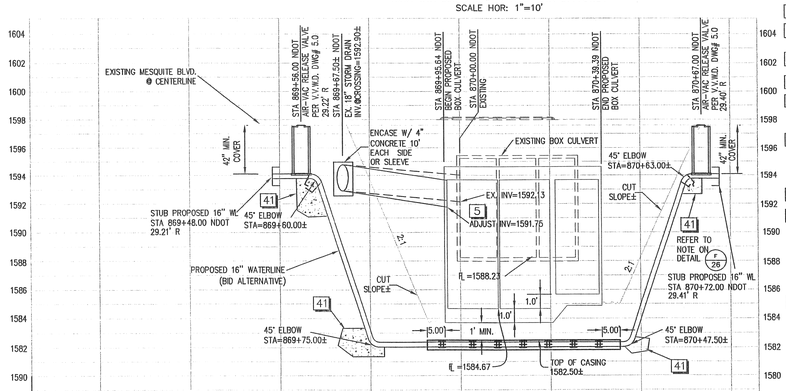


LEGEND

- SD = NEW STORM DRAIN
- SD = EXISTING STORM DRAIN
- W = EXISTING WATER LINE WITH SIZE SHOWN
- = EXISTING STREET LIGHT POWER ELECTRICAL LINE
- CATV = EXISTING CABLE TV LINE
- FO = EXISTING FIBER OPTIC LINE
- = CENTERLINE OF ALIGNMENT
- = DESIGN INDEX (10') CONTOURS
- = DESIGN INTERMEDIATE (2') CONTOURS
- = EXISTING INDEX (10') CONTOURS
- = EXISTING INTERMEDIATE (2') CONTOURS
- = SAWCUT LINE
- = EXISTING GRADE @ CENTERLINE
- = EXISTING TOP OF BANK – EAST
- = EXISTING TOP OF BANK – WEST
- x = EXISTING FENCE, FENCE TYPE VARIES
- = NEW FENCE AS NOTED ON PLANS
- = ABBOTT WASH EASEMENT
- = NEW ASPHALT
- = EXISTING ASPHALT
- = NEW BOX CULVERT
- = EXISTING FEATURES OR OTHER AS NOTED ON PLANS
- = TRACT LINE
- = NEW MANHOLE
- 3 = CONSTRUCTION NOTE
- ROW = RIGHT OF WAY
- = PROPERTY LINE
- A/23 = CROSS SECTION
- = TRACT CORNER PER RECORD OF SURVEY FOR CLARK COUNTY FILE 31, PAGE 65 OF SURVEYS
- FL OF BOX 1547.00 = NEW SPOT ELEVATION
- X FL OF BOX 1547.00 = FUTURE EXISTING SPOT ELEVATION

16" WATER LINE PLAN AT MESQUITE BLVD.

NDOT STA 868+24.02 TO NDOT STA 871+61.84
SCALE HOR: 1"=10'



16'' WATER LINE PROFILE AT MESQUITE BLVD.

SCALE HOR: 1"=20'
SCALE VER: 1"=5'

MATCHLINE STA: 50+00 FOR CONTINUATION SEE SHEET 11

CONSTRUCTION NOTES

5. EXTEND/TRIM CULVERT TO EXTERIOR FACE OF CHANNEL WALL, SEE DETAIL (D/21) FOR TYPICAL PIPE THROUGH WALL CONSTRUCTION.
11. SAW CUT AND MATCH NEW PAVEMENT WITH EXISTING PAVEMENT.
12. INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL SEE DETAIL (A/23)
30. COORDINATE POLE STABILITY REQUIREMENTS, DURING CONSTRUCTION, WITH OVERTON POWER.
32. INSTALL CHANNEL IDENTIFICATION SIGN SEE DETAIL (B/26)
33. REPLACE EXISTING CURB, GUTTER, SIDEWALK & GUARDRAIL WHERE REMOVED FOR CONSTRUCTION ON TOP OF NEW BOX CULVERT. CONTRACTOR SHALL ASBUILT EXIST. SURFACE PRIOR TO CONSTRUCTION TO PRESERVE GRADES. SEE DETAIL (D/23)
34. REPLACE EXISTING CURB, GUTTER, & SIDEWALK WHERE REMOVED FOR CONSTRUCTION ON EACH SIDE OF NEW BOX CULVERT. CONTRACTOR SHALL ASBUILT EXIST. SURFACE PRIOR TO CONSTRUCTION TO PRESERVE GRADES. SEE DETAIL (E/26) APPROXIMATE LIMITS OF REPLACEMENT INCLUDES SIDEWALK, CURB & GUTTER BETWEEN NEW BOX CULVERT & EXISTING DRIVEWAYS, EACH END.
35. ABANDON, REMOVE & DISPOSE OF EXISTING 10" WL UNDER EXISTING CULVERT
36. CONTRACTOR TO VERIFY LOCATION OF FIBER OPTIC, TELEPHONE CABLES, CABLE TV AND ELECTRICAL CONDUITS. CONTRACTOR SHALL PROTECT AND SUPPORT UTILITY SERVICES THROUGHOUT CONST. CONTINUED SERVICE NEEDS TO BE MAINTAINED THROUGHOUT CONST. CONTRACTOR IS TO COORDINATE CONDUIT RELOCATION WITH RIO VIRGIN TELEPHONE, OR APPROPRIATE UTILITY, THE RELOCATED FIBER OPTIC AND TELEPHONE CONDUITS. LOCATION SHOWN ON DETAIL (D/23) CONTRACTOR TO RELOCATE EXISTING UTILITIES.
37. CONTRACTOR SHALL VERIFY LOCATION OF WATER LINES. CONTRACTOR SHALL COORDINATE RELOCATION WITH VIRGIN VALLEY WATER DISTRICT, WATER SERVICE SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.
38. CONTRACTOR SHALL REPLACE ASPHALT REMOVED FROM MESQUITE BLVD. SEE DETAIL (C/26) (APPROX. LIMITS SHOWN). CONTRACTOR SHALL ASBUILT ROAD PRIOR TO CONSTRUCTION TO MAINTAIN GRADE.
39. INSTALL 12' COMMERCIAL DRIVEWAY, PER CC AREA STD DWG NO. 224. (USDPWC)
40. CONTRACTOR TO VERIFY LOCATION & DEPTH OF EXISTING UTILITIES. CONTRACTOR SHALL EXTEND SAW-CUT LINE TO INCLUDE UTILITIES CONSTRUCTION AND ADJUSTMENT OUTSIDE OF SHOWN SAW-CUT LINE, IF REQUIRED.
41. ALL FITTINGS SHALL BE THRUST BLOCKED PER DETAIL (F/26)
42. ALL VALVES SHALL BE INSTALLED PER DETAILS (H/26) (G/26)
43. END NEW CONCRETE BARRIER RAILING, (BLUNT END) SEE DETAIL (D/23)

NO	DESCRIPTION	DATE	BY

THESE PLANS ARE THE PROPERTY OF BULLOCH BROTHERS ENGINEERING INC. AND ARE NOT TO BE USED IN WHOLE OR IN PART FOR ANY PROJECT OTHER THAN THE ONE FOR WHICH THEY WERE PREPARED. ANY REUSE WITHOUT WRITTEN PERMISSION AND ADJUSTMENT OF THE APPROPRIATE COMPENSATION WILL BE AT THE USER'S SOLE RISK AND WITHOUT LIABILITY TO BULLOCH BROTHERS ENGINEERING INC. THE USER OF THESE PLANS SHALL INDEMNIFY AND HOLD HARMLESS BULLOCH BROTHERS ENGINEERING INC. AGAINST ALL CLAIMS, DAMAGES, LOSSES AND EXPENSES ARISING OUT OF OR RESULTING THEREFROM.

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS—LAND SURVEYORS—LAND PLANNERS
P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586-9592
761 W MESQUITE BLVD. STE 4
MESQUITE, NEVADA 89027
(702) 346-5101

CERTIFIED RECORD DRAWINGS (AS-BUILT'S)

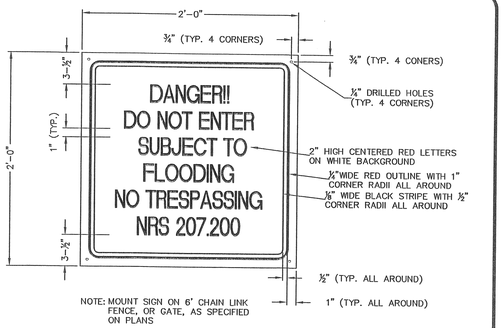
ABBOTT WASH CONVEYANCE PLAN AND PROFILE 15

FOR THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA
MESQUITE, NEVADA

WESTON L. NELSON Exp. 12/31/05 CIVIL No. 14044
7-14-05

SCALE:	AS NOTED	DRAWN BY:	JRE	CHECKED BY:	WN
PROJECT NO:	1029-190-05	DATE:	NOV 2003	SHEET NO:	25 OF 26

PLOT DATE



FLOOD WARNING SIGN DETAIL — A / 26

NOT TO SCALE



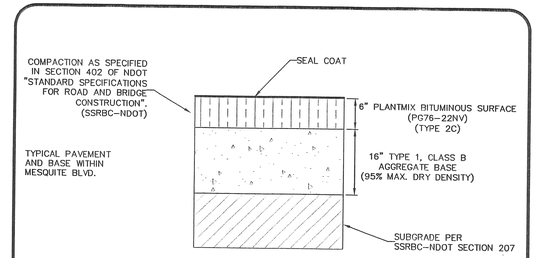
GREEN SIGN PANEL WITH 3" HIGH WHITE LETTERING

*REFLECTIVE SHEET CLASS 4
SIGN MATERIAL AND REFLECTIVE SHEETING SHALL MEET USS CLARK CO. AREA PER SECTION 716.03.03. ALUMINUM BLANK: ALUMINUM ALLOY ALCLAD 5052–H38, OR 6061–16, HEAT TREATED, HIGH TENSILE, DEGREASED AND ALODINE 1200 FINISH. THICKNESS TO BE 0.10 INCHES.

NOTE:
SIGN TO BE MOUNTED ON CHAIN LINK FENCE OR 2" SIGN POST, AS SPECIFIED ON PLANS. IF 2" SIGN POST SPECIFIED, POST SHALL BE INSTALLED PER C.C. AREA UNIFORM STD. DWG. NO. 249 AT A HEIGHT OF 7'–0" FROM GROUND SURFACE TO BOTTOM OF SIGN, WITH THE EDGE OF SIGN 6' FROM TBC.

CHANNEL IDENTIFICATION SIGN DETAIL — B / 26

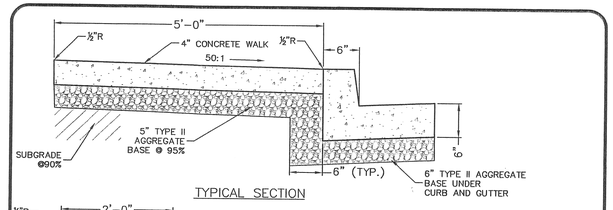
NOT TO SCALE



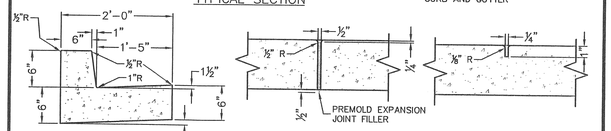
ASPHALT MATERIAL SPECIFICATIONS.
–ASPHALT CEMENT, GRADE PG 76–22NV (DENSE GRADE) 4.5%
–SPECIFIC GRAVITY 2.7 (RECOMMENDED)
–MINERAL FILLER 1.5%
–EMULSIFIED ASPHALT, TYPE SS–1h (DILUTED)
TACK PBS LIFTS 0.04 (gal/sqyd)
–SEAL COAT 0.12 (gal/sqyd)
–LIQUID ASPHALT, TYPE MC–70, PRIME COAT 0.28 (gal/sqyd)

TYPICAL ASPHALT AND BASE REPLACEMENT WITHIN MESQUITE BLVD. — C / 26

NOT TO SCALE PVEMENT AND BASE REPLACEMENT SHALL CONFORM TO SSRBC–NDOT SECTION 401, 402, 405, 406, AND 407.



TYPICAL SECTION



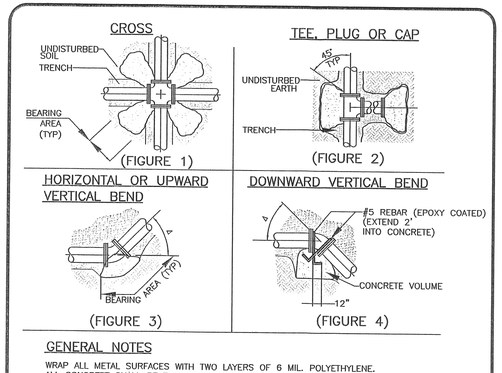
"L" TYPE CURB AND GUTTER
1/2" EXPANSION JOINTS AT ALL COLD JOINTS. AT 300' MAX FOR EXTRUDED CURB, OR AT 30 30' MAX FOR FORMED CURB. ALL CURB SHALL BE WATER TESTED.

EXPANSION JOINTS
(STD. WALK EXP JOINT IS TO BE INSTALLED @ 15' INTERVALS)
30' INTERVALS IF AN APPROVED ELASTOMERIC SEALANT USED TO SEAL JOINT. (ASTM C–904)

WEAKENED PLANE JOINTS
(TOOLED @ 5' INTERVALS FOR SIDEWALK)
(TOOLED @ 10' INTERVALS FOR CURB & GUTTER)

SIDEWALK/CURB & GUTTER/SIDEWALK JOINTS PER C.C. AREA STD. DWGS. — E / 26

NOT TO SCALE
REFER TO: C.C. AREA STD. DWGS. NO. 216, 234, AND 202



GENERAL NOTES

WRAP ALL METAL SURFACES WITH TWO LAYERS OF 6 MIL. POLYETHYLENE.
ALL CONCRETE SHALL BE TYPE V 4000 PSI MINIMUM,
28 DAYS COMPRESSIVE STRENGTH. CONCRETE IS TO BE PLACED AGAINST UNDISTURBED EARTH. TABLE BELOW DENOTES MINIMUM BEARING AREA OR VOLUME OF THRUST BLOCK
ALL VERTICAL SURFACES NOT BEARING AGAINST UNDISTURBED EARTH SHALL BE FORMED.

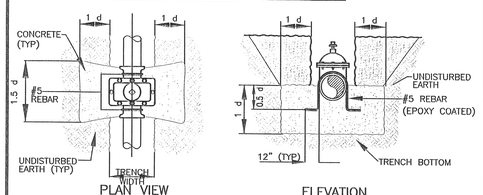
	BEARING AREA IN SQ FT						CONC/CU YDS		
PIPE ID	FIGURE	FIGURE	FIGURE 3, Δ				FIGURE 4, Δ		
	1	2	90°	45°	22½°	11¼°	45°	22½°	11¼°
4"	2	2	2	2	1	1	1.0	0.5	0.5
6"	2	3	4	2	1	1	1.5	1.0	0.5
8"	3	5	7	4	2	1	3.0	1.5	1.0
10"	4	8	11	6	3	2	4.0	2.5	1.5
12"	6	11	15	8	4	2	6.0	3.0	1.5
16"	10	20	28	15	8	4	10.5	6.0	3.0
18"	13	25	35	19	10	5	13.5	7.5	3.5
20"	16	31	44	24	12	6	16.0	9.0	4.5
24"	22	44	63	34	17	9	23.5	12.5	6.5

NOTE: USE O THRUST BLOCKS FOR PIPE DIAMETER GREATER THAN 12" REQUIRE PRIOR APPROVAL FROM VIRGIN VALLEY WATER DISTRICT, VVWD WILL BE ELEVATED ON A CASE BY CASE BASIS.

THRUST BLOCK INSTALLATION — F / 26

NOT TO SCALE
ALL FITTINGS SHALL CONFORM TO VVWD –DSSWW SPECIFICATIONS

LEGEND: d = NOMINAL PIPE SIZE

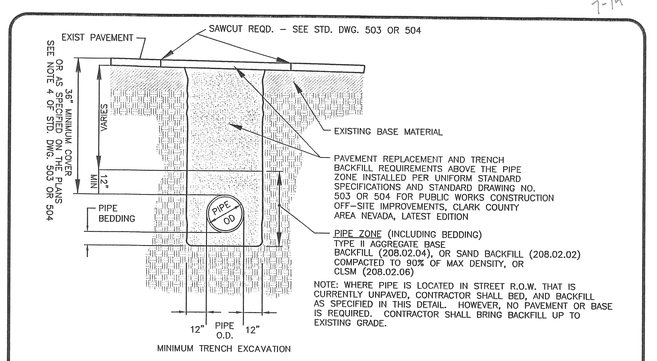


BUTTERFLY VALVES OR GATE VALVES

NOTES
1. ALL CONCRETE SHALL BE 4000 PSI MINIMUM 28 DAYS COMPRESSIVE STRENGTH
2. ALL VALVES TO BE WRAPPED WITH TWO LAYERS OF 6 MIL. POLYETHYLENE

ANCHOR BLOCK DETAILS FOR BUTTERFLY VALVES AND GATE VALVES — G / 26

NOT TO SCALE



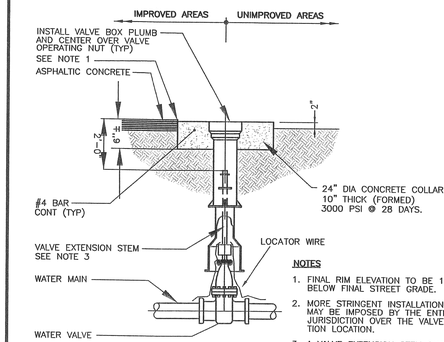
NOTE: WHERE PIPE IS LOCATED IN STREET R.O.W. THAT IS CURRENTLY UNPAVED, CONTRACTOR SHALL BED, AND BACKFILL AS SPECIFIED IN THIS DETAIL. HOWEVER, NO PAVEMENT OR BASE IS REQUIRED. CONTRACTOR SHALL BRING BACKFILL UP TO EXISTING GRADE.

TRENCH BACK FILL IN PAVED AREAS, UNPAVED AREAS WITHIN DEDICATED R.O.W. OR ROAD ACCESS — I / 26

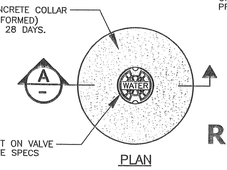
NOT TO SCALE (STREETS WITH 60' OR LESS R/W SEE STD. DWG. NO. 503)
(STREETS WITH GREATER THAN 60' R/W SEE STD. DWG. NO. 504)

NOTE: ALL TRENCHING WITHIN NDOT R.O.W. SHALL CONFORM TO SSRBC–NDOT SECTIONS 206 THROUGH 209.

VALVE BOX INSTALLATION



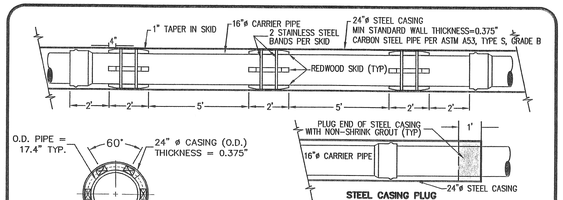
NOTES
1. FINAL RIM ELEVATION TO BE 1/8" TO 1/4" BELOW FINAL STREET GRADE.
2. MORE STRINGENT INSTALLATION REQUIREMENTS MAY BE IMPOSED BY THE ENTITY HAVING THE JURISDICTION OVER THE VALVE BOX INSTALLATION LOCATION.
3. A VALVE EXTENSION STEM SHALL BE PROVIDED WHERE THE DEPTH TO THE OPERATING NUT EXCEEDS FIVE (5) FEET.
4. CONTRACTOR TO FORM CONCRETE COLLAR IN UNIMPROVED AREAS WITH SONOTUBE AND REMOVE PRIOR TO BACK FILL INSTALLATION (TYP).



NOTE: VALVE INSTALLATION SHALL CONFORM TO VVWD–DSSWW SPECIFICATIONS AND VVWD–DSSWW STD. DWG. NO. 7 AND 7.1.

VALVE BOX INSTALLATION — H / 26

NOT TO SCALE



NOTE: CASING CONSTRUCTION SHALL CONFORM TO SECTION 629.03.16 OF UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA, UNLESS OTHERWISE DETAILED HEREIN.

NOTE: DETAIL SHOWS TYPICAL 18 LAY LENGTHS, SPACING MAY BE ADJUSTED FOR 20' LAY LENGTHS.

CASING DETAIL (BID ALTERNATIVE) — J / 26

NOT TO SCALE

REVISIONS

NO	DESCRIPTION	DATE	BY

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BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS–LAND SURVEYORS–
LAND PLANNERS
P.O. BOX 3174
CEDAR CITY, UTAH 84720
(435) 586–9592
561 W MESQUITE BLVD. STE 4
MESQUITE, NEVADA 89027
(702) 346–5101

ABBOTT WASH CONVEYANCE
GENERAL DETAILS
FOR
THE CITY OF MESQUITE
MESQUITE, CLARK CO., NEVADA
MESQUITE, NEVADA

SCALE: NTS
DRAWN BY: JRH
CHECKED BY: WAN
PROJECT NO: 1029–50–05
DATE: NOV 2005
SHEET NO: 25 OF 26
PLOT DATE:

BULLOCH BROTHERS ENGINEERING
ENGINEERS ★ SURVEYORS ★ LAND PLANNERS
Established in 1972

Date: June 28, 2006

City of Mesquite
10 East Mesquite Boulevard
Mesquite, Nevada 89027

Attention: Kurt Sawyer, Director of Building and Capital Projects

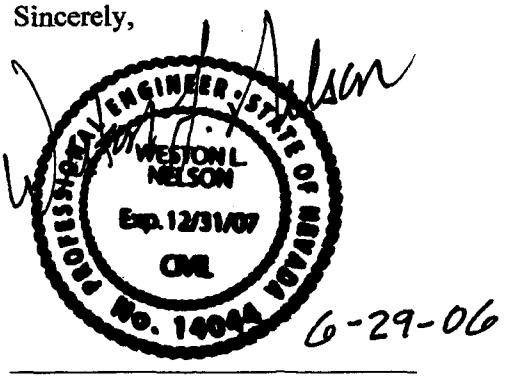
Regarding: As-Built Certification for Abbott Wash Conveyance, Ph. II Improvements

Dear Kurt,

The Abbott Wash – Phase II Improvements included in Nevada Department of Transportation (NDOT) Contract No. 3238, or Project No. STP-015-2(031)120, dated August 11, 2004, are complete, in place according to Plan, and are fully functional. Having observed the finished improvements in walking the project with the City, NDOT, and CCRFCD representatives, I certify to the best of my knowledge that the Abbott Wash portion of the improvements incorporated into the Contract Documents referenced above, which portion include Sheets DP-01 to DP-27, stamped and signed by Weston L. Nelson, P.E. on September 2, 2004, substantially represent what is now built. The various structures identified thereon conform to plan location, alignment, elevation, and geometry. In regards to the structural integrity and hydraulic capacity, these improvements are expected to perform as designed.

Please call if you need any further information or clarification regarding these improvements.

Sincerely,



6-29-06

Weston L. Nelson, P.E.
Bulloch Brothers Engineering, Inc.

CC: Allen Bell, P.E. – City Engineer for the City of Mesquite
Kevin Eubanks, P.E. – Assistant General Manager for CCRFCD

CONTRACT 3238

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	1

INDEX OF SHEETS

SHEET NO.	
1	TITLE SHEET
1A	LOCATION SKETCH
2-2B	SECTIONS OF IMPROVEMENT
3-3H	GENERAL NOTES, SUMMARIES AND ESTIMATE OF QUANTITIES
4-4D	LOCATION CONTROL
5-20	PLAN, PROFILE, GEOMETRICS AND SPECIAL DETAILS
L1.0-L4.6	LANDSCAPE DETAILS
H1-H6	HYDRAULIC DETAILS
RW1-RW5	RIGHT-OF-WAY
ST1-ST3	STRIPING DETAILS
TC1-TC53	TRAFFIC CONTROL PLAN
TS1-TS4	SIGN DETAILS, LOCATION AND SUMMARIES
T1-T15	SIGNAL SYSTEM AND LIGHTING SYSTEM
B1-B42	STRUCTURE DETAILS (H-2731)
BL1-BL2	BORING LOGS
DP1-DP27	DRAINAGE PLANS
S1-S10	STRUCTURE LIST

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CONSTRUCTION PLANS

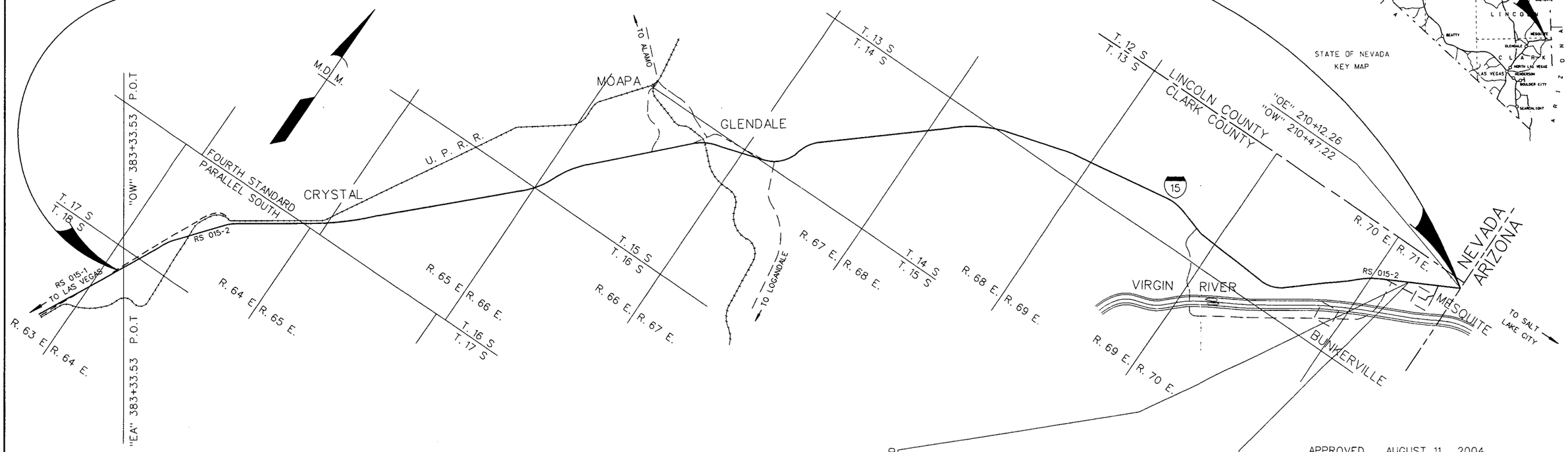
PROJECT STP-015-2(031)120
IR 15-CL 121.70

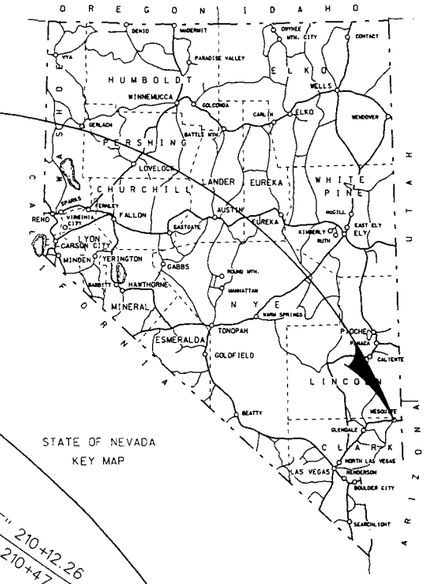
CLARK COUNTY

FROM 2.42 MILES EAST OF THE JUNCTION WITH ROUTE US 093,
VIA GLENDALE TO THE NEVADA/ARIZONA STATE LINE NEAR MESQUITE

BEGIN ROUTE SECTION 015-2

END ROUTE SECTION 015-2





ALIGNMENT

BEGIN PROJECT
"G1" 8+79.00 P.O.T.
"G1" 19+67.25 P.O.C.
STRUCTURE H-2731
"G1" 24+48.75 P.O.C.
"G1" 29+25.13 P.O.T.
END PROJECT

0 1 2 4 6
STATUTE MILES

BEGIN PROJECT STP-015-2(031)120
"G1" 8+79.00 P.O.T.

PROJECT STP-015-2(031)120

CONSTRUCT A GRADE SEPARATION OVER I-15 AND OLD MILL RD. ROAD TO CONNECT MESQUITE BLVD. TO PIONEER BLVD. USING PART OF EXISTING GRAPEVINE RD.

TOTAL ESTIMATED LENGTH OF PROJECT	0.00 MI.
TOTAL ESTIMATED LENGTH OF ROUTE SECTION	57.04 MI.
TOTAL LENGTH OF CONSTRUCTION TO BE CONTRACTED	0.38 MI.

"G1" 29+25.13 P.O.T.
END PROJECT STP-015-2(031)120

APPROVED AUGUST 11, 2004

JEFFREY FONTAINE, P.E., DIRECTOR, DEPT. OF TRANSPORTATION

GOVERNOR KENNY C. GUINN
CHAIRMAN, TRANSPORTATION BOARD

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	1A

MILEPOST SUMMARY

STATION	MILEPOST	DESCRIPTION
"PEe" 127+67.31 P.O.C.	CL-121.64	Bridge H-2731

M. D. M.
T. 13 S., R. 71 E

SEC. 7

SEC. 8

SEC. 9

SEC. 18

SEC. 17

SEC. 16

IR15-CL 120.37N
I-975N&S

IR15-CL 121.62N
H-2731

IR15-CL 121.63N
C-1381

IR15-CL 121.64N
B-2844

IR15-CL 122.68N
B-977

IR15-CL 122.92N
I-978N&S

REDD HILLS PKWY.

PIONEER BLVD.

WASH

I 15

OLD MILL RD.

ABBOTT

MESQUITE BLVD.

WASH

TOWN CENTER

EAST MESQUITE INTERCHANGE

WEST MESQUITE INTERCHANGE

TO ST. GEORGE

TO LAS VEGAS

TO BUNKERVILLE

15

144

0 0.25 0.5 1

STATUTE MILES

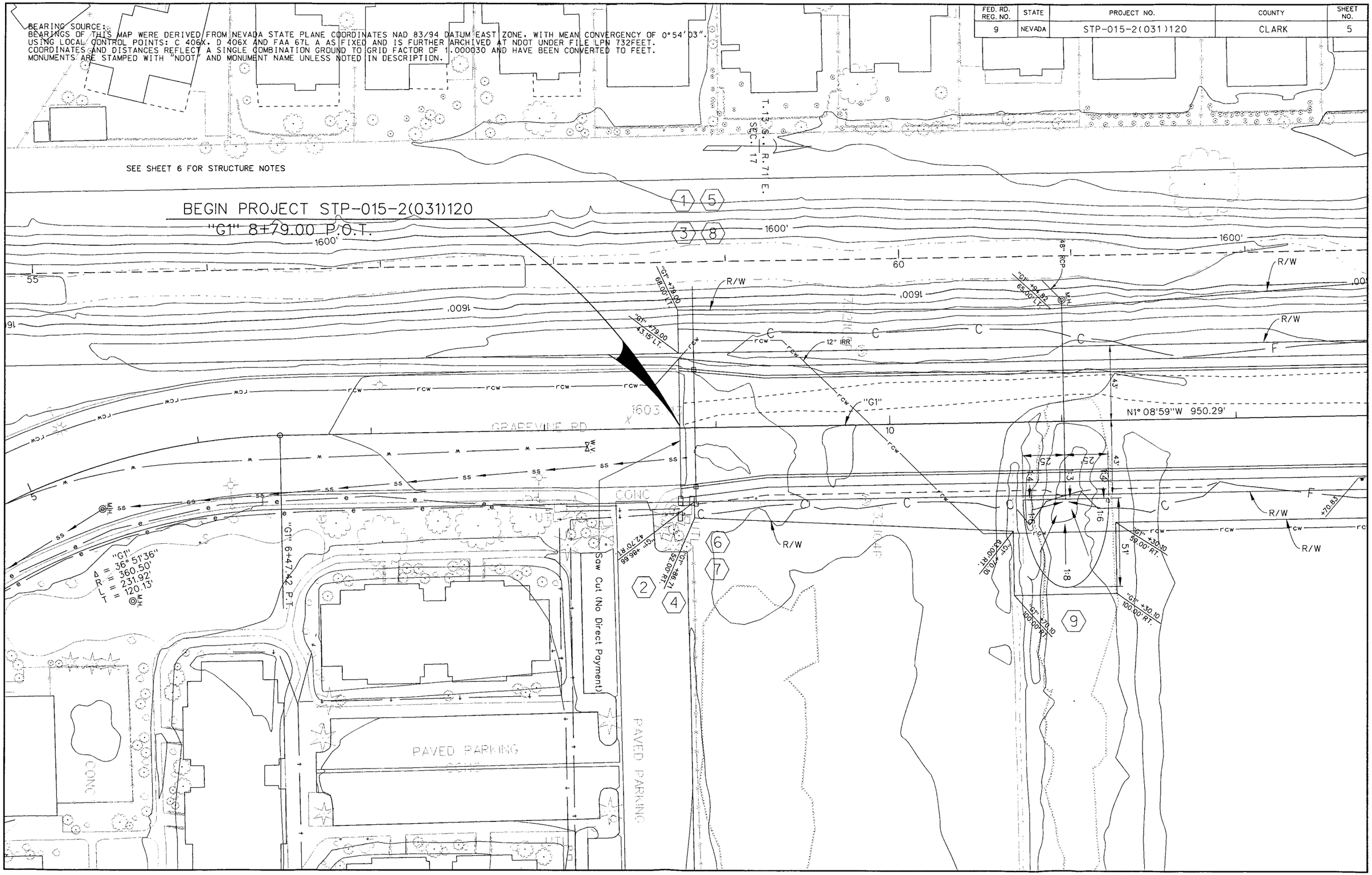
DESIGN DIVISION	
DESIGNER	Bill Walker
COORDINATOR	Chris Petersen
PHONE (775)-888-7652	

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

LOCATION SKETCH

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	5

BEARING SOURCE:
BEARINGS OF THIS MAP WERE DERIVED FROM NEVADA STATE PLANE COORDINATES NAD 83/94 DATUM EAST ZONE, WITH MEAN CONVERGENCY OF 0°54'03".
USING LOCAL CONTROL POINTS: C 406X, D 406X AND FAA 67L A AS FIXED AND IS FURTHER ARCHIVED AT NDOT UNDER FILE LPN 732FEET.
COORDINATES AND DISTANCES REFLECT A SINGLE COMBINATION GROUND TO GRID FACTOR OF 1.000030 AND HAVE BEEN CONVERTED TO FEET.
MONUMENTS ARE STAMPED WITH "NDOT" AND MONUMENT NAME UNLESS NOTED IN DESCRIPTION.



FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	6

1	"G1" 8+79.00 "G1" 28+82.40	CLEARING AND GRUBBING
2	"G1" 08+79.00 "G1" 19+53.27	CONSTRUCT TYPE 5 CURB AND GUTTER RT.
3	"G1" 08+79.00 "G1" 19+84.27	CONSTRUCT TYPE 5 CURB AND GUTTER LT.
4	"G1" 08+79.00 "G1" 19+51.23	CONSTRUCT CLASS A CONCRETE SIDEWALK (4-INCH) RT.
5	"G1" 08+79.00 "G1" 19+85.53	CONSTRUCT CLASS A CONCRETE SIDEWALK (4-INCH) LT.
6	"G1" 8+88.00	CONSTRUCT TYPE 2 DROP INLET 44.0' RT (GRATE ELEV. = 1602.09', H = 3.19'). INSTALL 18" X 9' RCP (UIE = 1598.90, LIE = 1598.83), AND CONNECT TO TYPE 11 DROP INLET 34.0' RT OF "G1" 8+88. WARP DITCH AT INLET, 2:1 MAX SLOPES (SEE PROFILE SHT H-1).
7	"G1" 8+88.00	CONSTRUCT TYPE 11 DROP INLET 34.0' RT IN FLOW LINE CURB AND GUTTER (H = 3.75', L = 12', A = 4'-0"). INSTALL 18" X 68' RCP (UIE = 1598.73, LIE = 1598.09), AND CONNECT TO TYPE 11 DROP INLET 33.6' LT OF "G1" 8+88 (SEE PROFILE SHT H-1).
8	"G1" 8+88.00	CONSTRUCT TYPE 11 DROP INLET 33.6' LT IN FLOW LINE CURB AND GUTTER (H = 4.50', L = 12', A = 4'-0"). INSTALL 18" X 47' RCP (UIE = 1598.00, LIE = 1597.59), AND OUTLET TO 81.6' LT OF "G1" 8+88 THROUGH WALL OF CONCRETE U-CHANNEL FLUSH (PACK VOID SPACE WITH NONSHRINK GROUT) (SEE PROFILE SHT H-1).
9	"G1" 11+01.00	INSTALL 48" X 115' RCP FROM 45' RT OF "G1" 11+01 (UIE = 1598.75') TO 70.0' LT OF "G1" 11+01 (LIE = 1598.29') AND CONNECT TO MANHOLE AT 70.0' LT OF "G1" 11+01 (MANHOLE BY OTHERS). CONSTRUCT CULVERT HEADWALL RT AND GRADE AT INLET RT (SEE PROFILE SHT H-1).

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	7



FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	8

⑩ "G1" 13+20.00
"G1" 19+49.40 CONSTRUCT TYPE A CONCRETE BARRIER RAIL RT. WITH GUARDRAIL-BARRIER RAIL CONNECTION (TRIPLE CORRUGATION) AND GUARDRAIL TERMINAL (TANGENTIAL) (METHOD B)

⑪ "G1" 13+75.00
"G1" 19+88.53 CONSTRUCT TYPE A CONCRETE BARRIER RAIL LT.

⑫ "G1" 13+89.00
"G1" 13+95.00 INSTALL 4-6" SCHEDULE 40 PVC PIPE SLEEVES FOR FUTURE LANDSCAPE IRRIGATION.

⑬ "G1" 14+46.00 CONSTRUCT TYPE 11 DROP INLET 29.5' LT IN FLOW LINE CURB AND GUTTER (H = 4.50', L = 15', A = 4'-0"). INSTALL 18" X 52' RCP (UIE = 1613.77', LIE = 1601.46'), AND OUTLET TO 80.9' LT OF "G1" 14+46 AND EXTEND/TRIM TO BOX CULVERT INSIDE WALL (SEE DETAIL SHT DP 17 FOR TYPICAL PIPE THROUGH WALL CONSTRUCTION AND PROFILE SHT H-2).

⑭ "G1" 17+90.00 REMOVE TREES (6-INCHES TO 12-INCHES) 18.00' LT.

⑮ "G1" 17+42.00 REMOVE TREES (25-INCHES TO 36-INCHES) 18.20' LT.

⑯ "G1" 19+00.00
"G1" 19+27.73 INSTALL 72-INCH CHAINLINK FENCE FROM "G1" 19+00.00 (110.00' RT.) TO "G1" 19+27.73 (37.00' RT.)

⑰ "G1" 19+00.00
"G1" 19+32.40 INSTALL 72-INCH CHANLINK FENCE FROM "G1" 19+00.00 (110.00' RT.) TO "G1" 19+32.40 (128.53' RT.)

⑱ "G1" 19+32.40
"G1" 19+44.37 INSTALL 72-INCH CHAINLINK FENCE FROM "G1" 19+32.40 (128.53' RT.) TO "G1" 19+44.37 (102.20' RT.)

⑳ "G1" 19+64.42
"G1" 20+50.00 INSTALL 72-INCH CHAINLINK FENCE FROM "G1" 19+64.42 (37.65' LT.) TO "G1" 20+50.00 (153.00' LT.)

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	9

SEE SHEET 10 FOR STRUCTURE NOTES.

"U"
Δ = 1°56'03"
R = 5196.58'
L = 175.45'
T = 87.73'

"U" 3+54.67 P.C.C.
"U" 1+79.24 P.C.C.
"U" 1+26.20 P.T.
"U" 1+00.00 A.O.T.
Δ = 50°39'08" "U"
R = 60.00'
L = 53.04'
T = 28.40'

"PWe"
Δ = 40°44'29"
R = 5084.00'
L = 3615.09'
T = 1887.76'

"G1" 23+55.08 P.O.C.=
"PWe" 127+47.33 P.O.C.

"G1" 22+56.48 P.O.C.=
"PEe" 127+67.31 P.O.C.

"PEe"
Δ = 40°44'29"
R = 5000.00'
L = 3555.36'
T = 1856.57'

"G1" 22+01.54 P.T.
"D" 11+71.03 P.T.
N51°27'57"W 76.92'

"O"
Δ = 37°26'26"
R = 500.00'
L = 326.73'
T = 169.44'

"O"
Δ = 33°20'59"
R = 4870.00'
L = 2834.64'
T = 1458.74'

IR15-CL 121.62N
H-2731

IR15-CL 121.63N
C-1381

IR15-CL 121.64N
B-2844

16" Water

24" P.C.
24" P.T.
24" A.O.T.

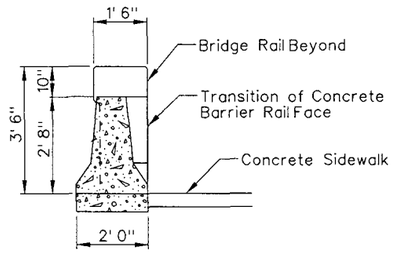
"PEe" +73.62 100.00' RT.
"PEe" +73.62 160.00' RT.
"PEe" +73.62 245.52' RT.
"PEe" +38.52 246.54' RT.
"PEe" +16.37 246.89' RT.
"PEe" +38.06 160.00' RT.
"PEe" +87.16 245.57' RT.
"PEe" +105.97 279.52' RT.
"G1" +73.62 153.00' LT.
"G1" +27.73 37.00' RT.
"G1" +14.77 154.24' RT.
"G1" +24.40 186.53' RT.
"G1" +66.18 112.73' RT.

1625+57
1621.395
1620'
1610'
1620.
1620,
1620'
1620'
1620'
1620'
1610'

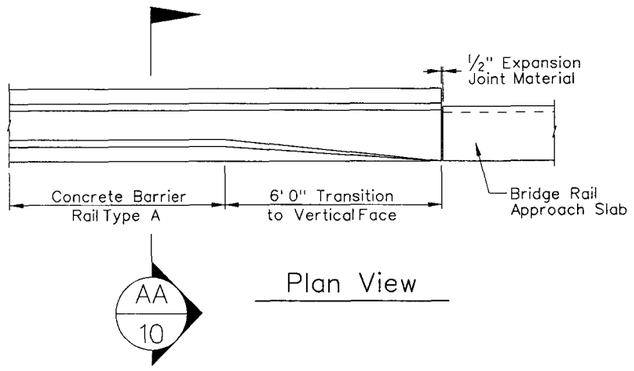
200'
100'
84'
30'
125
130
120'
UTL
R/W
SS
W
M.H.
W.V.
SD
IRR
SQ
12"
14"
16"
18"
24"
30"
36"
48"

27 26 25 24 20 29 28 33 31 30 34 36 33 35 41 39 38 37 22 23 21 19 18 17 16 15

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	10



Section A-A



Plan View

TYPICAL BRIDGE RAIL TO BARRIER RAIL TRANSITION

(19) "G1" 19+42.00 "G1" 19+60.00 WARP SLOPE TO STAY WITHIN ROW. (NO DIRECT PAYMENT)

(21) "G1" 19+44.37 "G1" 19+73.72 INSTALL 72-INCH CHAINLINK FENCE FROM "G1" 19+44.37 (102.20' RT.) TO "G1" 19+73.72 (121.79' RT.)

(22) "G1" 20+14.77 "G1" 21+09.40 REMOVE FENCE FROM 154.24' RT. TO 59.00' RT

(23) "G1" 20+14.77 "G1" 21+77.64 INSTALL 72-INCH CHAINLINK FENCE FROM "G1" 20+14.77 (154.24' RT) TO "G1" 21+77.64 (59.44' LT.)

(24) "G1" 20+50.00 "G1" 21+32.91 INSTALL 72-INCH CHAINLINK FROM "G1" 20+50.00 (153.00' LT.) TO "G1" 21+32.91 (99.44' LT.)

(25) "G1" 21+25.55 "G1" 21+77.64 REMOVE FENCE FROM 33.30' RT. TO 59.44" LT.

(26) "PEe" 128+31.00 EXISTING TYPE 2A DROP INLET 34.5' LT. SEE SHEET DP-08 FOR DETAILS.

(27) "PEe" 125+69.24 "PEe" 127+94.24 INSTALL GALVANIZED THRIE BEAM GUARDRAIL WITH GUARDRAIL TERMINAL (FLARED) 37.07' LT.

(28) "PWe" 126+09.74 "PWe" 130+84.74 INSTALL GALVANIZED THRIE BEAM GUARDRAIL WITH GUARDRAIL TERMINAL (FLARED) 24' LT.

(29) "PWe" 127+15.24 "PWe" 129+40.24 INSTALL GALVANIZED THRIE BEAM GUARDRAIL WITH GUARDRAIL TERMINAL (FLARED) 35.15' RT.

(30) "G1" 23+84.60 "G1" 24+98.40 REMOVE FENCE FROM 93.00' RT. TO 113.20' RT.

(31) "G1" 23+84.60 "G1" 25+10.00 REMOVE FENCE FROM 93.00' RT. TO 33.00' RT.

(32) "G1" 24+31.56 "G1" 27+82.00 CONSTRUCT TYPE A CONCRETE BARRIER RAIL RT.

(33) "G1" 24+33.10 "G1" 28+74.70 CONSTRUCT CLASS A CONCRETE SIDEWALK (4-INCH) RT.

(34) "G1" 24+34.00 "G1" 24+37.75 REMOVE FENCE FROM 319.60' RT. TO 105.22' RT.

(35) "G1" 24+34.24 "G1" 28+80.80 CONSTRUCT TYPE 5 CURB AND GUTTER RT.

(36) "G1" 24+53.14 "G1" 25+33.96 REMOVE FENCE FROM 46.47' RT. TO 979.19' LT.

(37) "G1" 24+60.87 "G1" 28+80.80 CONSTRUCT TYPE 5 CURB AND GUTTER LT.

(38) "G1" 24+62.13 "G1" 28+76.20 CONSTRUCT CLASS A CONCRETE SIDEWALK (4-INCH) LT.

(39) "G1" 24+63.24 "G1" 28+56.40 CONSTRUCT TYPE A CONCRETE BARRIER RAIL LT.

(41) "G1" 24+90.00 CONSTRUCT TYPE 2A DROP INLET 122.1' LT (GRATE ELEV = 1622.00', H = 3.17', A = 2'-6"). INSTALL 24" X 11' RCP (UIE = 1618.83', LIE = 1614.24'), AND OUTLET TO AND EXTEND/TRIM TO BOX CULVERT WALL 113.8' LT OF "G1" 24+95 (SEE SHT DP-01 FOR DETAILS OF BOX CULVERT AND SHT DP-17 FOR TYPICAL PIPE THROUGH WALL CONSTRUCTION) GRADE TO DRAIN AT INLET (NO DIRECT PAYMENT).

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	11

- LIMITS OF PLANTMIXING MISCELLANEOUS AREAS

SEE SHEET 12 FOR STRUCTURE NOTES

END PROJECT STP-015-2(031)120
"G1" 29+25.13 P.O.T.

"U" 3+54.67 P.T.
"U" R = 5196.58'
L = 175.45'
T = 87.73'
"U" 1°56'03"
"U" 1+79.24 P.C.C.
"U" 1+66.20 P.C.
"U" 1+00.00 P.O.T.
"U" 50°51'08"
"U" 600.00'
"U" 523.60'
"U" 279.78'
"G1" 50°00'00"
"G1" 600.00'
"G1" 523.60'
"G1" 279.78'
"D" 13°55'49"
"D" 500.00'
"D" 121.56'
"D" 61.08'
"D" 74+17.38 P.C.
"D" 75+39.16 P.T.
"G1" 29+25.13 P.O.T.=
"PB" 401+87.63 P.O.T.=
"PB" 85+11.74 P.O.T.
"D" 79+56.72 P.O.T.
"RH" 42+55.11 P.R.C.
"G1" 75+60 L.T.
"G1" 73+13 L.T.
"G1" 70+94 L.T.
"G1" 68+58 L.T.
"G1" 66+34 L.T.
"G1" 64+08 RT.
"G1" 62+00 RT.
"G1" 59+78 RT.
"G1" 57+56 RT.
"G1" 55+37 RT.
"G1" 53+13 RT.
"G1" 50+91 RT.
"G1" 48+68 RT.
"G1" 46+45 RT.
"G1" 44+23 RT.
"G1" 42+00 RT.
"G1" 39+78 RT.
"G1" 37+56 RT.
"G1" 35+34 RT.
"G1" 33+13 RT.
"G1" 30+91 RT.
"G1" 28+68 RT.
"G1" 26+45 RT.
"G1" 24+23 RT.
"G1" 22+00 RT.
"G1" 19+78 RT.
"G1" 17+56 RT.
"G1" 15+34 RT.
"G1" 13+11 RT.
"G1" 10+89 RT.
"G1" 8+66 RT.
"G1" 6+45 RT.
"G1" 4+23 RT.
"G1" 2+00 RT.
"G1" 0+00 P.O.T.
"G1" 0+00 P.C.C.
"G1" 0+00 P.C.
"G1" 0+00 P.T.
"G1" 0+00 P.R.C

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	12

(40) "G1" 24+69.00 — CONSTRUCT TYPE 8 DROP INLET 126.9' RT (GRATE ELEV = 1616.65'). INSTALL 42" X 25' RCP (UIE = 1612.15', LIE = 1609.33'), AND OUTLET TO AND EXTEND/TRIM TO BOX CULVERT INSIDE WALL 113.0' RT OF "G1" 24+42 (SEE DETAIL SHEET DP 17 FOR TYPICAL PIPE THROUGH WALL CONSTRUCTION). DITCH INTO DROP INLET FROM 310.0' RT OF "G1" 21+74 WITH V-DITCH AT 0.9% SLOPE, SS = 2:1. CONSTRUCT RIPRAP APRON (SEE DETAIL SHT H-6 AND PROFILE SHT H-3).

(42) "G1" 25+02.00 — CONSTRUCT TYPE 8 DROP INLET 121.5' RT (GRATE ELEV = 1616.65'). INSTALL 42" X 25' RCP (UIE = 1612.15', LIE = 1609.79'), AND OUTLET TO AND EXTEND/TRIM TO BOX CULVERT WALL 107.5' RT OF "G1" 24+76 (SEE DETAIL SHEET DP 17 FOR TYPICAL PIPE THROUGH WALL CONSTRUCTION). DITCH IN TO DROP INLET FROM 310.0' RT OF "G1" 21+74 WITH V-DITCH AT 0.9% SLOPE, SS = 2:1. CONSTRUCT RIPRAP APRON (SEE DETAIL SHT H-6 AND PROFILE SHT H-3).

(43) "G1" 25+50.78 / "G1" 25+58.64 — INSTALL 72-INCH CHAINLINK FENCE FROM "G1" 25+50.78 (100.57' RT.) TO "G1" 25+58.64 (49.0'RT.)

(44) "G1" 25+68.81 / "G1" 25+70.94 — INSTALL 72-INCH CHAINLINK FENCE "G1" 25+68.81 (49.0' LT.) TO "G1" 25+70.94 (78.00' LT.)

(45) "G1" 28+26.00 / "G1" 28+32.00 — INSTALL 4-6" SCHEDULE 40 PVC PIPE SLEEVES FOR FUTURE LANDSCAPE IRRIGATION.

(46) "G1" 28+30.90 / "G1" 28+82.40 — PAVE SPANDREL RT.

(47) "G1" 28+30.90 / "G1" 28+82.40 — PAVE SPANDREL LT.

(48) "G1" 28+31.00 — CONSTRUCT TYPE 11 DROP INLET 41.5' RT IN FLOW LINE CURB AND GUTTER (H = 4.50', L = 15', A = 4'-0"). INSTALL 18" X 28' RCP (UIE = 1627.71', LIE = 1615.55'), AND OUTLET TO 18.6' RT OF "G1" 28+21 AND EXTEND/TRIM TO BOX CULVERT WALL (SEE DETAIL SHEET DP 17 FOR TYPICAL PIPE THROUGH WALL CONSTRUCTION AND PROFILE SHT H-4).

(49) "G1" 28+36.33 / "G1" 29+20.75 — INSTALL TYPE A GLUE DOWN CURB ISLAND RT. (SEE SHEET 20)

(50) "G1" 28+54.00 / "G1" 28+62.00 — INSTALL TYPE A GLUE DOWN CURB ISLAND LT. (SEE SHEET 20)

(51) "G1" 28+66.36 / "G1" 28+66.58 — REMOVE PEDESTRIAN RAIL FROM 76.34' LT. TO 24.09' RT.

(52) "G1" 28+69.68 / "G1" 28+71.00 — REMOVE SIDEWALK FROM 74.93' RT. TO 76.30' LT.

(53) "G1" 28+72.80 — CONSTRUCT TYPE A HANDICAP RAMP RT. (NO DIRECT PAYMENT)

(54) "G1" 28+73.75 — CONSTRUCT TYPE A HANDICAP RAMP LT. (NO DIRECT PAYMENT)

(55) "G1" 28+80.73 / "G1" 28+80.78 — REMOVE CURB AND GUTTER FROM 91.31' RT. TO 91.28' LT.

(56) "G1" 28+80.73 / "G1" 28+80.78 — CONSTRUCT TYPE 1 VALLEY GUTTER FROM 91.31' RT. TO 91.28' LT.

(57) "G1" 28+80.93 — CONSTRUCT TYPE 2 DROP INLET 40.1' LT OF "G1" 28+80.93 (GRATE ELEV. = 1630.89', H = 6' +/-, A = 2'-6"). CAST DIRECTLY ON ROOF OF EXISTING RCB. CONNECT TO RCB WITH 18" HOLE AT DIRECTION OF ENGINEER. WARP CONCRETE AT INLET TO MATCH PROPOSED VALLEY GUTTER (SEE PROFILE H-5).

(58) "G1" 28+82.00 — REMOVE EXISTING DROP INLET 44.9' LT AND CAP HOLE WITH 3' X 3' X 6" CONCRETE PAD, #4 BARS BOTH DIR, 12" O.C.

(59) "G1" 28+82.66 / "G1" 28+98.63 — INSTALL TYPE A GLUE DOWN CURB ISLAND RT. (SEE SHEET 20)

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	13

D.N. LT.

D.N. RT.

+79 — 4:1 B.S. — +68 +90 — 4:1 F.S. — +70 — +20 +25 Trans. — +75 — 2:1 F.S. — +71.30 ┐ +15.30

+79 — 4:1 F.S.~1.0' Ditch~4:1 B.S. — +68 +90 — 4:1 F.S. — +70 Trans. — +75 — 2:1 F.S.

EXCAVATION	yd^3
BORROW	yd^3
EMBANKMENT	yd^3

3212
43626
64777 (A)

(A) INCLUDES 21151 YD^3 SELECTED BORROW BORROW

+0.04 ft./ft. Rt. Shldr.

Trans. Rt. Shldr. +14 +38

+52

Trans. Lt. Shldr. +38

-0.04 ft./ft. Lt. Shldr.

Match Existing Cross Slope

-0.02 ft./ft. Rt. & Lt. Shldr.

SUPERELEVATION

'G1'

5.58%

3:1 SLOPE

SELECT BORROW

400.00' V.C.

"G1"

0.50%

+79.00 BEGIN PROJECT
1608.12 "G" & +79.00 P.O.T.

+00.00
1604.73

+0.04 ft./ft. Rt. Shldr. / Level / -0.04 ft./ft. Lt. Shldr.

1665 1660 1655 1650 1645 1640 1635 1630 1625 1620 1615 1610 1605 1600

5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	14

D.N. LT. +71.30 +15.30 Structure +05.16 +41.22 2:1 F.S. +66 +67

D.N. RT. Structure 2:1 F.S.

EXCAVATION	yd^3	163
BORROW	yd^3	22426
EMBANKMENT	yd^3	37955 Ⓑ

Structure

Ⓑ INCLUDES 15539 YD^3 SELECTED BORROW

+0.04 ft./ft. Rt. Shldr. +39 Trans. Lt. Shldr. +87

+0.04 ft./ft. Lt. Shldr. +58 Trans. Lt. Shldr. +82.40

Level

-0.04 ft./ft. Lt. Shldr. +39 Trans. Rt. Shldr. +87

-0.04 ft./ft. Rt. Shldr. +58 Trans. Rt. Shldr. +82.40

SUPERELEVATION

+62.00 1664.00

"G1"

END PROJECT "G" 28+82.40 P.O.T.

530.00' V.C. -6.36% 300.00' V.C.

FOR SLOPE LIMITS SEE BRIDGE DETAILS

3:1 SLOPE

SELECT BORROW

FOR SLOPE LIMITS SEE BRIDGE DETAILS

3:1 SLOPE

SELECT BORROW

+32.40 1634.09

-2.00%

"G1"

1665 1660 1655 1650 1645 1640 1635 1630 1625 1620 1615 1610 1605 1600

19 20 21 22 23 24 25 26 27 28 29 30 31 32 33

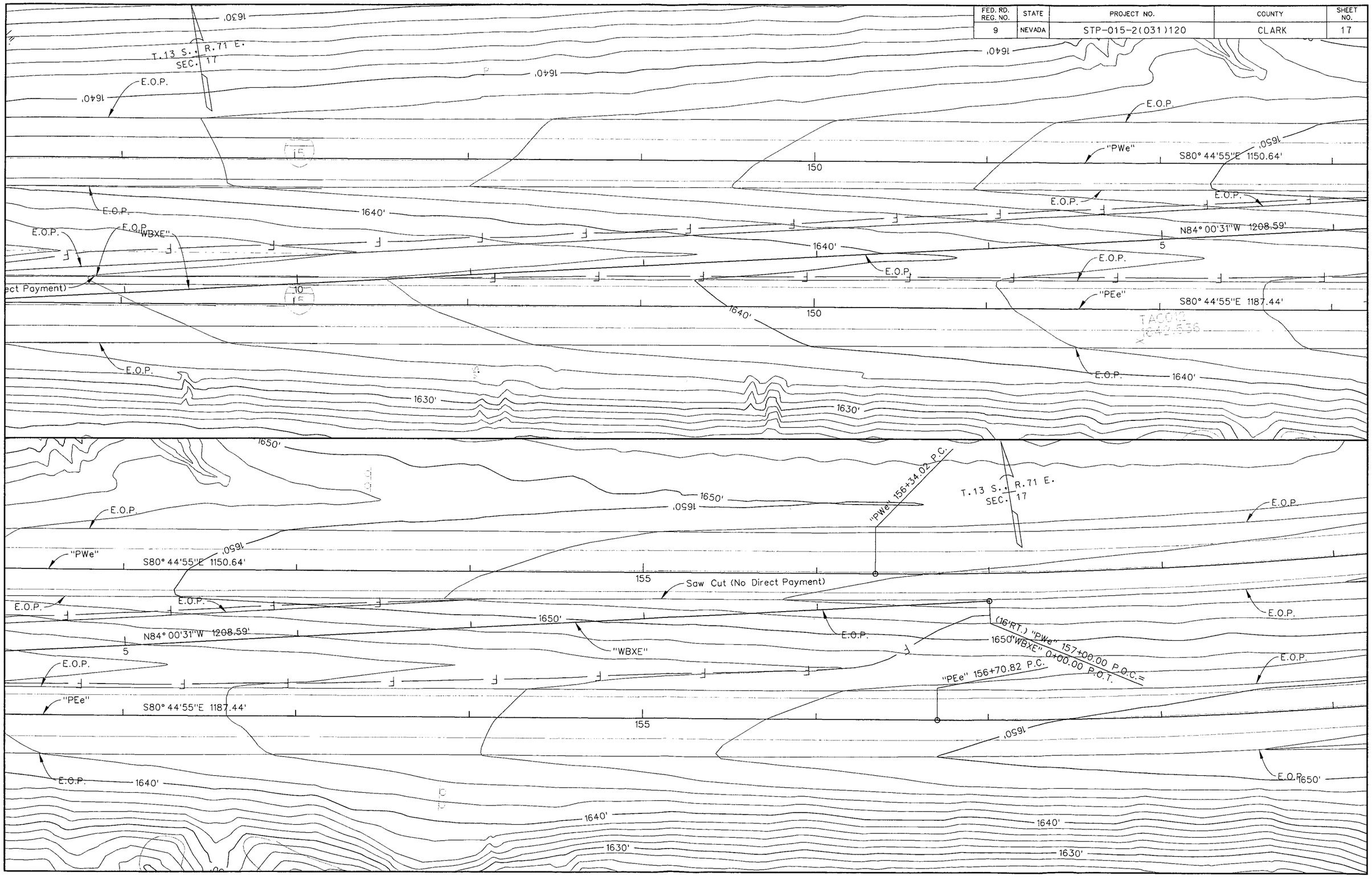
FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	15

"WBXW" 12+12.27 P.O.T.
"PWe" 108+00.00 P.O.T.=
E.O.P.
S58° 30'36"W 21.78'
"WBXW" 11+80.49 P.T.
"PWe" 108+68.30 P.C.
"WBXW"
Δ = 12°58'06"
R = 2200.00'
L = 497.95'
T = 250.04'
Saw Cut (No Direct Payment)
"PWe"
"WBXW"
"EBXW"
N57° 30'36"E 606.01'
"PEe"
"EBXW" 0+00.00 P.O.T.=
"PEe" 108+68.30 P.C.=
1625.000
1620'
T. 13 S., R. 71 E.
SEC. 17
"WBXW" 6+92.54 P.C.
1630'
1640'
SCATTERED BRUSH
"PEe" 113+44
"PEe" 115+73 INSTALL 24" X 231' CMP FROM 36.8' LT OF "PEe 113+44 (UIE =1623.52')
TO 36.4' LT OF "PEe" 115+73 (LIE = 1622.99'). INSTALL METAL END
SECTIONS AT INLET AND OUTLET.
"PWe" 120+00.00 P.O.T.=
"EBXW" 11+26.27 P.O.C.
N70° 15'51"E 30.53'
Saw Cut (No Direct Payment)
"EBXW"
Δ = 12° 45'15"
R = 2200.00'
L = 489.72'
T = 245.88'
"EBXW" 10+95.73 P.T.
S71° 28'42"W 692.54'
1622.054
1625.188
"EBXW" 6+06.01 P.C.
1618.298
"PEe" 120+00.00 P.O.C.=
"WBXW" 0+00.00 P.O.T.
UTL

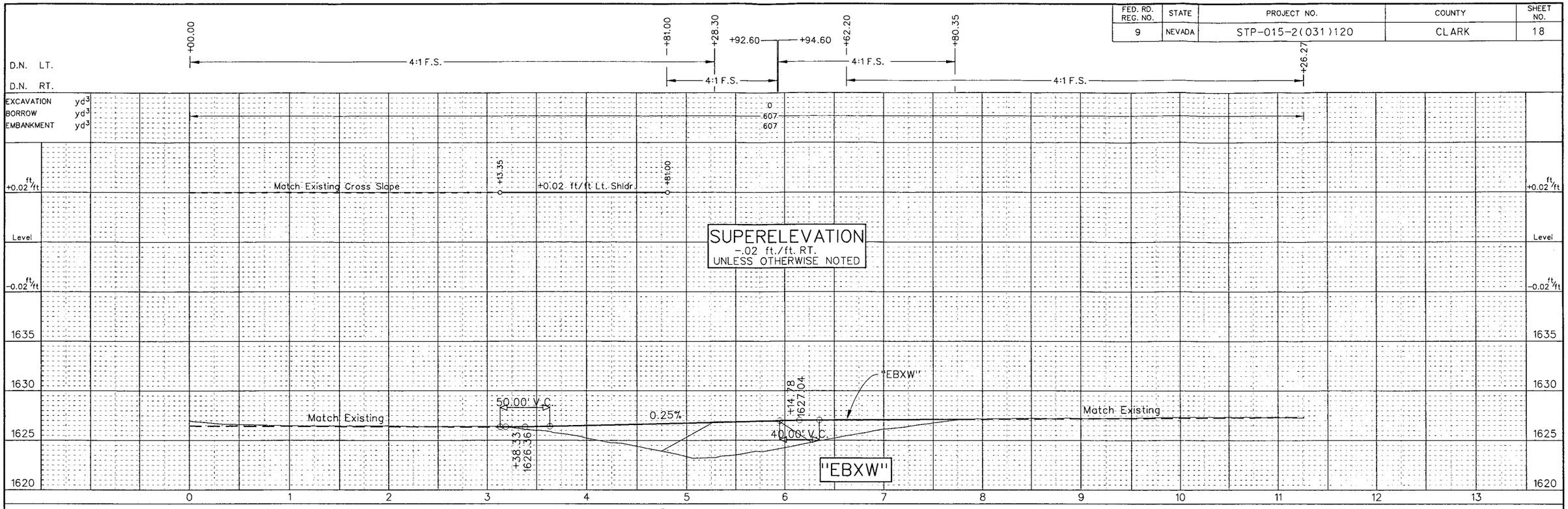
FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	16

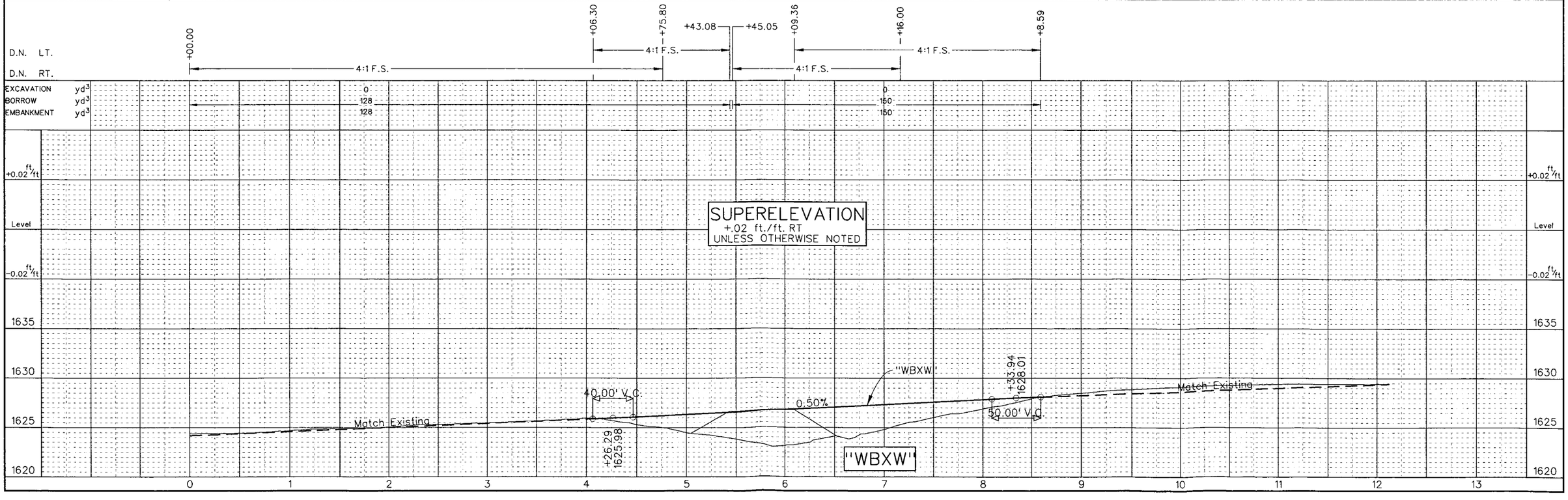


FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	17



FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	18





FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	19

+00.00 +57.65 +96.50 +79.75

D.N. LT.

D.N. RT.

4:1 F.S.

4:1 F.S.

EXCAVATION yd³ 0
BORROW yd³ 733
EMBANKMENT yd³ 733

SUPERELEVATION
-.02 ft./ft. RT.
UNLESS OTHERWISE NOTED

+0.02 ft/ft
Level
-0.02 ft/ft
1640
1635
1630
1625

Match Existing
+88.08 1630.15
0.84%
"EBXE"
+50.00 1632.35
160.00' V.C.
0.14%
200.00' V.C.
0.85%
+79.75 1635.15
+90.00 1632.68
"EBXE"

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

+00.00 +90.47 +35.32 +08.59

D.N. LT.

D.N. RT.

4:1 F.S.

4:1 F.S.

EXCAVATION yd³ 0
BORROW yd³ 2474
EMBANKMENT yd³ 2474

SUPERELEVATION
+.02 ft/ft. RT
UNLESS OTHERWISE NO

+0.02 ft/ft
Level
-0.02 ft/ft
1660
1655
1650
1645

Match Existing
"WBXE"
-0.48%
+100.00 1653.63
400.00' V.C.
"WBXE"
-2.55%
1645
1640
1650
"WBXE"
180.00' V.C.
+55.30 1639.50
Match Existing

0 1 2 3 4 5 6 7 8 9 10 11 12

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	20

"RH"

S88° 32'03"W 1350.00'

"G1" 29+25.13 P.O.T.=
"RH" 40+84.63 P.O.T.=
"PB" 85+41.74 P.O.T.

"PB"

** Vary the Elevations of Curb, Gutter & Sidewalk as Necessary to Provide Positive Drainage From Ⓐ To Ⓑ. Roadway Cross Slope May Vary.

Type 1 Valley Gutter

+82.28
91.28' LT. (Match Existing)

+80.78
91.28' LT. (Match Existing)

+76.16
76.28' LT. (Match Existing)

+71.00
76.30' LT. (Match Existing)

+79.27
74.16' LT.

+56.38
55.10 LT.

S. 88° 32'03" W.~4.0'

+62.00
8.00' LT.

+62.00
4.00' LT.

+60.00
10.00' LT.

+60.00
2.00' LT.

N. 1° 27'57" W.~4.0'

+56.00
10.00' LT.

+56.00
2.00' LT.

+54.00
8.00' LT.

+54.00
4.00' LT.

S. 88° 32'03" W.~4.0'

N. 1° 27'57" W.~4.0'

Type A Glue Down Curb

Type 5 Curb & Gutter

+30.75
47.00' LT.

+30.75
41.50' LT.

5' Sidewalk

N1° 27'57"W 200.01'

Concrete Barrier Rail (Type A)

"G1"

+14.47
30.74' RT.

+18.46
34.53' RT.

N.1° 27'57"W.~14.24'

+00.22
30.74' RT.

+96.55
36.33' RT.

Type A Glue Down Curb

+20.75
78.02' RT.

N.85° 31'22"E.~43.55'

+12.95
79.48' RT.

+94.05
95.88' RT.

Type A Glue Down Curb

N.65° 36'03"E.~15.24'

+88.11
81.84' RT.

+92.20
98.63' RT.

N.1° 40'08"E.~5.87'

+86.33
98.65' RT.

+84.28
82.66' RT.

+84.33
96.66' RT.

N.88° 19'52"E.~14.00'

+82.23
91.31' RT. (Match Existing)

+80.73
91.31' RT. (Match Existing)

+79.24
74.19' RT.

+74.68
74.95' RT. (Match Existing)

+69.69
70.00' RT.

+69.68
74.95' RT. (Match Existing)

Type 5 Curb & Gutter

+30.75
41.50' RT.

5' Sidewalk

Concrete Barrier Rail (Type A)

+82.00
47.00' RT.

SEC. 8
SEC. 17

T. 13 N. R. 71 E

CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	2.0'	90°00'00"	3.14'	2.00'
2	2.0'	90°00'00"	3.14'	2.00'
3	2.0'	90°00'00"	3.14'	2.00'
4	2.0'	90°00'00"	3.14'	2.00'
5	4.0'	113°27'24"	7.92'	6.10'
6	4.0'	86°59'19"	6.07'	3.80'
7	4.0'	164°50'48"	11.51'	30.07'
8	500.00'	5°17'30"	46.18'	23.11'
9	2.0'	156°23'34"	5.46'	9.57'
10	2.0'	112°43'50"	3.94'	3.01'
11	2.0'	90°00'00"	3.14'	2.00'
12	50.00'	89°59'10"	78.53'	49.99'
13	50.00'	90°00'36"	78.55'	50.01'

2" Plantmix Bituminous Surface * with Seal Coat

Varies

Type A Glue Down Curb

Type A Glue Down Curb

4" Type 1 Class B Aggregate Base

SECTION A-A

* To Be Paid For As Plantmix Miscelaneous Areas

4" Class A Concrete (Island Paving)

Varies

Type A Glue Down Curb

Type A Glue Down Curb

2" Type 1 Class B Aggregate Base

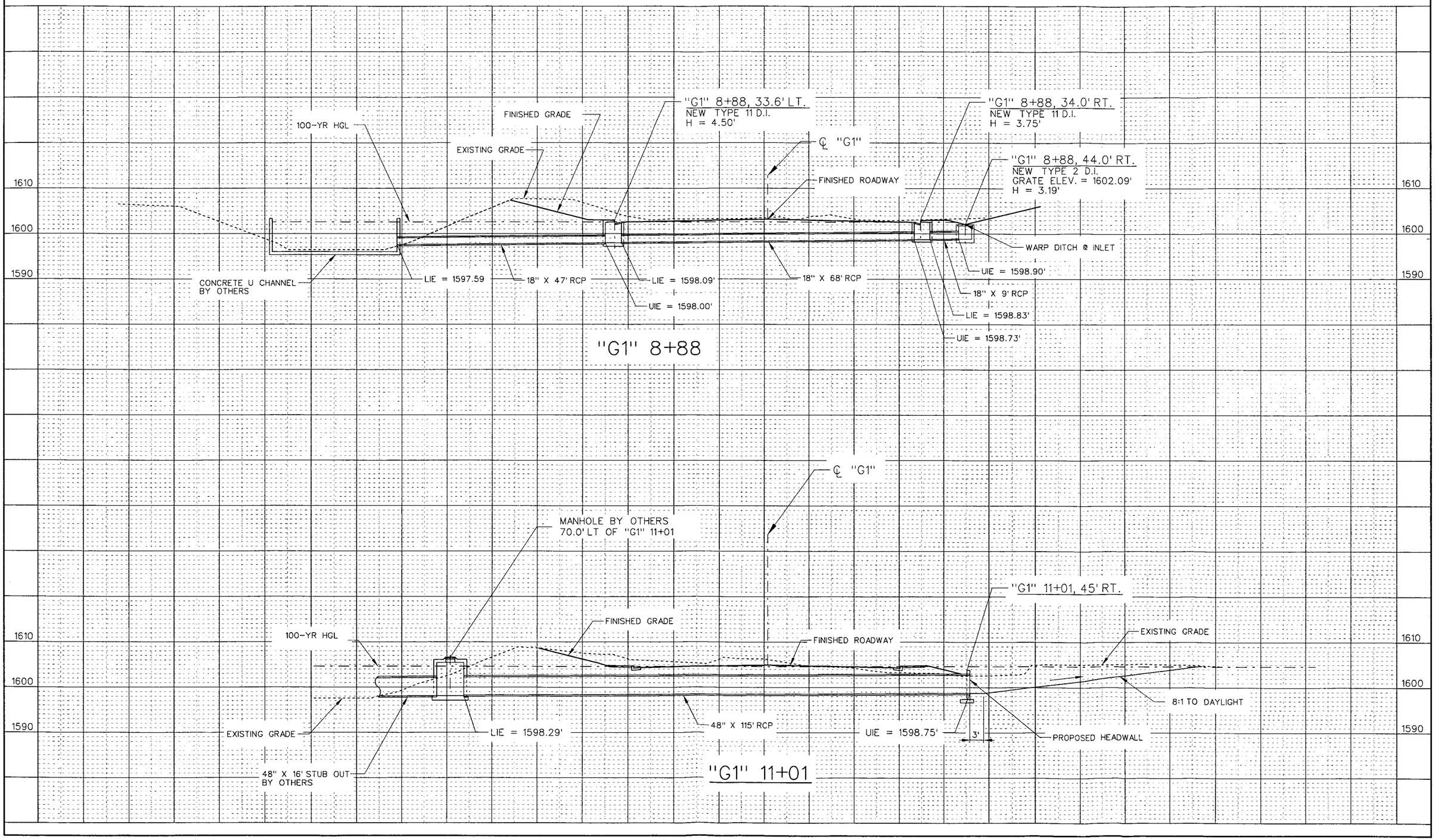
SECTION B-B

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GEOMETRICS

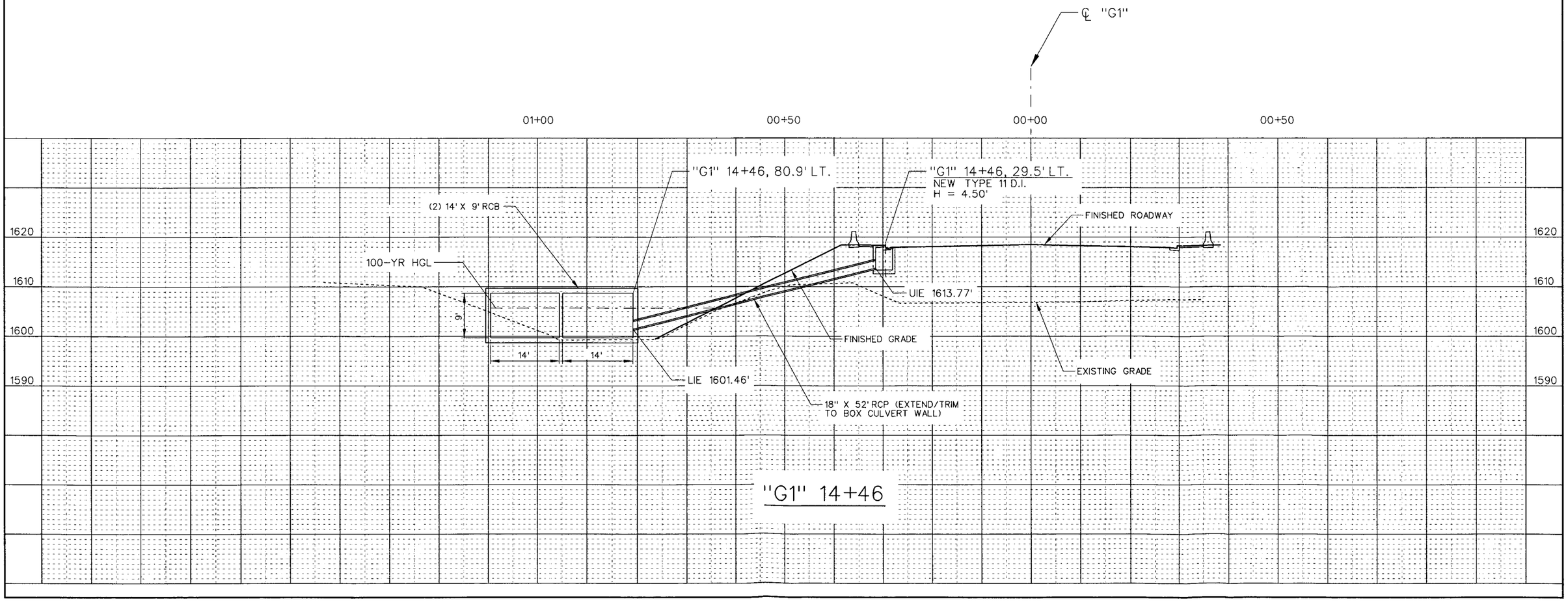
NOTE:
VERTICAL EXAGGERATION 1H:1V

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	H-1



FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	H-2

NOTE:
VERTICAL EXAGGERATION 1H:1V

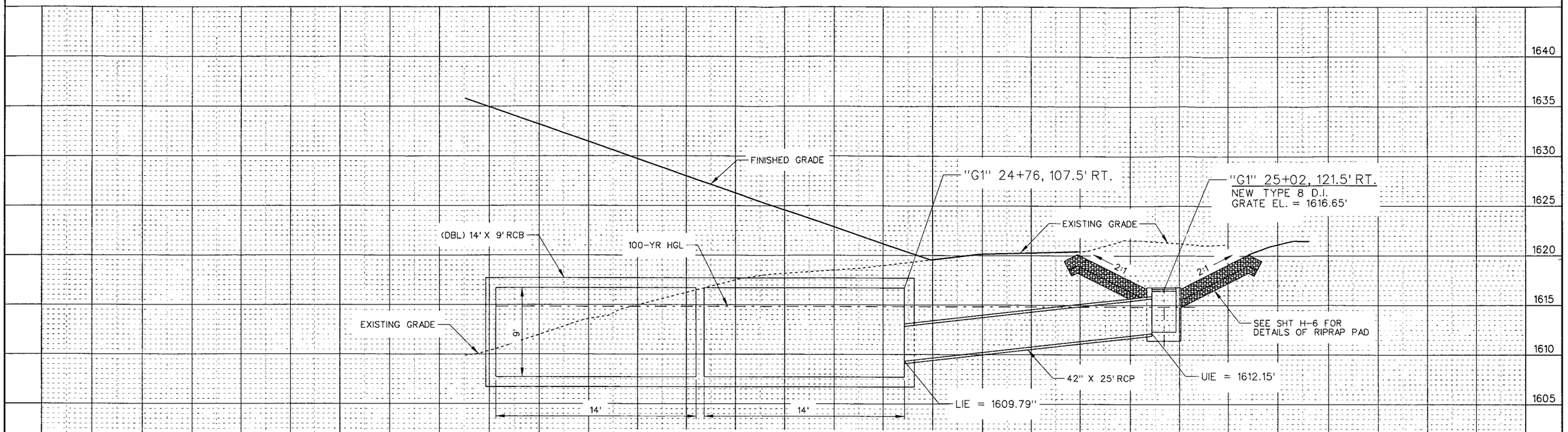


"G1" 14+46

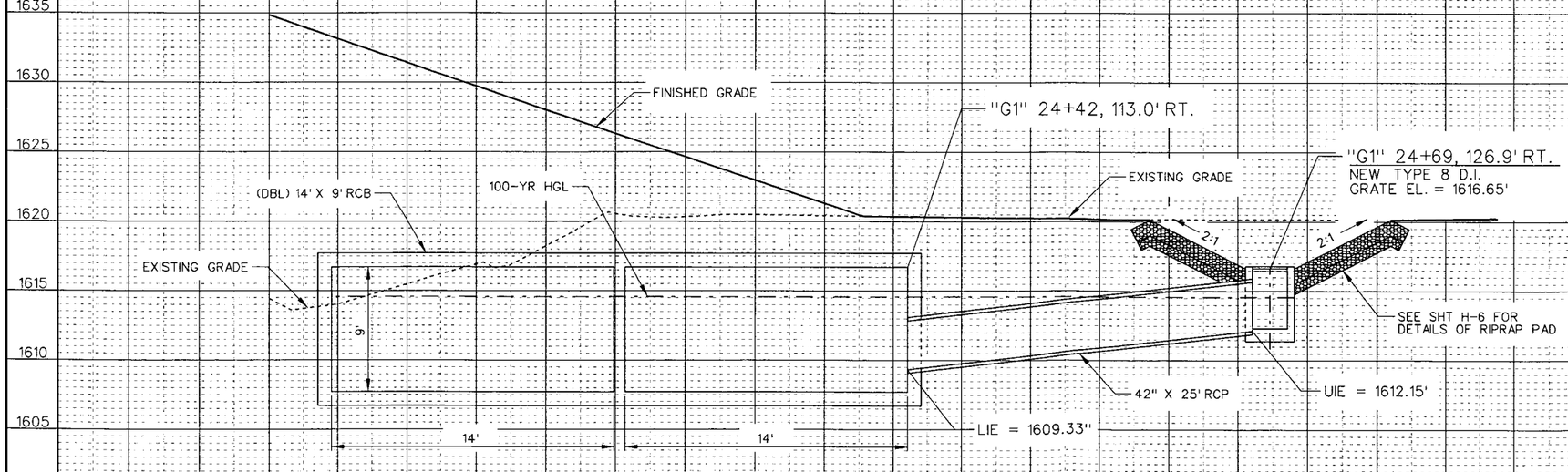
NOTE:

EXISTING RCB IS SKEWED TO PROPOSED ROADWAY
VERTICAL EXAGGERATION 1H:1V

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	H-3



"G1" 24+76 TO "G1" 25+02

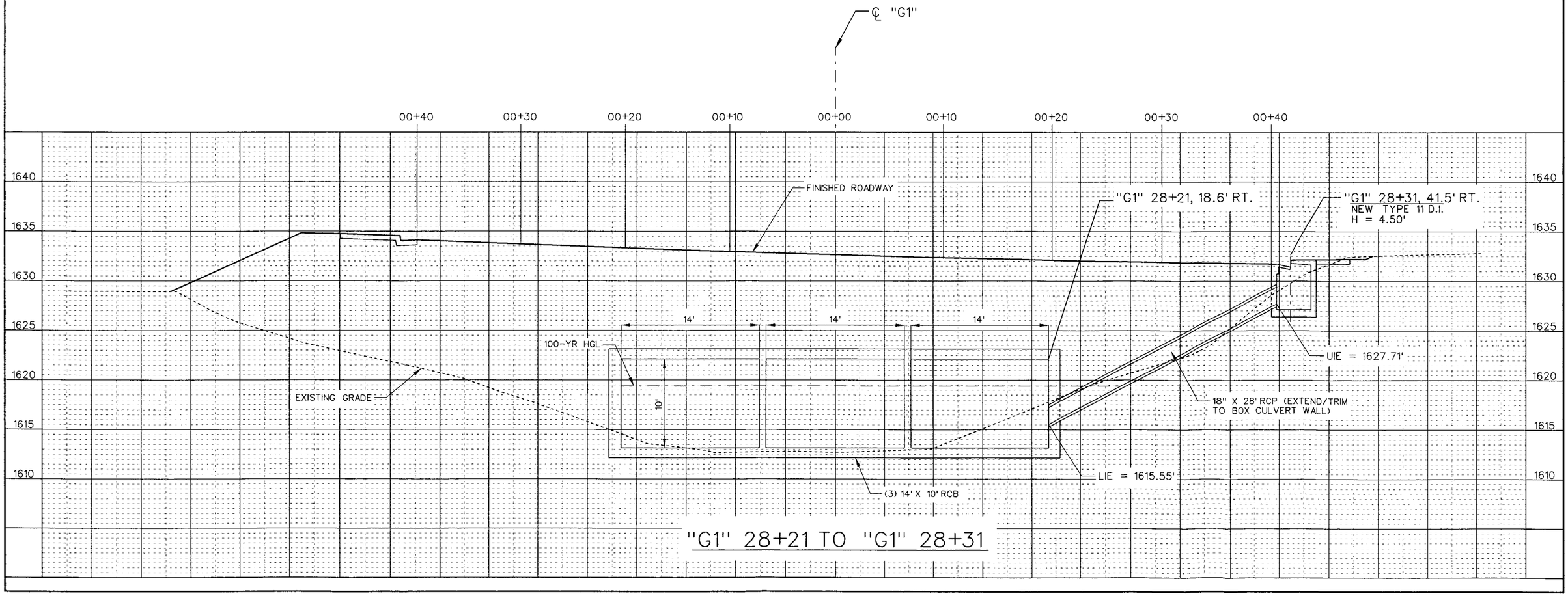


"G1" 24+42 TO "G1" 24+69

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	H-4

NOTE:

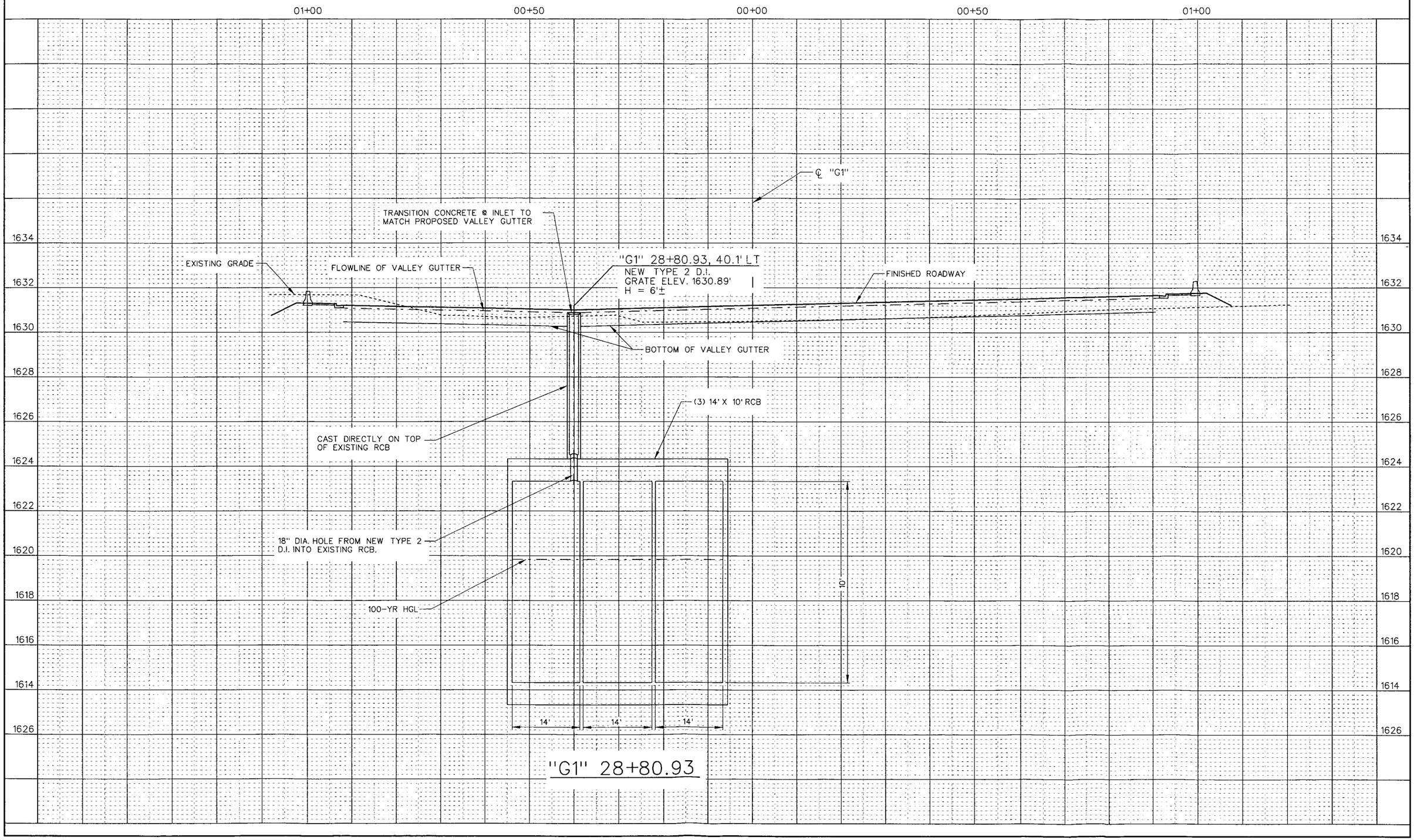
ROADWAY IS SHOWN SKEWED TO THE RCP AND RCB PROJECTION.
VERTICAL EXAGGERATION 1H:1V



"G1" 28+21 TO "G1" 28+31

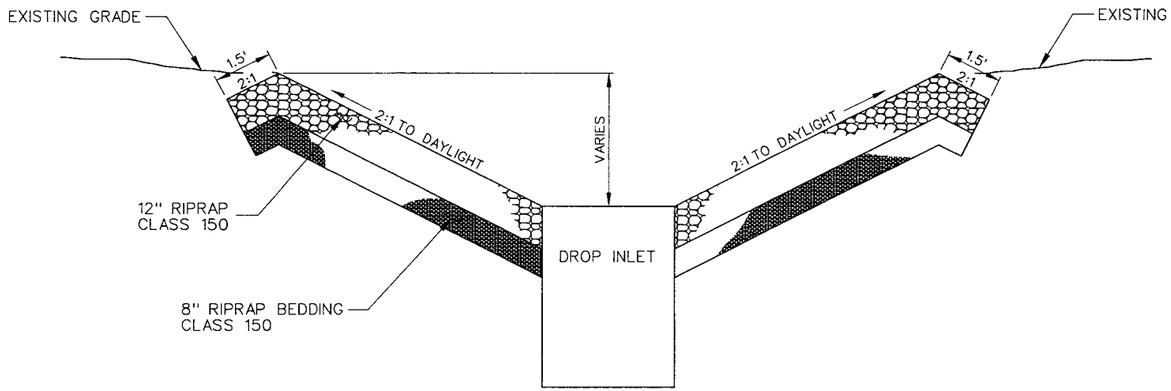
NOTE:
EXISTING RCB IS SKEWED TO PROPOSED ROADWAY.
VERTICAL EXAGGERATION 1H:5V

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	H-5

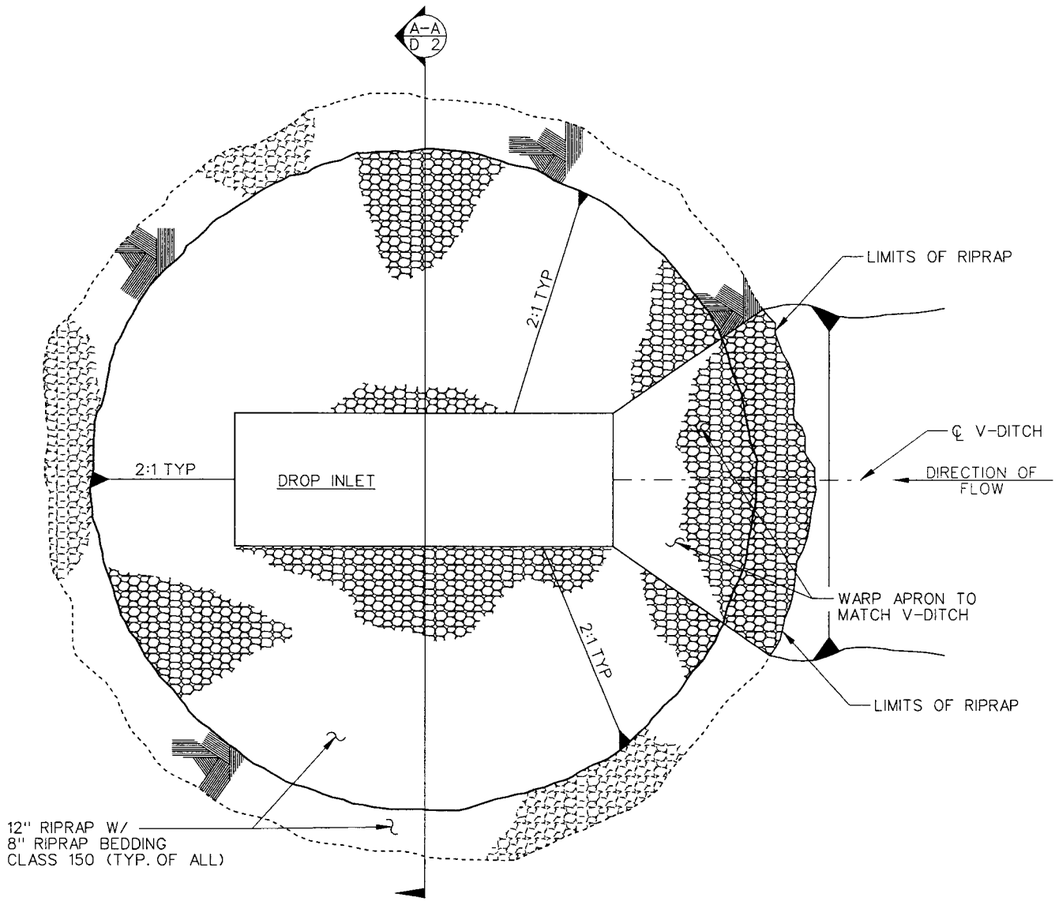


"G1" 28+80.93

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	H-6



A-A



PLAN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RIPRAP APRON DETAIL

INDEX OF SHEETS

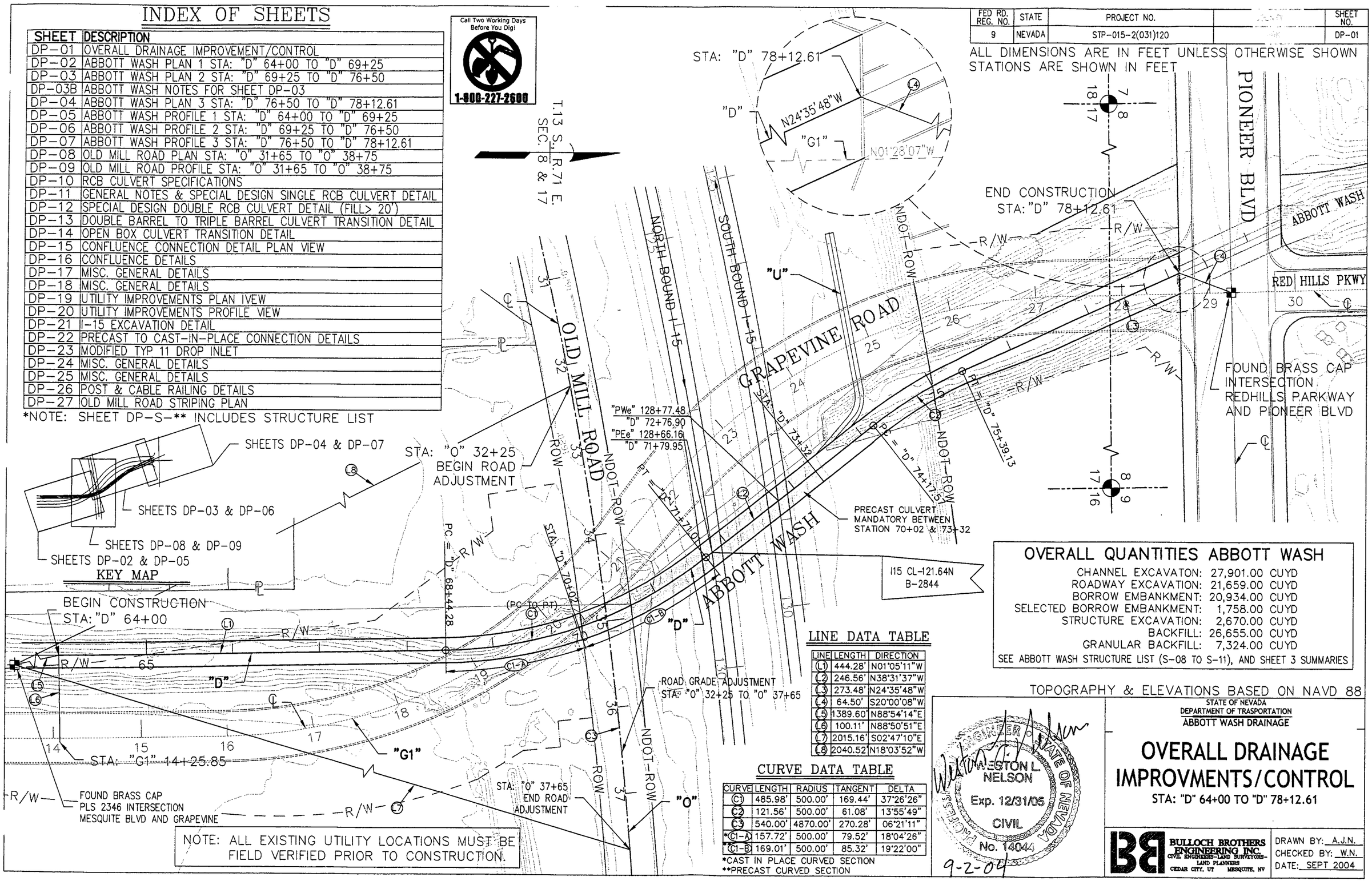
SHEET	DESCRIPTION
DP-01	OVERALL DRAINAGE IMPROVEMENT/CONTROL
DP-02	ABBOTT WASH PLAN 1 STA: "D" 64+00 TO "D" 69+25
DP-03	ABBOTT WASH PLAN 2 STA: "D" 69+25 TO "D" 76+50
DP-03B	ABBOTT WASH NOTES FOR SHEET DP-03
DP-04	ABBOTT WASH PLAN 3 STA: "D" 76+50 TO "D" 78+12.61
DP-05	ABBOTT WASH PROFILE 1 STA: "D" 64+00 TO "D" 69+25
DP-06	ABBOTT WASH PROFILE 2 STA: "D" 69+25 TO "D" 76+50
DP-07	ABBOTT WASH PROFILE 3 STA: "D" 76+50 TO "D" 78+12.61
DP-08	OLD MILL ROAD PLAN STA: "O" 31+65 TO "O" 38+75
DP-09	OLD MILL ROAD PROFILE STA: "O" 31+65 TO "O" 38+75
DP-10	RCB CULVERT SPECIFICATIONS
DP-11	GENERAL NOTES & SPECIAL DESIGN SINGLE RCB CULVERT DETAIL
DP-12	SPECIAL DESIGN DOUBLE RCB CULVERT DETAIL (FILL> 20')
DP-13	DOUBLE BARREL TO TRIPLE BARREL CULVERT TRANSITION DETAIL
DP-14	OPEN BOX CULVERT TRANSITION DETAIL
DP-15	CONFLUENCE CONNECTION DETAIL PLAN VIEW
DP-16	CONFLUENCE DETAILS
DP-17	MISC. GENERAL DETAILS
DP-18	MISC. GENERAL DETAILS
DP-19	UTILITY IMPROVEMENTS PLAN IVEW
DP-20	UTILITY IMPROVEMENTS PROFILE VIEW
DP-21	I-15 EXCAVATION DETAIL
DP-22	PRECAST TO CAST-IN-PLACE CONNECTION DETAILS
DP-23	MODIFIED TYP 11 DROP INLET
DP-24	MISC. GENERAL DETAILS
DP-25	MISC. GENERAL DETAILS
DP-26	POST & CABLE RAILING DETAILS
DP-27	OLD MILL ROAD STRIPING PLAN

*NOTE: SHEET DP-S-** INCLUDES STRUCTURE LIST

Call Two Working Days Before You Dig!
1-800-227-2600

FED RD. REG. NO.	STATE	PROJECT NO.		SHEET NO.
9	NEVADA	STP-015-2(031)120		DP-01

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN
STATIONS ARE SHOWN IN FEET



NOTE: ALL EXISTING UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

LINE DATA TABLE

LINE	LENGTH	DIRECTION
L1	444.28'	N01°05'11"W
L2	246.56'	N38°31'37"W
L3	273.48'	N24°35'48"W
L4	64.50'	S20°00'08"W
L5	1389.60'	N88°54'14"E
L6	100.11'	N88°50'51"E
L7	2015.16'	S02°47'10"E
L8	2040.52	N18°03'52"W

CURVE DATA TABLE

CURVE	LENGTH	RADIUS	TANGENT	DELTA
C1	485.98'	500.00'	169.44'	37°26'26"
C2	121.56'	500.00'	61.08'	13°55'49"
C3	540.00'	4870.00'	270.28'	06°21'11"
*C1-A	157.72'	500.00'	79.52'	18°04'26"
**C1-B	169.01'	500.00'	85.32'	19°22'00"

*CAST IN PLACE CURVED SECTION
**PRECAST CURVED SECTION

OVERALL QUANTITIES ABBOTT WASH

CHANNEL EXCAVATON:	27,901.00 CUYD
ROADWAY EXCAVATION:	21,659.00 CUYD
BORROW EMBANKMENT:	20,934.00 CUYD
SELECTED BORROW EMBANKMENT:	1,758.00 CUYD
STRUCTURE EXCAVATION:	2,670.00 CUYD
BACKFILL:	26,655.00 CUYD
GRANULAR BACKFILL:	7,324.00 CUYD

SEE ABBOTT WASH STRUCTURE LIST (S-08 TO S-11), AND SHEET 3 SUMMARIES

TOPOGRAPHY & ELEVATIONS BASED ON NAVD 88

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

OVERALL DRAINAGE IMPROVMENTS/CONTROL

STA: "D" 64+00 TO "D" 78+12.61

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

100.000000:1.000000 PLOT SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-02

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN
STATIONS ARE SHOWN IN FEET

TOPOGRAPHY & [illegible]NS BASED ON NAVD 88

CONCRETE U-CHANNEL BY OTHERS

6' CHAIN LINK FENCE (BY OTHERS)

POST AND CABLE RAILING (BY OTHERS, TO REMAIN)

CONTROL TIE

MATCH EXISTING

BEGIN CONSTRUCTION STA: 64+00

STA: 64+50 OFFSET: 32.25' LT.

STA: 64+50 OFFSET: 21.25' RT.

STA: 66+15 OFFSET: "D" 12.33' LT.

S13°13'44"E 1389.60'

DESERT ROSE SUBDIVISION

TYPE A CULVERT

TYPE B CULVERT

STA: "D" 66+50 SEE DETAIL SHEET DP-18

ABBOTT WASH EASEMENT

EXISTING CONTOURS

PROPOSED CONTOURS

T13 S. R. 71 E. SEC. 17

PC = 68+44.28

MATCH LINE SHEET DP-03 STA: "D" 69+25

GRAPEVINE ROAD

1600' ABBOTT WASH "D"

N01°05'11"W 444.28'

FG=1615.89

FG=1627.05

FG=1638.21

"GI"

IRR-12"

R/W

1610' 1612 1614 1620 1630 1640 1608

FOUND BRASS CAP PLS 2346 INTERSECTION MESQUITE BLVD AND GRAPEVINE

1 EXISTING IRRIGATION PIPE

2 REMOVE EXISTING FENCE AND DISPOSE.

3 REMOVE EXISTING RIPRAP LOCATED @ END OF CONCRETE U CHANNEL & DISPOSE.

4 INSTALL 6' CHAIN LINK FENCE PER NDOT STD. DWG NO R-6.3.2.1, (TUBULAR POSTS).

5 RELOCATE EXISTING ACCESS GATE & SIGNS FROM STA: "D" 63+30 TO "D" 64+50 (NO DIRECT PAYMENT)

6 INSTALL POST & CABLE RAILING PER DETAILS ON SHEET DP-26. MATCH EXISTING POST & CABLE RAILING

7 CONSTRUCT 12' WIDE GRAVELED MAINTENACE ROAD, TURN AROUND, AND 5' WIDE ACCESS PATH PER DETAIL B SHEET DP-25. MATCH EXISTING.

8 EXISTING GRAVEL MAINTENANCE ROAD/ ACCESS PATH.

9 INSTALL MODIFIED TYPE 4 MANHOLE PER DETAIL C, SHEET DP-24. RIM=1613±

10 PROVIDE 6'X3' ACCESS OPENING IN CENTER WALL BETWEEN CULVERTS PER DETAIL A, SHEET DP-25. (NO DIRECT PAYMENT)

△1 STA: 63+30, OFFSET: 14.25' LT. (FACE OF WALL)

△2 STA: 63+50, OFFSET: 14.25' RT. (FACE OF WALL)

Call Two Working Days Before You Dig!
1-800-227-2600

CURVE DATA TABLE

STA:	CURVE	LENGTH	RADIUS	TANGENT	DELTA
68+44.28-71+71.01	C1	485.98'	500.00'	169.44'	37°26'26"
68+44.28-70+02	*C1-A	157.72'	500.00'	79.52'	18°04'26"

*CAST-IN-PLACE CURVED CULVERT SECTION

PROFESSIONAL ENGINEER STATE OF NEVADA
WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044

Weston L. Nelson
9-2-04

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

PLAN VIEW 1

STA: "D" 64+00 TO "D" 69+25

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

50.000000:1.000000 PLOT SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)20	CLARK	DP-03

TOPOGRAPHY & ELEVATIONS BASED ON NAVD 88

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN
STATIONS ARE SHOWN IN FEET

CURVE DATA TABLE

CURVE	LENGTH	RADIUS	TANGENT	DELTA
*C1	326.73'	500.00'	169.44'	37°26'26"
C2	121.56'	500.00'	61.08'	13°55'49"
C4	26.19'	29.07'	14.06'	51°37'20"

*CURVE C1 INCLUDES CURVES C1-A AND C1-B. SEE SHEET DP-01 FOR DATA ON CURVES C1-A AND C1-B.

LINE DATA TABLE

LINE	LENGTH	DIRECTION
L2	246.56'	N38°31'37"W
L3	273.48'	N24°35'48"W
L10	26.20'	N49°31'37"W

Call Two Working Days Before You Dig!
1-800-227-2600

SEE NOTES ON FOLLOWING SHEET DP-03B

T13 S. R 71 E. SEC. 17 & 8

STUB CULVERT FOR FUTURE CONNECTION. COVER END WITH CONCRETE SLAB. SEE DETAIL D, SHEET DP-17 STA: 3+55±

SEE SHEETS 9 & 10 OF CONSTRUCTION PLANS FOR GRAPEVINE OVERPASS FOR S.D. INLET INTO UNNAMED WASH CULVERT STUB.

SEE UTILITY PLAN SHEET DP-19 & 20

I-15 NORTHBOUND

I-15 SOUTHBOUND

NDOT ROW

EX 12" SD

"O"

"U"

"D"

"G1"

OLD MILL ROAD

GRAPEVINE ROAD

ABBOTT WASH

EXISTING CONTOURS

PROPOSED CONTOURS

PILES FOR BRIDGE ABUTMENT SEE BRIDGE SECTION OF NDOT GRAPEVINE OVERPASS PLANS

MATCH LINE SHEET DP-02 STA: "D" 69+25

115 CL-121.64N B-2844

"PEe" 128+66.16 P.O.C.= "D" 71+79.95 TANGENT

"PWe" 128+77.48 P.O.C.= "D" 72+76.90 TANGENT

EXISTING 12' X 8' RCB CULVERT

(EAST WINGWALL ONLY)

PT = 71+71.01

PC = 1+37.88

PT = 1+64.07

N38°31'37"W 246.56'

N24°35'48"W 273.48'

S78°51'03"W 174.74'

STA: 70+16.11 INV. 1604.40

STA: 70+25 OFFSET: 13.12' LT./RT.

STA: 73+94 OFFSET: 13.12' RT.

EQUATION STATION STA: "D" 73+73+69.45 OFFSET: 15.12' LT =STA: "U" 1+00

DROP INLET

PRECAST CULVERT STA: "D" 70+02 TO 73+32

= PRECAST CULVERT

= PLUG CULVERT

BEGIN 110' TRANSITION STA: 75+39.13

END 110' TRANSITION STA: 76+49.13

NOTE: TRANSITION SPECIAL DESIGN SEE SHEET DP-13

STA: 75+28 OFFSET: 14.50' LT. INV=1616.50

STA: 75+00 OFFSET: 14.50' RT. INV=1613.00

NOTE: STA: "D" 73+32 TO "D" 74+08± CONFLUENCE, SPECIAL DESIGN

NO CENTER WALL

MATCH LINE SHEET DP-04 STA: "D" 76+50

SEE UTILITY PLAN, SHEET DP-19

PROFESSIONAL ENGINEER STATE OF NEVADA
WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
9-2-04

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

PLAN VIEW 2

STA: "D" 69+25 TO "D" 76+50
& STA: "U" 1+00 TO "U" 3+55

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

50.000000:1.000000 PLOT SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-03B

11 REMOVE AND DISPOSE OF EXISTING CULVERT AND/OR WINGWALL(S), OR INLET BOX & GRATE, AS SHOWN. ABANDON REMAINING EXISTING 12'X8' RCB IN PLACE. NO DIRECT PAYMENT FOR SAWCUT.

12 PLUG END OF ABANDONED EXISTING 12'X8' RCB CULVERT PER NDOT STD PLAN NO. B-20.1.7.

13 INSTALL 30" RCP CLASS III STORM DRAIN THROUGH BOX CULVERT WALL. SEE DETAIL A, SHEET DP-17 FOR TYPICAL PIPE THROUGH WALL CONSTRUCTION. SEE SHEETS DP-08 & DP-09 FOR CONTINUATION OF 30" STORM DRAIN CONSTRUCTION. (NO DIRECT PAYMENT)

14 STA: "D" 72+17, OFFSET: 8' RT. PROVIDE 2'ø OPENING IN TOP OF BOX CULVERT. INSTALL PIPE RISE INLET (TYPE 3) PER NDOT STD PLAN R-4.1.2 OVER OPENING.
GRATE ELEVATION=1619.34, TOP OF RCB CULVERT=1615.27

15 REGRADE MEDIAN AREA TO DIRECT RUNOFF TO NEW INLET OPENING IN 14'X9' RCB CULVERT PER NDOT STD DWG. NO. R-1.4.1, MATCH EXISTING WIDTH. PROVIDE POSITIVE DRAINAGE @ S=0.50% MIN. (NO DIRECT PAYMENT), QUANTITY INCLUDED IN OVERALL GRADING ESTIMATES.

16 CAP EXISTING OPENING IN TOP OF EXISTING 12'X8' RCB CULVERT. PER DETAIL C, SHEET DP-17. STA: "D" 72.65, OFFSET: 28' LT.

17 REMOVE AND SALVAGE EXISTING PRECAST BOX CULVERT HEADWALL & WINGWALLS. CONTACT PERSON: BILL TANNER, PH: (702)346-5237. LOCATE TO CITY YARD.

18 BACKFILL DEPRESSED AREA BETWEEN OLD MILL ROAD AND I-15 PER SECTION 207.02.01 OF NDOT STD. SPECIFICATIONS. (NO DIRECT PAYMENT), QUANTITY INCLUDED IN OVERALL GRADING ESTIMATES.

19 INSTALL MODIFIED TYPE 4 MANHOLE PER DETAIL C, SHEET DP-24.
OFFSET/DISTANCE FROM CL TO CENTER OF 4' OPENING.

20 REMOVE AND DISPOSE OF EXISTING MANHOLE SECTION RINGS AND BASE. COORDINATE WITH CITY OF MESQUITE PUBLIC WORKS DEPT. CONTACT PERSON : BILL TANNER (702) 346-5237

21 INSTALL SWEEPING 14" PVC FITTING ASTM F670 W/ PVC REPAIR COUPLING TO RECONNECT SEWER. SEE DETAIL D, SHEET DP-25. ENCASE W/ SLURRY CEMENT BACKFILL. COORDINATE WITH CITY OF MESQUITE PUBLIC WORKS DEPT. CONTACT PERSON : BILL TANNER (702) 346-5237

22 POTHOLE, FIELD VERIFY LOCATION & ELEVATIONS OF UTILITY/UTILITIES. CONSULT W/ ENGINEER FOR ANY CONFLICTS. (NO DIRECT PAYMENT).

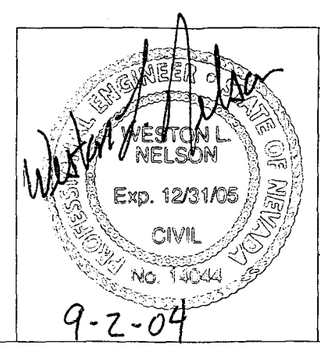
27 INSTALL RCP STORM DRAIN THROUGH BOX CULVERT WALL. SEE DETAIL A SHEET DP-17 FOR TYPICAL PIPE THROUGH WALL CONSTRUCTION.
(NO DIRECT PAYMENT)

71 INSTALL TYPE I MANHOLE PER NDOT STD. DWG. NO. R-4.7.1. STA: "D" 75+47.18, OFFSET: 152.72' LT., RIM=1637.5, INV IN=1629.36, INV OUT=1628.86.

72 INSTALL 18" RCP, CLASS V PIPE, N73°25'39"E, 139.71' CEN TO END, S=8.63%. EXCAVATION & BACKFILL PER NDOT STD. DWG. NO. R=1.1.5, PIPE BEDDING PER NDOT STD. DWG. NO. R-1.1.6. EXCAVATION AND BACKFILL QUANTITIES INCLUDED IN ABBOTT WASH STRUCTURE LIST. REFER TO APPLICABLE SECTION OF NDOT STD. SPECIFICATIONS & SPECIAL PROVISIONS THERETO.

73 CAP RCP CULVERT PER DETAIL B, SHEET SP-17. (NO DIRECT PAYMENT)

74 INSTALL 18" RCP, CLASS IV PIPE, S60°55'09"W, 35.00" END TO END, S=3.0%. EXCAVATION & BACKFILL PER NDOT STD. DWG. NO. R=1.1.5, PIPE BEDDING PER NDOT STD. DWG. NO. R-1.1.6. EXCAVATION AND BACKFILL QUANTITIES INCLUDED IN ABBOTT WASH STRUCTURE LIST. REFER TO APPLICABLE SECTION OF NDOT STD. SPECIFICATIONS & SPECIAL PROVISIONS THERETO.



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

NOTES FOR SHEET DP-03

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NO SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-04

GRAPHY & ELEVATIONS BASED ON NAVD 88

MANHOLE DATA TABLE

NUM	TYPE	RIM	INV IN	INV IN	INV OUT
(1)	EX SS MH	1631.68	1610.28 NE	1610.88 W	1609.91 SE
(2)	EX SS MH	1631.25	1611.10 N	1611.52 E	1611.02 SW

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN
STATIONS ARE SHOWN IN FEET

Call Two Working Days Before You Dig!
1-800-227-2600

22 POTHOLE, FIELD VERIFY LOCATION AND ELEVATIONS OF UTILITY/UTILITIES. CONSULT W/ ENGINEER OR C.M. FOR ANY CONFLICTS. (NO DIRECT PAYMENT)

23 END CONSTRUCTION STA: 78+12.61 (MATCH EXISTING)

24 SEE SHEETs 5-11 OF CONSTRUCTION PLANS FOR GRAPEVINE OVERPASS FOR ADDITIONAL INLET W/ GRAPEVINE ROAD.

25 INSTALL TYPE 11 INLET PER MODIFIED DETAIL. SEE SHEET DP-23, L=30', H=6.03', A=3.0', STA: "P" 84+48.15 OFFSET: 44.50' LT., TBC ELEV=1632.03, INV OUT=1625.50. INLET EXCAVATION & BACKFILL PER NDOT STD. DWG. NO. R-1.1.2. EARTH QUANTITIES INCLUDED W/ STRUCTURE EXCAVATION AND BACKFILL QUANTITIES. REFER TO APPLICABLE SECTION OF NDOT STD. SPECIFICATIONS & SPECIAL PROVISIONS THERETO.

26 INSTALL TYPE 11 INLET PER MODIFIED DETAIL. SEE SHEET DP-23, L=30', H=7.58', A=3.0', STA: "P" 86+43.16 OFFSET: 44.50' LT., TBC ELEV=1631.58, INV OUT=1623.50. INLET EXCAVATION & BACKFILL PER NDOT STD. DWG. NO. R-1.1.2. EARTH QUANTITIES INCLUDED W/ STRUCTURE EXCAVATION AND BACKFILL QUANTITIES. REFER TO APPLICABLE SECTIONS OF NDOT STD. SPECIFICATIONS & SPECIAL PROVISIONS THERETO.

27 INSTALL RCP STORM DRAIN THROUGH BOX CULVERT WALL. SEE DETAIL A SHEET DP-17 FOR TYPICAL PIPE THROUGH WALL CONSTRUCTION. (NO DIRECT PAYMENT)

28 CONNECT TO EXISTING CULVERT WITH NEW EXTENSION PER NDOT STD. DRAWING NO B-20.1.7 (NO DIRECT PAYMENT)

29 SEE SHEET DP-19 FOR CONTINUATION OF REUSE & POTABLE WATERLINE.

30 INSTALL 24" RCP, CLASS III. PIPE EXCAVATION & BACKFILL PER NDOT STD. DWG. NO. R-1.1.5, PIPE BEDDING PER NDOT STD. DWG. NO. R-1.1.6. EXCAVATION AND BACKFILL QUANTITIES INCLUDED IN STRUCTURE EXCAVATION AND BACKFILL QUANTITIES. SEE SHEET DP-01. REFER TO APPLICABLE SECTION OF NDOT STD. SPECIFICATIONS & SPECIAL PROVISIONS THERETO.

31 INSTALL TYPE I MANHOLE PER NDOT STD DWG. NO. R-4.7.1
STA: "P"86+45.16, OFFSET 75' LT., RIM=1632.00, INV IN=1622.35, INV OUT=1622.25

32 STUB, PLUG & BLOCK NEW 14" WL. TO STA: "P" 86+40, OFFSET: 65' LT. PIPE INVERT ELEVATION=1626.83. INSTALL TEMPORARY BLOW OFF VALVE. SEE DETAIL B, SHEET DP-24 FOR DETAILS. COORDINATE WITH VIRGIN VALLEY WATER DISTRICT.
CONTACT PERSON: MICHAEL WINTERS, PH.:(702)346-5731 (NO DIRECT PAYMENT)

33 INSTALL 14" BUTTERFLY VALVE, STA: "P" 86+20, OFFSET: 65' LT. SEE DETAIL A, SHEET DP-21. (NO DIRECT PAYMENT)

34 INSTALL 2" AIR/VAC VALVE. SEE DETAIL B, SHEET DP-21. STA: "G1" 28+50, OFFSET: 33' LT.

35 CONNECT NEW 12" FM TO EXISTING 12" FM (REUSE WATER) SOUTH OF SIDEWALK. 90° ELBOW, THRUST PER DETAIL D, SHEET DP-21 INSTALL 12" BUTTERFLY VALVE AND THRUST PER DETAIL D, SHEET DP-21 COORDINATE CONSTRUCTION WITH CITY OF MESQUITE SANITATION DISTRICT.
CONTACT PERSON: BILL TANNER, PH.:(702)346-5237 (NO DIRECT PAYMENT)

36 ABANDON IN PLACE 12" FM. FILL EACH END OF ABANDONED PIPE SOLID W/ GROUT. L=5.0'. CUT, CAP, & PLUG. (NO DIRECT PAYMENT).

BEARING: S01°27'57"E
LENGTH: 28.00'
SLOPE: 4.31%

STA: 77+74.61
OFFSET: 21.61' RT.
INV=1619.00

BEARING: N69°35'48"W
LENGTH: 76.39'
SLOPE: 4.25%

FUTURE WATERLINE TIE BY OTHERS

MATCH EXISTING

GRAPEVINE RD "G1"

"D"

EXISTING IMPROVEMENTS TO REMAIN

ABBOTT WASH (EXISTING IMPROVEMENTS)

FOUND BRASS CAP
INTERSECTION
REDHILLS PARKWAY
AND PIONEER BLVD
STA: "P" 85+45.66

RED HILLS PARKWAY

STA: "D" 76+79
OFFSET: 21.67' RT.
INV=1617.50

MATCH LINE SHEET DP-04
STA: "D" 76+50

BEARING: S20°24'12"W
LENGTH: 138.09'
SLOPE: 5.79%

110' TRANSITION
STA: "D" 75+39.13
STA: "D" 76+49.13
SEE TRANSITION STRUCTURE
SHEET DP-13

STA: "P" 84+46.65
SD @ INLET

MATCH EXISTING

PIONEER BOULEVARD

FINISH FLOOR ELEV OF FUTURE CONSTRUCTION SHALL BE 1634.50

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

PLAN VIEW 3

STA: "D" 76+50 TO 78+12.61

PROFESSIONAL ENGINEER STATE OF NEVADA
WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
9-2-04

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

50.000000:1.000000 PLOT SCALE

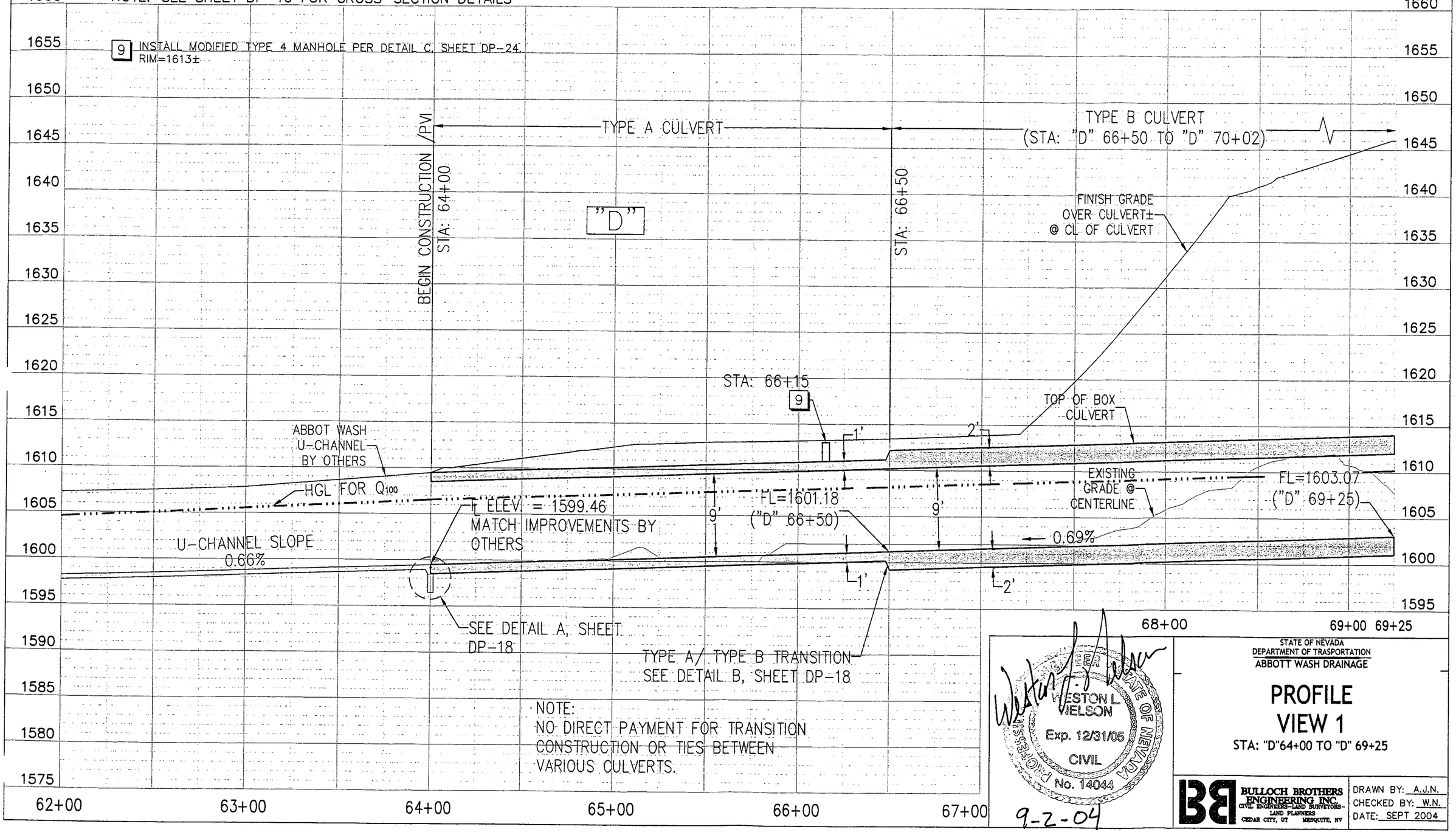
TOPOGRAPHY & ELEVATIONS BASED ON NAVD 88

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
	NEVADA	STP-015-2(031)120	CLARK	DP-05

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN
STATIONS ARE SHOWN IN FEET

NOTE: SEE SHEET DP-10 FOR CROSS-SECTION DETAILS

9 INSTALL MODIFIED TYPE 4 MANHOLE PER DETAIL C, SHEET DP-24. RIM=1613±



NOTE:
NO DIRECT PAYMENT FOR TRANSITION CONSTRUCTION OR TIES BETWEEN VARIOUS CULVERTS.

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

PROFILE VIEW 1

STA: "D"64+00 TO "D" 69+25

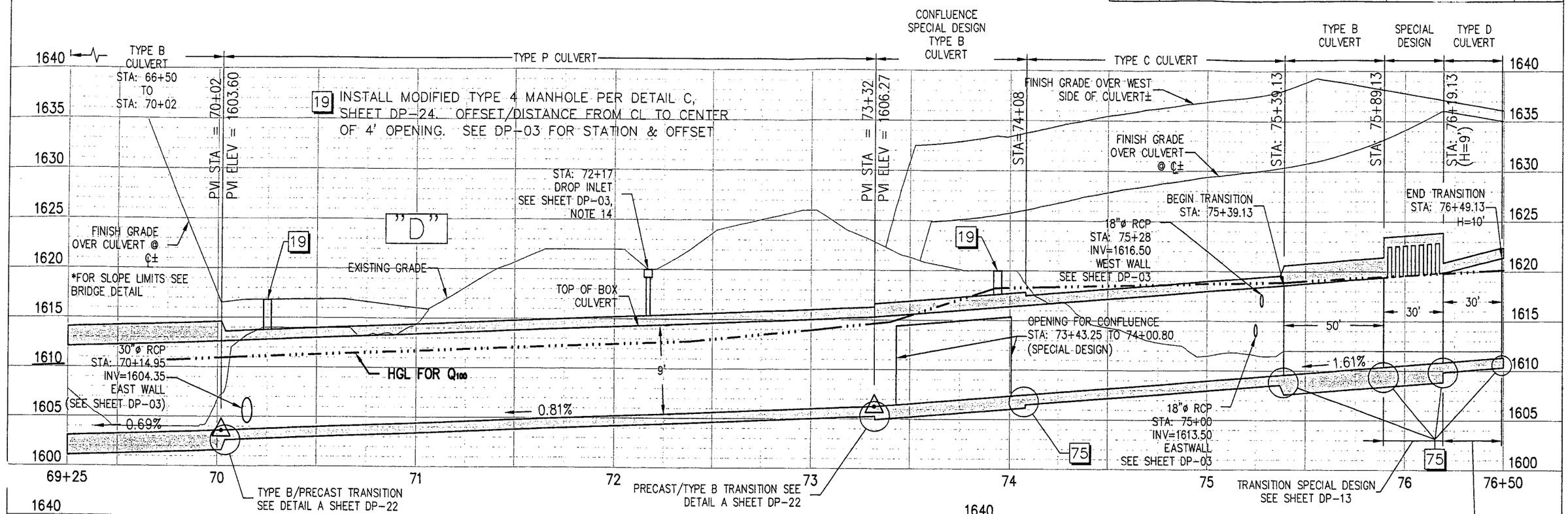
BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

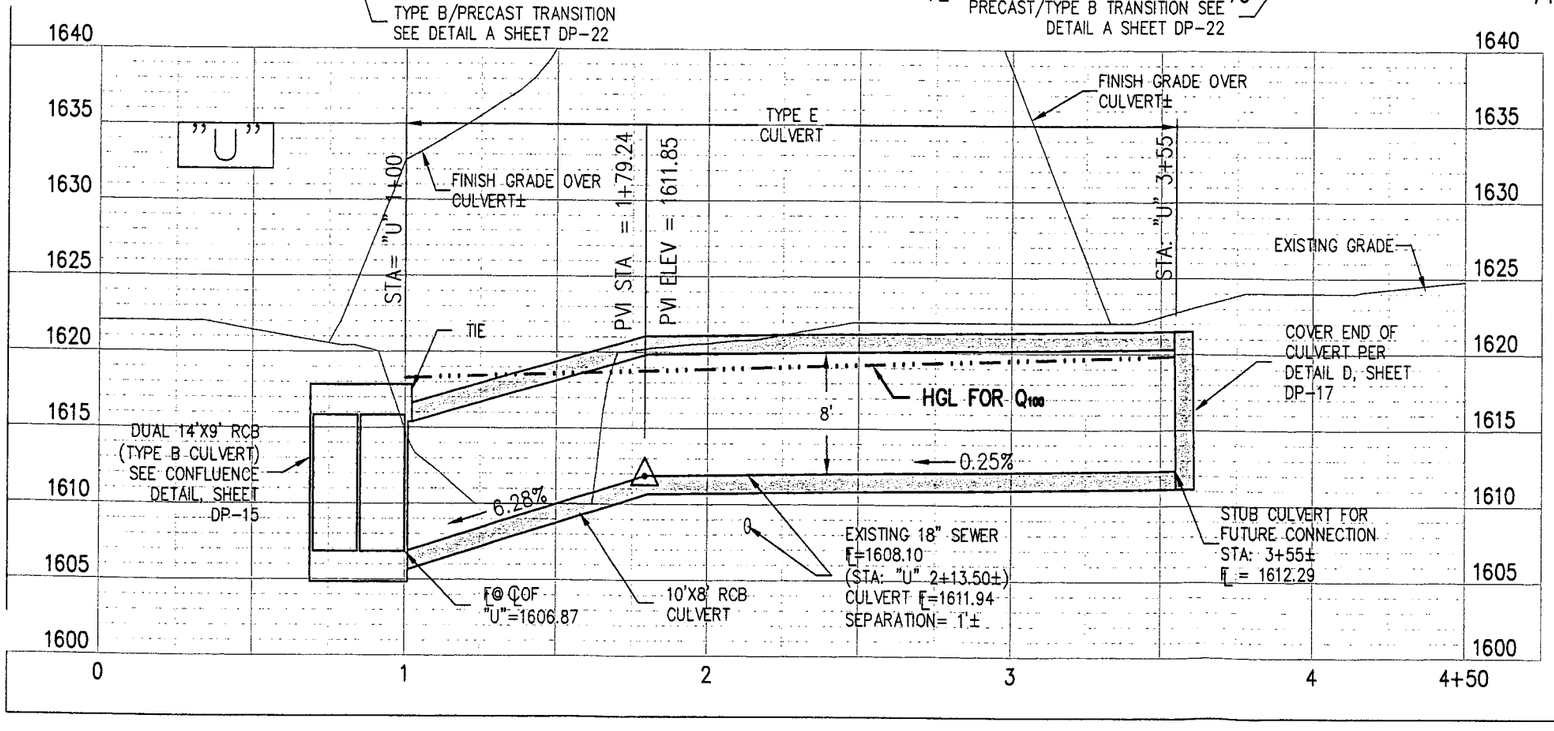
DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

50.000000:1.000000 PLOT SCALE

TOPOGRAPHY & ELEVATIONS BASED ON NAVD 88 ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN STATIONS ARE SHOWN IN FEET

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-06





75 PROVIDE CONSTRUCTION JOINT @ CULVERT TRANSITIONS. SEE DETAIL C, SHEET DP-25. (TYPICAL) (NO DIRECT PAYMENT)

NOTE:
NO DIRECT PAYMENT FOR TRANSITION CONSTRUCTION, OR TIES BETWEEN VARIOUS CULVERTS.

WESTON L. NELSON Exp. 12/31/05 CIVIL No. 14044 STATE OF NEVADA PROFESSIONAL ENGINEER

9-2-04

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

PROFILE VIEW 2

STA: "D" 69+25 TO "D" 76+50
& STA "U" 1+00 TO "U" 3+55

BULLOCH BROTHERS ENGINEERING INC. CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS CEDAR CITY, UT MESQUITE, NV

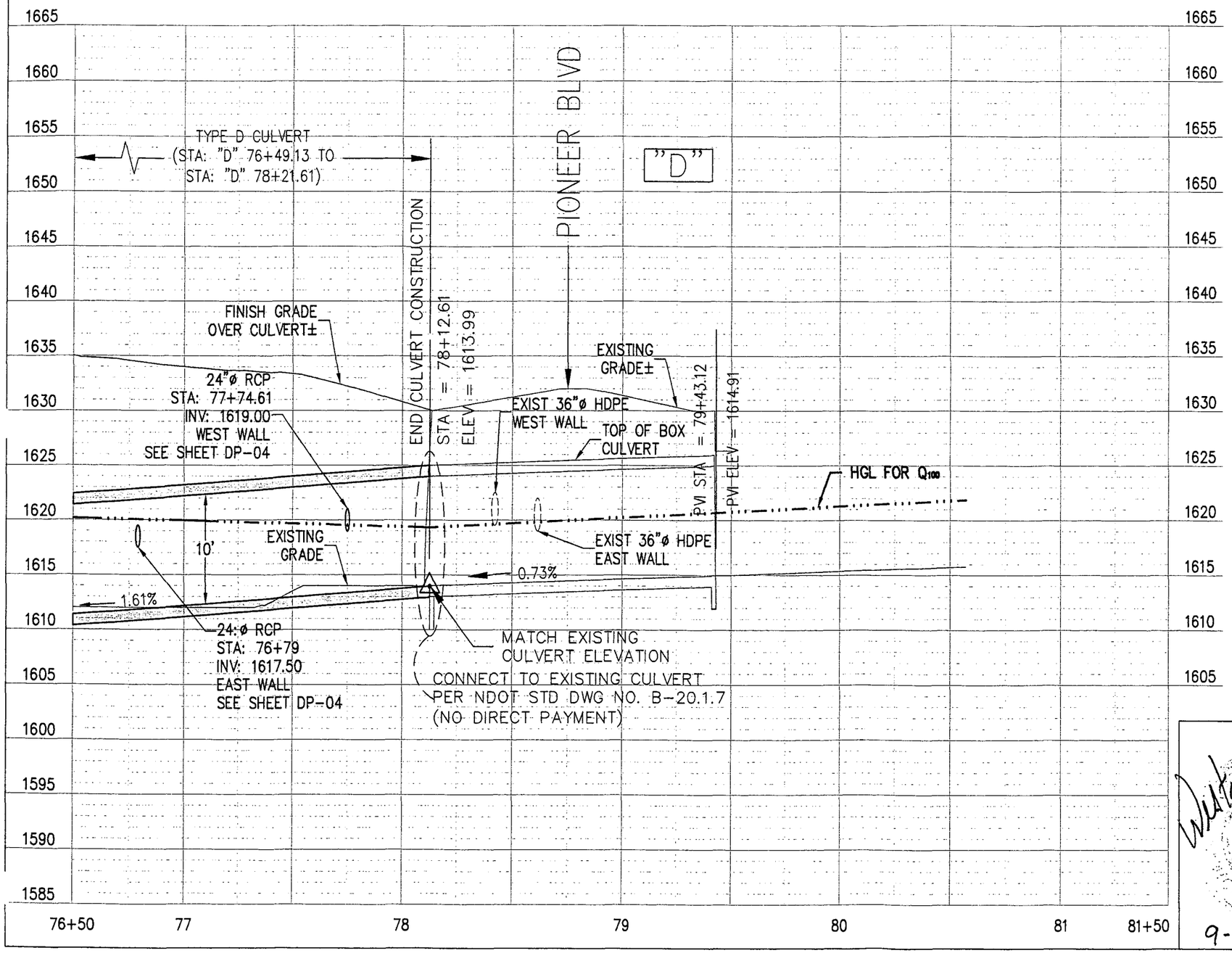
DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

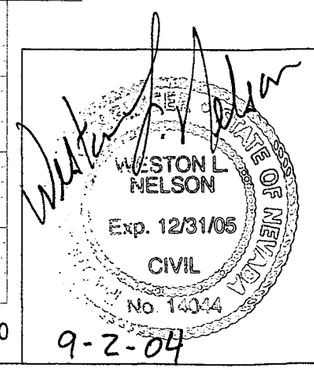
50.000000:1.000000 PLOT SCALE

TOPOGRAPHY & ...TIONS BASED ON NAVD 88

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-07

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN
STATIONS ARE SHOWN IN FEET





STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

PROFILE
VIEW 3

STA: "D" 76+50 TO "D" 78+12.61

BULLOCH BROTHERS ENGINEERING INC
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

50.000000:1.000000 PLOT SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	[illegible]120	CLARK	DP-08

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN
STATIONS ARE SHOWN IN FEET

TOPOGRAPHY & ELEVATIONS BASED ON NAVD 88

19 INSTALL MODIFIED TYPE 4 MANHOLE PER DETAIL C, SHEET DP-24. OFFSET/DISTANCE FROM CL TO CENTER OF 4' OPENING. SEE DP-03 FOR STATION & OFFSET

37 RELOCATE EXISTING AIR RELEASE VENT, CONCRETE PAD AND BOLLARDS TO STATION INDICATED; LOCATE BEHIND SIDEWALK. COORDINATE WITH VIRGIN VALLEY WATER DISTRICT. CONTACT MICHAEL WINTERS, PH: (702)346-5731

38 INSTALL TYPE 2 M.H. WITH MANHOLE COVER FRAME AND CONCRETE COVER PER NDOT STD PLANS R-4.7.1 & R-4.7.3 STA: "0" 37+48, OFFSET: 7.5' RT, RIM=1611.33, INV IN (N)=1608.00, INV IN (S)=1608.00, INV IN (E)=1605.93, INV OUT (W)=1605.73

39 INSTALL TYPE 2 M.H. WITH MANHOLE COVER FRAME AND CONCRETE COVER PER NDOT STD PLANS R-4.7.1 & R-4.7.3 STA: "0" 35+19.61, OFFSET: 7.5' RT, RIM=1616.13, INV IN=1604.60, INV OUT=1604.50

40 INSTALL RCP CLASS III STORM DRAIN AT SIZE AND SLOPE INDICATED. PIPE EXCAVATION & BACKFILL PER NDOT STD. PLAN NO. R-1.1.5, PIPE BEDDING PER NDOT STD. PLAN NO. R-1.1.6. EXCAVATION AND BACKFILL QUANTITIES INCLUDED IN STRUCTURE EXCAVATION & BACKFILL QUANTITIES SHOWN ON SHEET DP-01. REFER TO SECTION 206 OF NDOT STD SPECIFICATIONS AND ANY SPECIAL PROVISION THERETO.

41 STA: "0" 37+50.43 OFFSET: 24.50' RT. INSTALL MODIFIED NDOT TYPE 11 INLET, L=15', H=2.70', A=4.0'. TBC=1611.34 INV OUT=1608.14, SEE SHEET DP-23. REFER TO APPLICABLE SECTIONS OF NDOT STD. SPECIFICATIONS AND SPECIAL PROVISIONS THERETO.

42 REMOVE AND DISPOSE OF EXISTING ASPHALT. STA: "0" 31+65± TO "0" 38+75±. BETWEEN SAWCUT AND EXISTING APSHALT LIMIT SHOWN

43 REFER TO SHEET 2A FOR BASE, ASPHALT, CURB & GUTTER, AND SIDEWALK PLACEMENT.

44 INSTALL NDOT TYPE 10 INLET, STA: 37+48, OFFSET: 28' LT. TO TBC @ CENTER OF INLET. TBC=1612.29, INV OUT=1608.20, H=5.09' FROM TBC GRADE TO FLOOR.

45 ABANDON IN PLACE 16" W.L. & 12" FM, FILL EACH END SOLID W/ GROUT. L=5.0', FILL VALVE CANS WITH CONCRETE, CUT CAP & PLUG. (NO DIRECT PAYMENT)

46 STA: "0" 36+30, OFFSET: 19.50' RT. CONNECT TO EXISTING 14" W.L. CUT IN AND INSTALL 14"X14"X14" DUCTILE IRON TEE, AND COUPLING, THRUST PER DETAIL D, SHEET DP-21. INSTALL 14" BUTTERFLY VALVE AND THRUST PER DETAILS A & D, SHEET DP-21. COORDINATE WITH VIRGIN VALLEY WATER DISTRICT. CONTACT PERSON: MICHAEL WINTERS, PH: (702) 346-5731 (NO DIRECT PAYMENT)

47 POTHOLE EXISTING UTILITIES TO VERIFY LOCATION & ELEVATION. COORDINATE CONFLICTS WITH ENGINEER & C.M. (NO DIRECT PAYMENT)

48 STA: "0" 35+60, OFFSET: 3.10' LT.. CONNECT TO EXISTING 12" FM. CUT IN AND INSTALL 12"X12"X12" DUCTILE IRON TEE, AND COUPLING, THRUST PER DETAIL D, SHEET DP-21. INSTALL 14" BUTTERFLY VALVE AND THRUST PER DETAILS A & D, SHEET DP-21. COORDINATE WITH CITY OF MESQUITE SANITATION DEPARTMENT, CONTACT PERSON: BILL TANNER, PH: (702)346-5237 (NO DIRECT PAYMENT)

49 SEE SHEET DP-19 FOR CONTINUATION OF POTABLE AND REUSE WATERLINES.

73 CAP RCP CULVERT END PER DETAIL B, SHEET DP-17. (NO DIRECT PAYMENT)

75 SLURRY CEMENT BACKFILL PER SECTION 207 AROUND S.D. SEE ABBOTT WASH STRUCTURE LIST. (2070536)

I-15 SOUTHBOUND

I-15 NORTHBOUND

ABBOTT WASH

GRAPEVINE ROAD

OLD MILL ROAD

EXISTING BOX CULVERT

EQUATION STATION
"O" = 34+94.87
"D" = 70+36.54

T13 S., R. 71 E.
SEC. 8 & 17

SEE UTILITY PLAN SHEET DP-19

CONTROL OF ACCESS FENCE TO REMAIN

SAWCUT (NO DIRECT PAYMENT)

MATCH EXISTING CURB, GUTTER, & ASPHALT STA: "0" 31+65 (TBC=1620.37)

ABANDON IN PLACE

EXISTING ASPHALT LIMITS

MATCH EXISTING ASPHALT STA: "0" 31+65

MATCH EXISTING CURB, GUTTER, & SIDEWALK STA: "0" 31+65 (TBC=1620.47)

STA: "0" 34+15

STA: "0" 36+12

MATCH EXISTING CURB & GUTTER STA: "0" 38+02.70 (TBC=1612.50)

SAWCUT (NO DIRECT PAYMENT)

STA: "0" 37+48

STA: "0" 36+28

END CURB, GUTTER, & SIDEWALK STA: "0" 37+60.39

END ASPHALT STA: "0" 38+75 (MATCH EXISTING)

NDOT ROW

ROW

R/W

IRR

"0"

STORM DRAIN LINE DATA

LINE	LENGTH	BEARING	SIZE
L1	10.56'	S24°03'12"W	30" RCP
L2	228.02'	S83°52'36"W	30" RCP
L3	15.50'	S04°46'47"E	19"X30" RCP ELLIPTICAL
L4	34.00'	N04°46'47"W	18" RCP
L5	5.00'	N83°52'36"E	24" RCP

OLD MILL RD CENTER CURVE DATA

CURVE	STA:	RADIUS	LENGTH	TANGENT	DELTA
C1	"0" 31+65 TO "0" 38+75	4870'	710'	355.63'	08°21'11"

= NEW ASPHALT

= EXISTING ASPHALT

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1-800-227-2600

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

OLD MILL ROAD PLAN VIEW

STA: "0" 31+65 TO "0" 38+75

PROFESSIONAL ENGINEER STATE OF NEVADA
WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
9-2-04

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

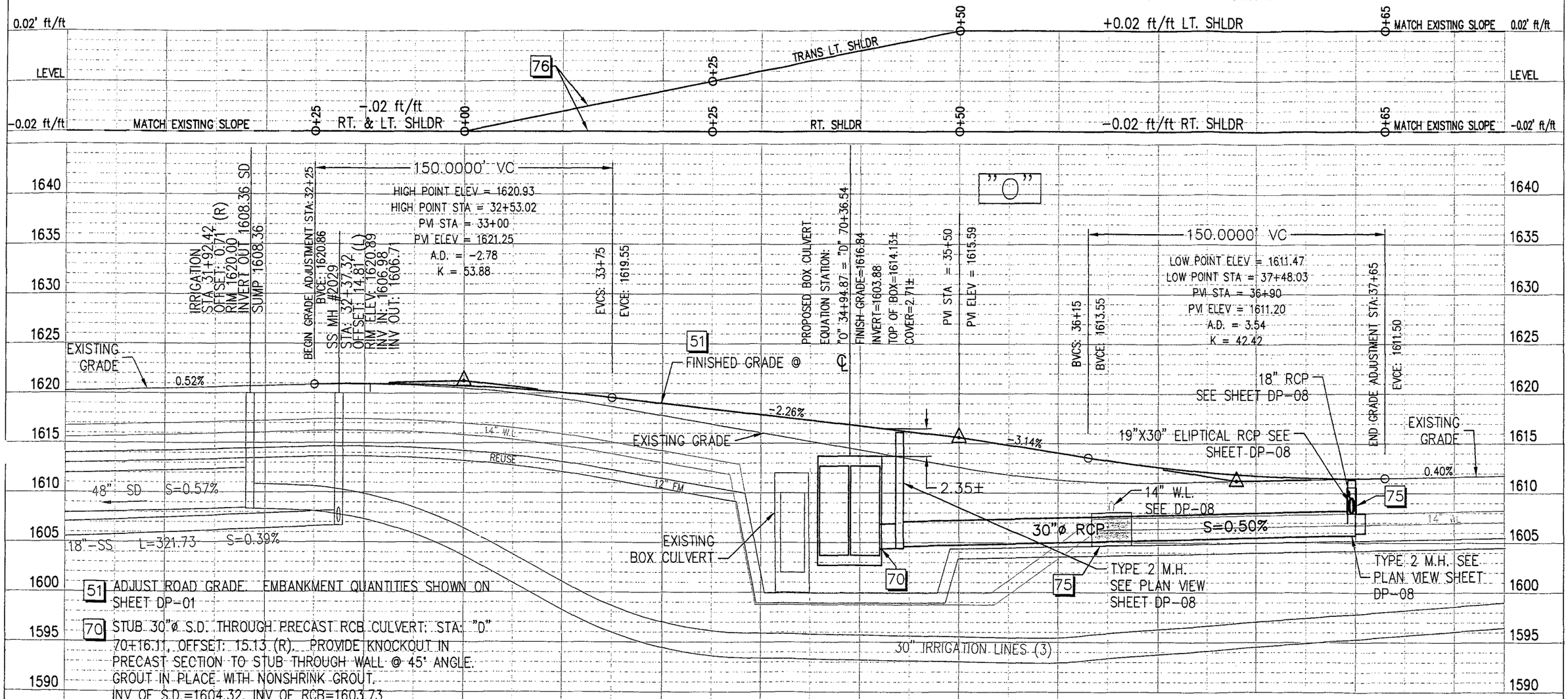
DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

50.000000:1.000000 PLOT SCALE

TOPOGRAPHY & ELEVATIONS BASED ON NAVD 88

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-09

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN
STATIONS ARE SHOWN IN FEET

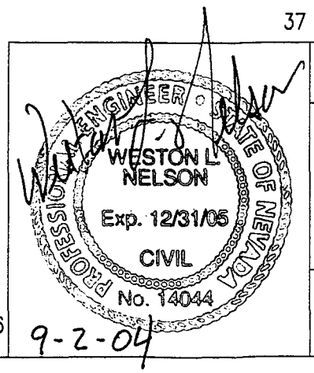


51 ADJUST ROAD GRADE. EMBANKMENT QUANTITIES SHOWN ON SHEET DP-01

70 STUB 30"ø S.D. THROUGH PRECAST RCB CULVERT: STA: "D" 70+16.11, OFFSET: 15.13 (R). PROVIDE KNOCKOUT IN PRECAST SECTION TO STUB THROUGH WALL @ 45° ANGLE. GROUT IN PLACE WITH NONSHRINK GROUT. INV OF S.D.=1604.32, INV OF RCB=1603.73 SEE DETAIL A, SHEET DP-17 (NO DIRECT PAYMENT)

75 SLURRY CEMENT BACKFILL PER SECTION 207 AROUND S.D. SEE ABBOTT WASH STRUCTURE LIST. (2070536)

76 SHLDR=LIP OF GUTTER. FINISH GRADE @ SHLDR=0.02' (1/4") OVER LIP OF GUTTER



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

OLD MILL ROAD PROFILE VIEW

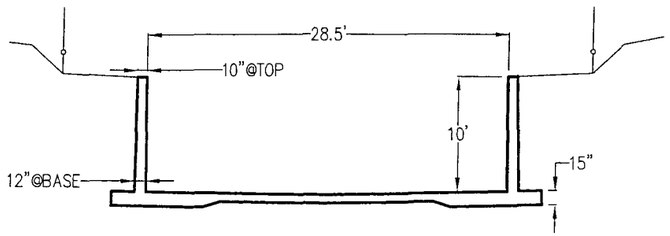
STA: "O" 32+25 TO "O" 37+65

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

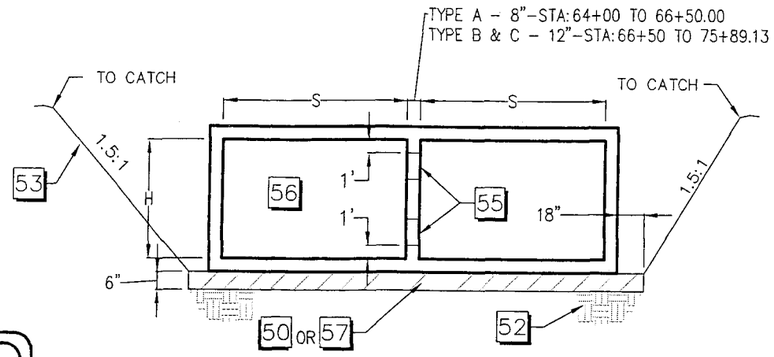
50.000000:1.000000 PLOT SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-10



RECTANGULAR CONCRETE CHANNEL (BY OTHERS) (R)

NOT TO SCALE (DP-10)



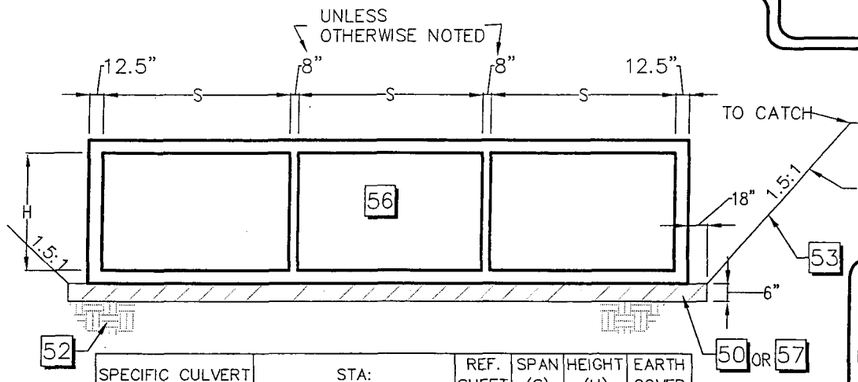
NOTE: REFER TO SHEETS DP-13 AND DP-14 FOR SPECIAL DESIGN OF TRANSITION STRUCTURE BETWEEN STA: 75+89.13 TO 76+19.13. REFER TO SHEETS DP-15 AND DP-16 FOR SPECIAL DESIGN OF CONFLUENCE STA: 73+40 TO 77+03.

SPECIFIED CULVERT	STA:	REFERENCE SHEET	SPAN (S)	HEIGHT (H)	EARTH COVER
TYPE A	"D" 64+00 – 66+50	*B-20.1.1 *B-20.1.3	13'-11"	9'	≤10'
TYPE B	"D" 66+50 – 70+02	DP-12	14'		>20'
TYPE B	"D" 73+32.00 – 74+08	DP-12	14-17.5'		≤20'
⚠⚠TYPE C	"D" 74+08 – 75+39.13	*B-20.1.1 *B-20.1.3	14'		≤20'
TYPE B	"D" 75+39.13 – 75+89.13	DP-12	14'-17.5'		≤20'

* REFER TO NDOT STD PLANS FOR ROAD & BRIDGE CONSTRUCTION.
⚠ CONSTRUCT TYPE C CULVERT WITH 12" THICK INTERIOR WALL TO MATCH TYPE B INTERIOR WALL.
⚠ LONGITUDINAL BARS SHALL BE #5 BARS @ 12" O.C. INSTEAD OF #4 BAR @ 18" O.C. AS SHOWN.

DOUBLE RCB CULVERT (B)

NOT TO SCALE (DP-10)

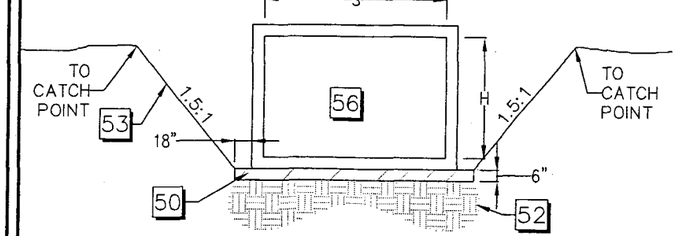


SPECIFIC CULVERT	STA:	REF. SHEET	SPAN (S)	HEIGHT (H)	EARTH COVER
⚠ TYPE D	"D" 76+19.13 – 78+13.00	*B-20.1.1 *B-20.1.3	≤14'	9'–10'	≤20'

* REFER TO NDOT STD PLANS FOR ROAD & BRIDGE CONSTRUCTION.
⚠ LONGITUDINAL BARS SHALL BE #5 BARS @ 12" O.C. INSTEAD OF #4 BAR @ 18" O.C. AS SHOWN.

TRIPLE RCB CULVERT (D)

NOT TO SCALE (DP-10)

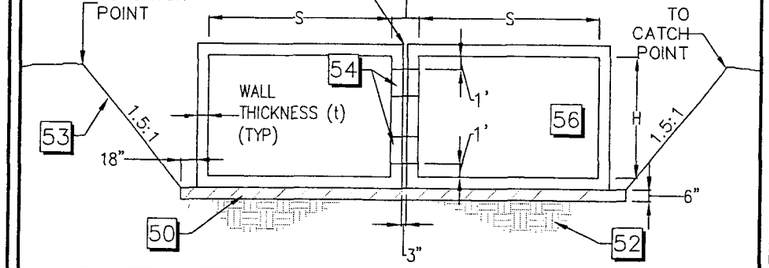


SPECIFIC CULVERT	STA:	REF. SHEET	SPAN (S)	HEIGHT (H)	EARTH COVER
TYPE E	"U" 1+37.88 TO 3+55	DP-11	10'	8'	>20'

SPECIAL DESIGN SINGLE RCB CULVERT (E)

NOT TO SCALE (DP-10)

NOTE: CONTRACTOR SHALL PROVIDE REQUIRED INFORMATION SPECIFIED IN SECTION 503 OF STD. SPEC FOR R&B CONST NDOT, AND SPECIAL PROVISIONS.



SPECIFIC CULVERT	STA:	REF. SHEET	SPAN (S)	HEIGHT (H)	EARTH COVER
TYPE P	"D" 70+02 TO 73+32	*B-20.1.8	14'	9'	≤10'

* REFER TO NDOT STD PLANS FOR ROAD & BRIDGE CONSTRUCTION.
NOTE: 6" OF BEDDING MATERIAL OR BASE REQUIRED INSTEAD OF 4" SPECIFIED ON NDOT PLAN B-20.1.8

PRECAST CONCRETE BOX CULVERT (P)

DESIGN PRECAST FOR FILL CONDITIONS SHOWN ON SHEETS DP-06 & DP-09 UNDER I-15 & OLD MILL RD RESPECTIVELY

NOT TO SCALE (DP-10)

CONSTRUCTION NOTES

50 6" TYPE 1 CLASS B AGGREGATE BASE.

52 8" SCARIFIED, MOISTURE CONDITIONED, RECOMPACTED NATIVE MATERIAL @95% OF THE MAXIMUM DENSITY AS DETERMINED BY TEST METHOD NO. NEV. T101. THE INPLACE DENSITY WILL BE DETERMINED BY TSET METHOD NO. NEV. T102 OR T103.

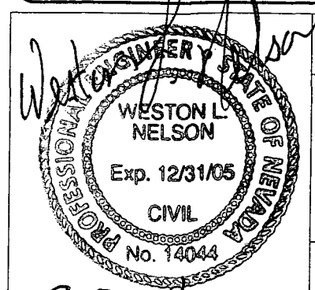
53 EXCAVATION LIMITS & QUANTITIES CALCULATED ARE BASED ON LIMITS SHOWN, WHICH ARE BASED ON NDOT STD PLAN NO. R-1.1.4 (B-20.1.8 FOR PRECAST). CONTRACTOR SHALL REFER TO NDOT STD PLANS SPECIFIED, AND APPLICABLE SECTIONS OF NDOT'S STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION (CURRENT EDITION [SECTIONS 203, 206, & 207]), AND SPECIAL PROVISIONS THERETO FOR CONSTRUCTION REQUIREMENTS AND METHODS OF PAYMENT FOR EXCAVATION & BACKFILL. ACCEPTABLE MATERIAL FROM EXCAVATION MAY BE USED FOR BACKFILLING.

54 STA: "D" 70+02 TO 73+32. PROVIDE 2'ø OPENING IN CENTER WALL @ 24' O.C. ALTERNATE TOP AND BOTTOM OPENINGS. PROTECT OPENINGS FROM GROUT FILL BETWEEN CULVERTS.

55 PROVIDE 2'ø OPENING IN CENTER WALL AT 20' O.C. BETWEEN STA: "D" 74+20 AND STA: 75+80. ALTERNATE TOP & BOTTOM OPENINGS.

56 REFER TO GENERAL NOTES ON SHEET DP-11.

57 OPTIONAL FOR WET SOIL CONDITIONS: 24" TYPE CLASS B AGGREGATE BASE OVER WOVEN FILTER FABRIC. WHEN DIRECTED BY ENGINEER.



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

RCB CULVERT SPECIFICATIONS

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS–LAND SURVEYORS–LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-11

GENERAL NOTES:

1) DESIGN SPECIFICATIONS: AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES (SSHB), 1996 EDITIONS WITH INTERUMS THROUGH 1998, EXCEPT AS NOTED BELOW.

2) CONSTRUCTION SPECIFICATIONS: STATE OF NEVADA DEPARTMENT OF HIGHWAYS "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION," CURRENT EDITION, AND SPECIAL PROVISIONS THERETO.

3) LOADING: LIVE LOAD: STANDARD HS25-44 OR ALTERNATE FHWA MILITARY LOADING, IMPACT FOR TOP SLAB IS APPLIED AS SPECIFIED IN AASHTO-SSHB, SECTION 3.8. EARTH LOAD: EQUIVALENT FLUID PRESSURE FOR TWO CONDITIONS,
   1) 120 LBS/CU. FT. VERTICAL, 30 LBS./CU. FT. HORIZONTAL. (AASHTO 6.2.1)
   2) 120 LBS/CU. FT. VERTICAL, 60 LBS./CU. FT. HORIZONTAL. (AASHTO 6.2.1)
   * LOAD FACTORS: 1.3(DL+ $\frac{5}{3}$ LL) NOTE: REFERENCE NDOT RCB CULVERT LOADING PER STD PLAN NO. B-20.1.1.

   DESIGN & CONSTRUCT PRECAST BOX CULVERT AS DEFINED IN SECTION 502.03.24 OF NDOT STANDARD SPECIFICATIONS.

4) CONCRETE: TYPE V PORTLAND CEMENT, CLASS-MODIFIED A PER TABLE I, SECTION 501.03.04 OF NDOT STANDARD SPECIFICATIONS, WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4500 PSI. SLUMP LIMITED TO 3 INCHES FOR FLAT WORK AND 4 INCHES FOR CONCRETE USED IN FORMS. MINIMUM SACKS OF CEMENT PER CUBIC YARD OF CONCRETE SHALL 6.5.

   PORTLAND CEMENT CONCRETE, AND CONCRETE INSTALLATION, SHALL CONFORM TO SECTIONS 501 & 502 RESPECTIVELY, OF NDOT STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION. AND ANY SPECIAL PROVISION APPLICABLE. CONCRETE CLASS & STRENGTH SPECIFIED ABOVE IS APPLICABLE FOR ALL RCB CULVERT CONSTRUCTION ASSOCIATED WITH THIS PROJECT. MISC. CONCRETE IMPROVEMENTS ASSOCIATED WITH ABBOTT WASH IMPROVEMENTS (i.e. DP-**) SUCH AS INLETS, SHALL CONFORM TO NDOT STD. SPECIFICATIONS.

5) REINFORCING STEEL: ALL REINFORCING STEEL TO BE ASTM A615 GRADE 60. MAIN REINFORCEMENT IS TO BE PLACED IN THE TRANSVERSE DIRECTION. STAGGER SPLICES NOT SHOWN. HOOKS MAY BE ROTATED OR TILTED, AS NECESSARY, FOR CLEARANCE. REINFORCEMENT SHALL HAVE A 2 $\frac{1}{2}$ INCH CLEARANCE ON BOTTOM OF BOTTOM SLAB AND 2 INCH CLEARANCE ON REMAINDER OF STRUCTURE AND ITS APPURTENANCES UNLESS OTHERWISE NOTED ON THE PLANS.

6) FOUNDATION PRESSURE: THE RCB CULVERTS FROM STATION 64+00 TO 66+50; AND FROM 70+02 TO 73+32 ARE DESIGNED TO THE FOLLOWING SOIL BEARING PRESSURES:

COVER HEIGHTS	10 FT.	20 FT.
RCB HEIGHT	TONS/SQ. FT.	
6 FT.	1	1.6
8 FT.	1.1	1.7
10 FT.	1.2	1.8
12 FT.	1.3	1.9
14 FT.	1.4	2.0

DUE TO OVERBURDEN PROPOSED BETWEEN STA: "D" 66+50 AND STA: "D" 70+02 AND BETWEEN STA: "D" 73+32 AND STA: "D" 78+12, SOME SETTLEMENT IS EXPECTED TO OCCUR REGARDLESS OF SUBGRADE PREPARATION. CULVERT CONSTRUCTED BETWEEN THESE STATION SHALL FOLLOW THE RECOMMENDED PROCEDURES AS DEFINED IN THESE IMPROVEMENT PLANS, AND AS DESCRIBED IN THE SPECIAL CONDITIONS. PROCEDURES INCLUDE CONSTRUCTION OF CULVERT BETWEEN STA: "D" 66+50 AND STA: "D" 70+02, AND BETWEEN STA: "D" 73+32 AND STA: "D" 78+12. FIRST LOAD THE STRUTURE UNIFORMLY TO SAME HEIGHT, WAIT 30 DAYS FOR CONSOLIDATION TO OOCUR, TIE INTO SETTLED CULVERTS FOR CONTINUATION OF REMAINING CULVERTS.

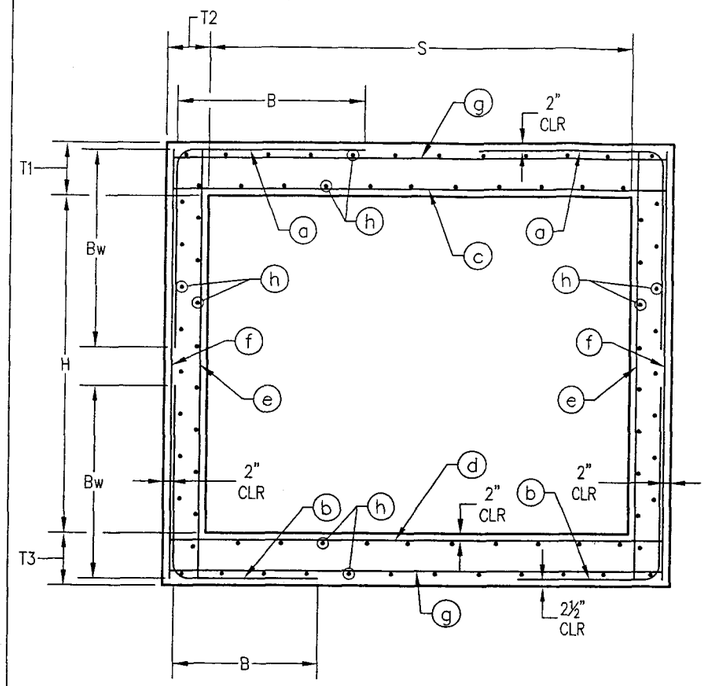
7) DESIGNATION: BOX CULVERTS ARE SHOWN ON PLANS AS SPAN TIMES HEIGHT. LENGTH OF BOX CULVERTS INDICATED BY TYPE AND STATIONING.

8) ADDITIONAL LENGTH: LENGTH OF CULVERT SHALL BE INCREASED AS FOLLOWS: ADD 2.0 FT TO EACH END WHEN COVER AT SHOULDER IS 0.0 TO 5.0 FT. ADD AN ADDITIONAL 1.0 FT TO EACH END FOR EACH SUCCEEDING 5.0' OF COVER OR PORTION THEREOF.

9) PROPOSED CULVERT(S) TIE INTO EXISTING CHANNEL IMPROVEMENS ON EACH END, OR TIE INTO VARIOUS TYPES OF CULVERT SPECIFIED FOR PROJECT. SEE REFERENCED SECTIONS DRAINAGE IMP. PLANS (DP-**)

10) QUANTITIES: QUANTITIES DO NOT INCLUDE "d" BARS, NOR SPLICES IN BARS, NOR TEMPERATURE BARS FOR EXPOSED TOP SLAB, NOR CONCRETE OR REINFORCEMENT FOR PARAPETS OR PAVING LEDGES.

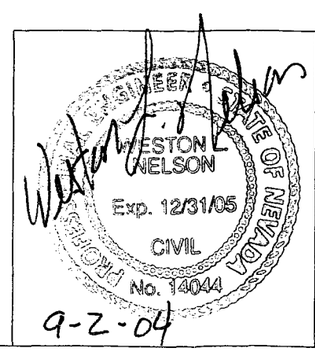
11) THREE OR MORE CELL: FOR CULVERTS WITH MORE THAN TWO CELLS, USE DIMENSIONS AND REINFORCEMENT FOR THE "DOUBLE BOX CULVERT" AND ADJUST THE QUANTITIES ACCORDINGLY.



UN-NAMED WASH CULVERT TYPE "E" (E / DP-11)
NOT TO SCALE

HEIGHT			H=8'
SPAN (S)			S=10'
EARTH COVER			>20'
CONCRETE	ROOF	T1 (inches)	15
	EXTERIOR WALL	T2 (inches)	12
	INVERT	T3 (inches)	15
REINFORCEMENT	BAR NO.		6
a	DIMENSION	B (inches)	53
	DIMENSION	Bw (inches)	56
	SPACING	(inches)	5
	BAR NO.		6
b	DIMENSION	B (inches)	41
	DIMENSION	Bw (inches)	55
	SPACING	(inches)	5
c	BAR NO.		8
	SPACING	(inches)	5
d	BAR NO.		8
	SPACING	(inches)	5
e	BAR NO.		4
	SPACING	(inches)	5
f	BAR NO.		4
	SPACING	(inches)	5
g	BAR NO.		4
	SPACING	(inches)	10
h	BAR NO.		4
	SPACING	(inches)	6
QUAN	CONCRETE	CY/LF	1.78
	REINFORCEMENT	LBS/LF	421

PROVIDE 2" CLEARANCE UNLESS OTHERWISE SPECIFIED. ALL BENDS AND LAP DIMENSIONS NOT SPECIFICALLY DETAILED ON PLANS SHALL BE FABRICATED TO MEET ACI SPECIFICATIONS.



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

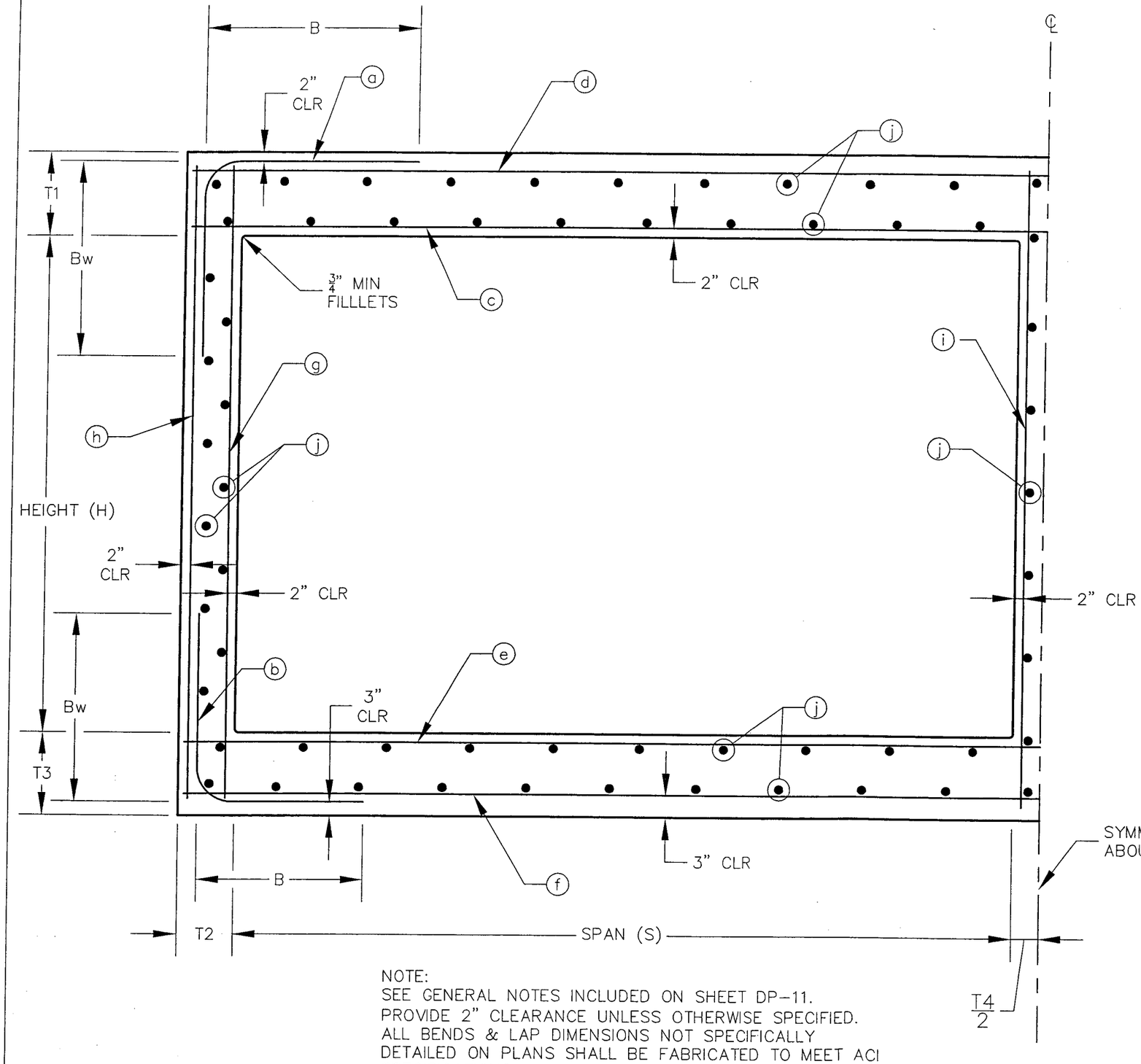
GENERAL NOTES & DETAIL FOR SPECIAL DESIGN SINGLE RCB CULVERT

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-12



HEIGHT			H=9'	
SPAN (S)			S=14'	14'≤S≤17.5'
EARTH COVER			>20'	≤20'
CONCRETE	ROOF	T1 (inches)	24	24
	EXTERIOR WALL	T2 (inches)	12	12
	INVERT	T3 (inches)	24	24
	INTERIOR WALL	T4 (inches)	12	12
REINFORCEMENT	BAR NO.		6	6
	(a) DIMENSION	B (inches)	53	53
	(a) DIMENSION	Bw (inches)	53	53
	(a) SPACING	(inches)	5	5
	BAR NO.		6	6
	(b) DIMENSION	B (inches)	41	41
	(b) DIMENSION	Bw (inches)	52	52
	(b) SPACING	(inches)	5	5
	(c) BAR NO.		7	7
	(c) SPACING	(inches)	5	5
	(d) BAR NO.		10	10
	(d) SPACING	(inches)	5	5
	(e) BAR NO.		7	7
	(e) SPACING	(inches)	5	5
	(f) BAR NO.		10	10
	(f) SPACING	(inches)	5	5
	(g) BAR NO.		5	5
	(g) SPACING	(inches)	10	10
	(h) BAR NO.		4	4
	(h) SPACING	(inches)	5	5
	(i) BAR NO.		5	5
	(i) SPACING	(inches)	10	10
	(j) BAR NO.		5	5
	(j) SPACING	(inches)	12	12
QUAN	CONCRETE	CY/LF	5.59	5.59
	REINFORCEMENT	LBS/LF	1268	1268

NOTE:
SEE GENERAL NOTES INCLUDED ON SHEET DP-11.
PROVIDE 2" CLEARANCE UNLESS OTHERWISE SPECIFIED.
ALL BENDS & LAP DIMENSIONS NOT SPECIFICALLY DETAILED ON PLANS SHALL BE FABRICATED TO MEET ACI SPECIFICATIONS.

PROFESSIONAL ENGINEER STATE OF NEVADA
WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
9-2-04

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

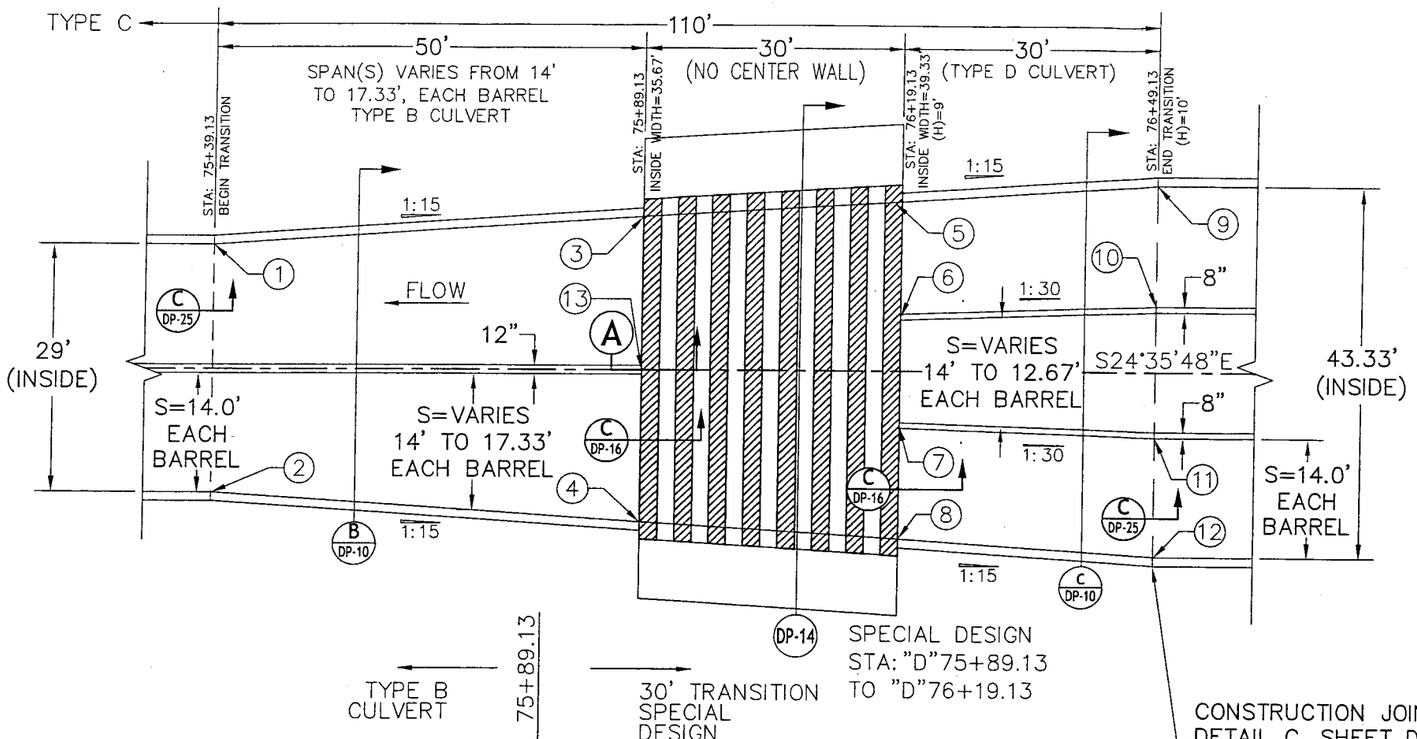
SPECIAL DESIGN DBL. RCB CULVERT DETAIL
(TYPE B)

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

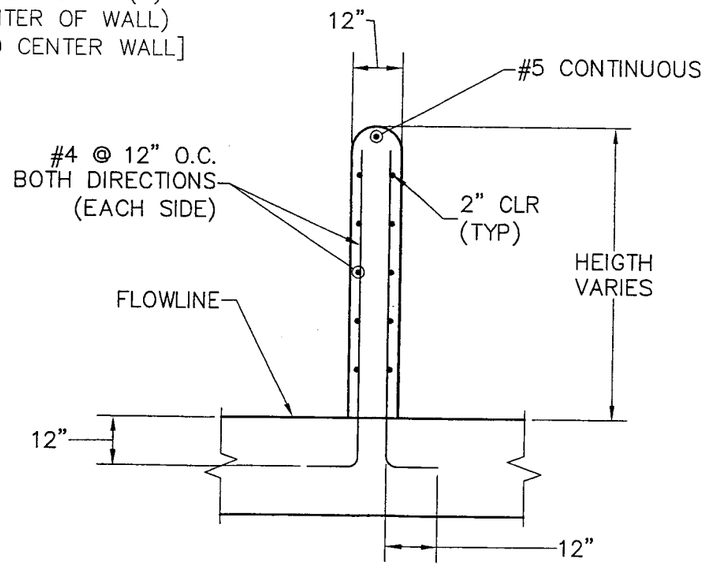
DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-13



1. OFFSET: 14.5' (L) (INSIDE FACE)
2. OFFSET: 14.5' (R) (INSIDE FACE)
3. OFFSET: 17.83' (L) (INSIDE FACE)
4. OFFSET: 17.83' (R) (INSIDE FACE)
5. OFFSET: 19.67' (L) (INSIDE FACE)
6. OFFSET: 6.67' (L) (CENTER OF WALL) [END CENTER WALL]
7. OFFSET: 6.67' (R) (CENTER OF WALL) [END CENTER WALL]
8. OFFSET: 19.67' (R) (INSIDE FACE)
9. OFFSET: 21.67' (L) (INSIDE FACE)
10. OFFSET: 7.33' (L) (CENTER OF WALL)
11. OFFSET: 7.33' (R) (CENTER OF WALL)
12. OFFSET: 21.67' (R) (INSIDE FACE)
13. OFFSET: 21.67' (R) (INSIDE FACE) [END CENTER WALL]



PEIR EXTENSION FRONT VIEW
NOT TO SCALE
B

NOTE:
ALL BENDS & LAP DIMENSIONS NOT SPECIFICALLY DETAILED SHALL BE FABRICATED TO MEET ACI SPECIFICATIONS.

SEE SHEET DP-14 FOR TRANSITION SPECIAL DESIGN.

SEE SHEET DP-12 FOR TYPE B CULVERT DESIGN.

PROFESSIONAL ENGINEER STATE OF NEVADA
WESTON L NELSON
Exp. 12/31/05
CIVIL
No. 14044
9-2-04

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

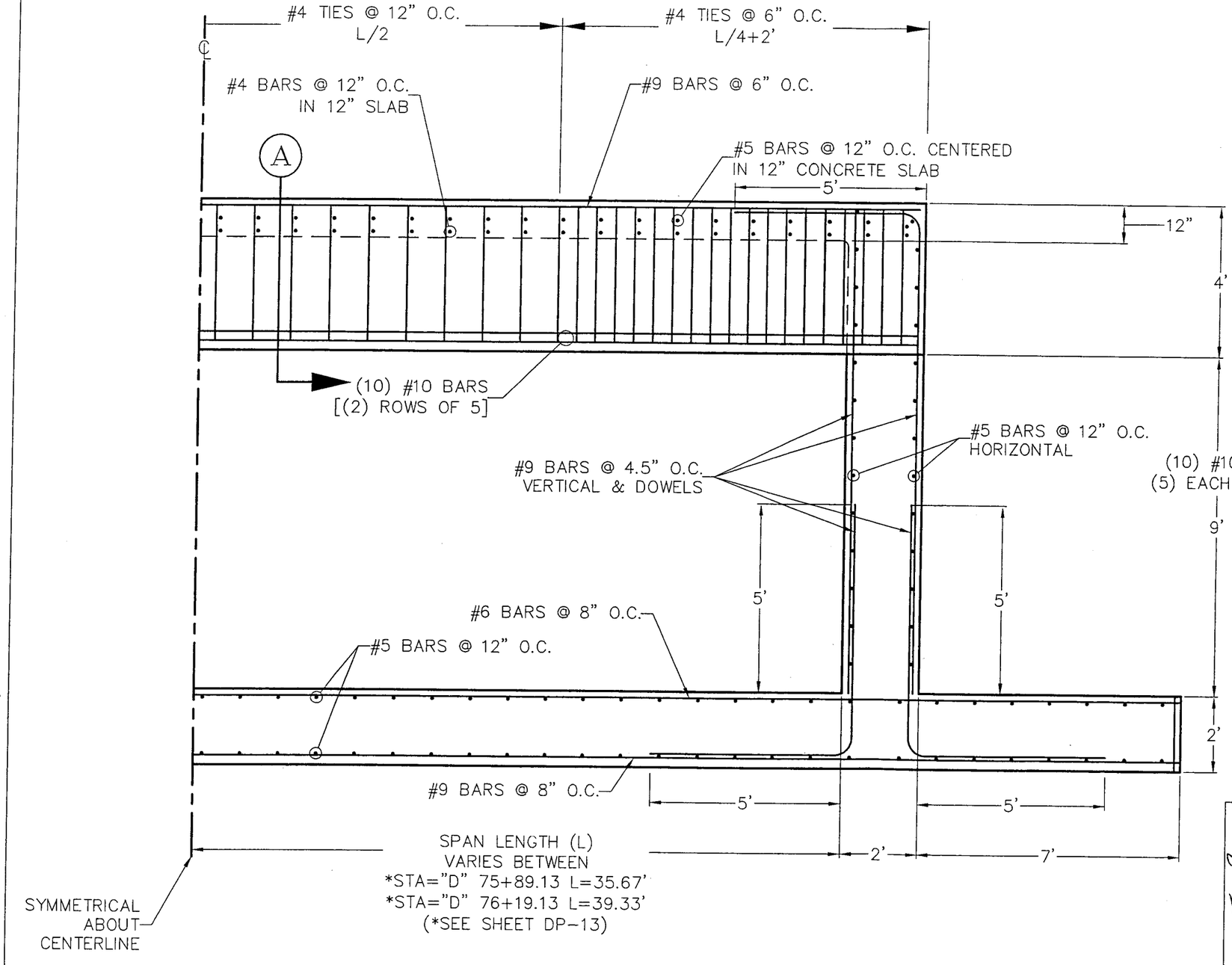
DOUBLE BARREL TO TRIPLE BARREL CULVERT TRANSITION DETAIL PLAN VIEW

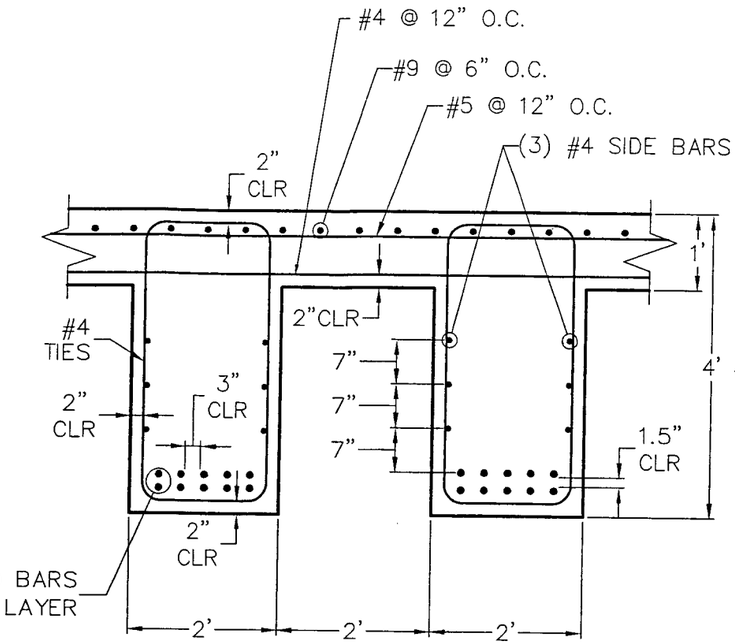
BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS—LAND SURVEYORS—LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

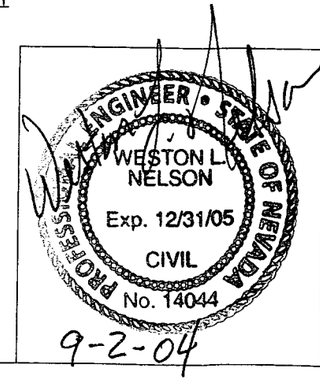
FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-14





SPECIAL DESIGN ROOF SECTION A
NOT TO SCALE — DP-14

NOTE:
ALL BENDS & LAP DIMENSIONS NOT SPECIFICALLY DETAILED SHALL BE FABRICATED TO MEET ACI SPECIFICATIONS.



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

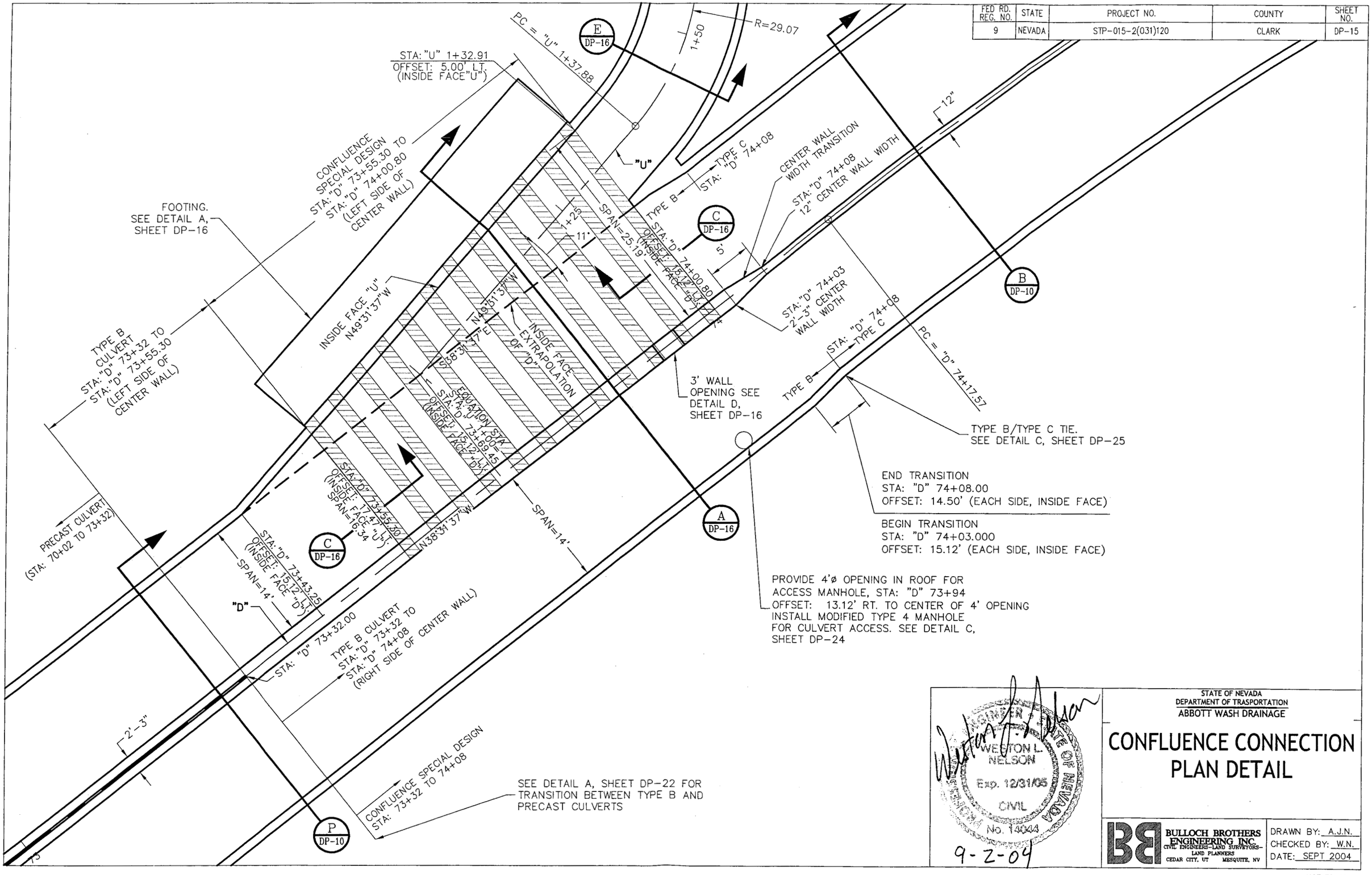
CULVERT TRANSITION DETAIL (NO CENTER WALL)

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS–LAND SURVEYORS–LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-15



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

CONFLUENCE CONNECTION PLAN DETAIL

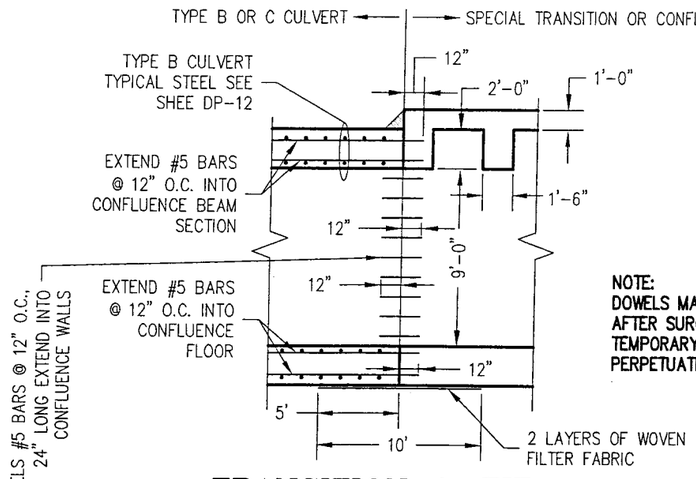
WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
STATE OF NEVADA
9-2-04

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

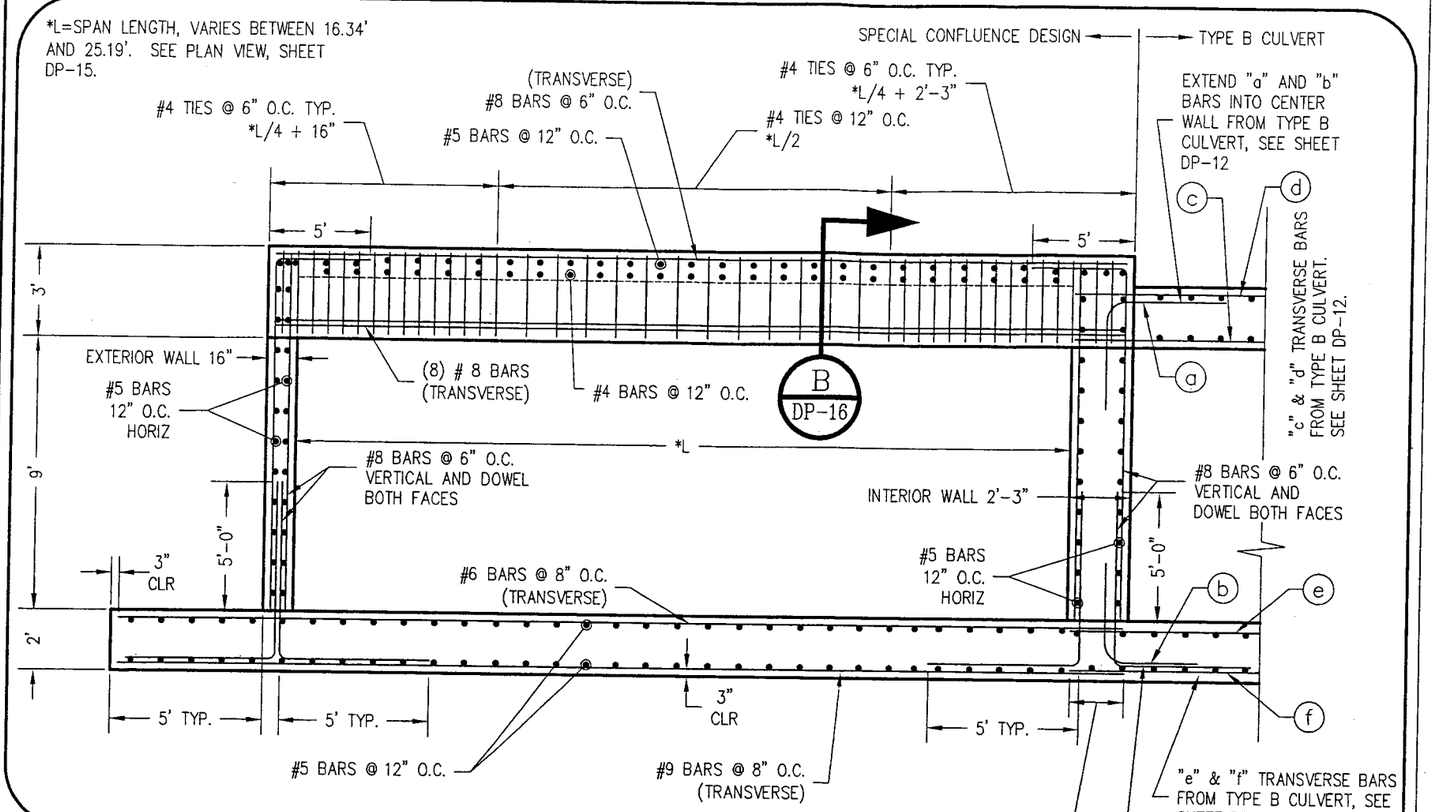
FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-16



NOTE:
DOWELS MAY BE EXPOXIED IN PLACE AFTER SURCHARGING TO ACCOMODATE TEMPORARY CONDITIONS USED TO PERPETUATE STORM FLOWS.

TRANSITION & TIE TYPE B TO SPECIAL — C / DP-16

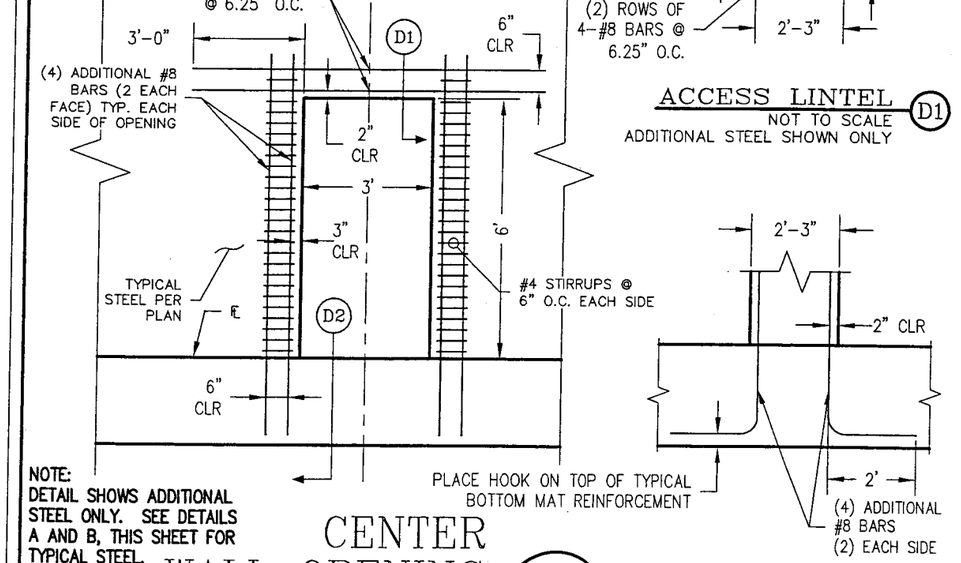
NOT TO SCALE
(NO DIRECT PAYMENT)



NOTE:
2" CLEARANCE IS TYPICAL FOR REBAR UNLESS OTHERWISE NOTED.

CONFLUENCE SPECIAL DESIGN SECTION — A / DP-16

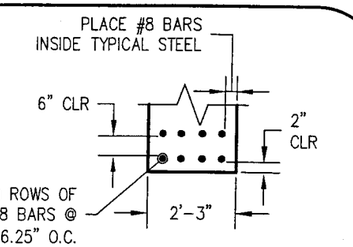
NOT TO SCALE



NOTE:
DETAIL SHOWS ADDITIONAL STEEL ONLY. SEE DETAILS A AND B, THIS SHEET FOR TYPICAL STEEL.

CENTER WALL OPENING — D / DP-16

NOT TO SCALE
(NO DIRECT PAYMENT)

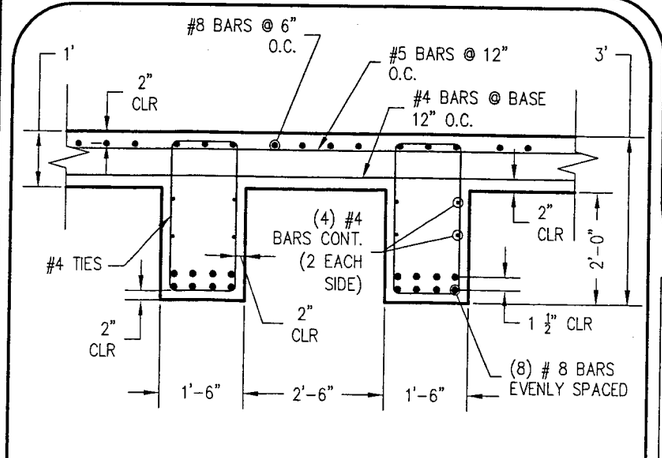


ACCESS LINTEL — D1

NOT TO SCALE
ADDITIONAL STEEL SHOWN ONLY

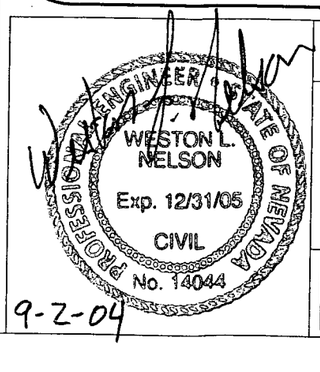
DOWEL EXTENSION — D2

(EACH SIDE OF OPENING)
NOT TO SCALE
ADDITIONAL STEEL SHOWN ONLY



BEAM SECTION — B / DP-16

NOT TO SCALE



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

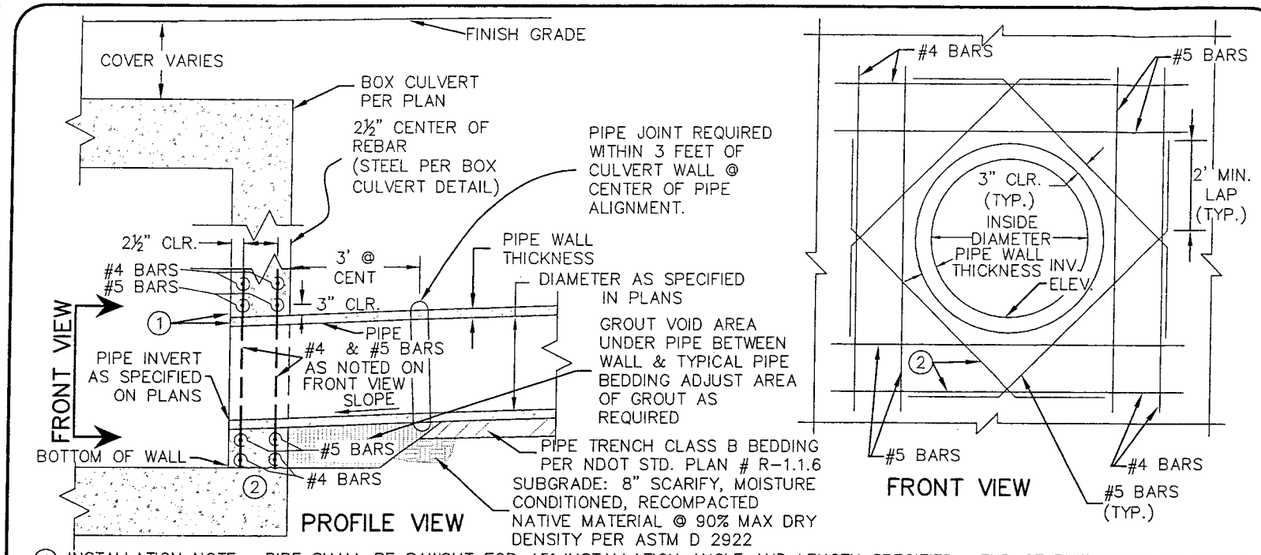
CONFLUENCE DETAILS

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-17

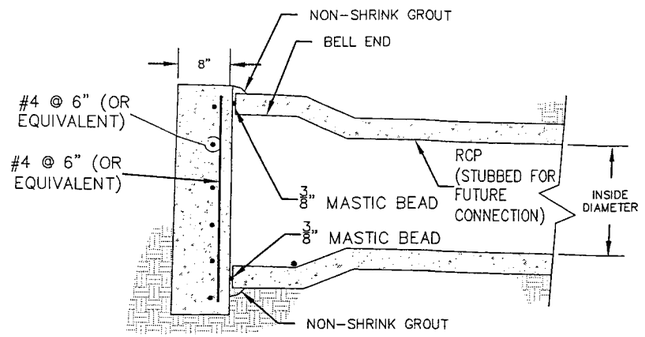


① INSTALLATION NOTE: PIPE SHALL BE SAWCUT FOR 45° INSTALLATION ANGLE AND LENGTH SPECIFIED. END OF PIPE SHALL BE FLUSH WITH FACE OF CULVERT WALL. STUB PIPE THROUGH FORMS AND CAST INTO WALL DURING CONCRETE PLACEMENT, OR PROVIDE ANNULAR BLOCK OUT OPENING THROUGH CULVERT WALL. ANNULAR SPACE SHALL BE FILLED SOLID WITH NONSHRINK GROUT.

② ALL REINFORCEMENT SHOWN IS IN ADDITION TO NORMAL WALL REINFORCEMENT (FOR BOTH CULVERT FACE, AND EARTH SIDE REINFORCEMENT MATS). ADDITIONAL REINFORCEMENT SHALL BE TIED TO NORMAL WALL REINFORCEMENT (BOTH FACES).

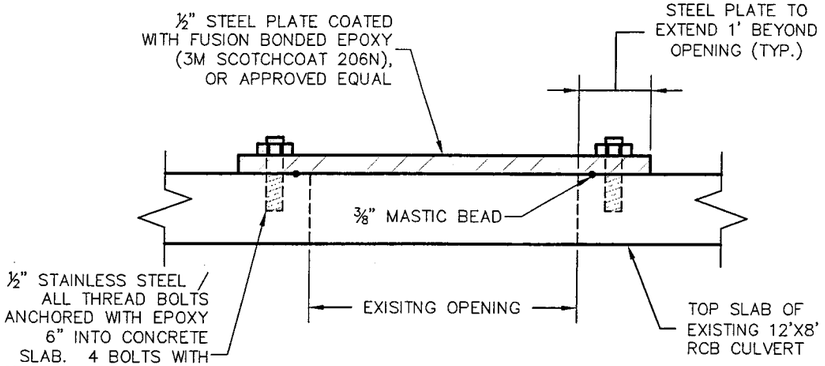
PIPE THROUGH BOX CULVERT (A)

(NO DIRECT PAYMENT) NOT TO SCALE DP-17



PIPE CAP DETAIL (B)

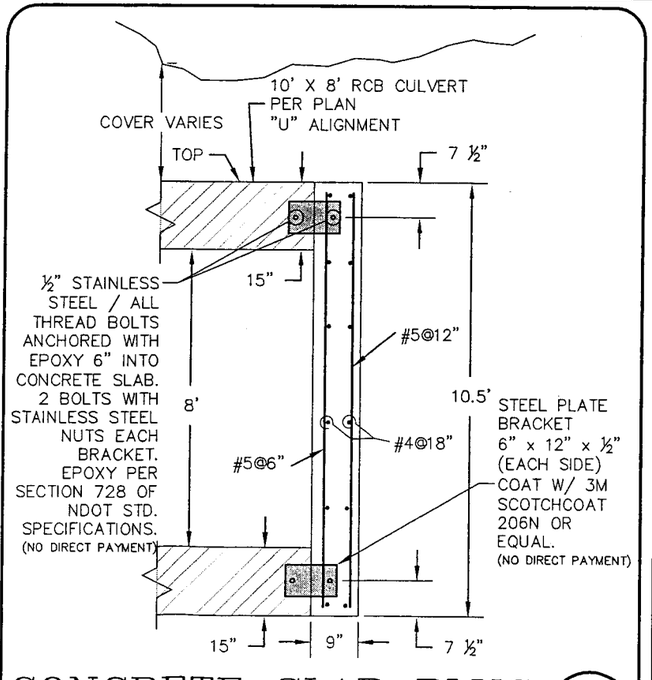
(NO DIRECT PAYMENT) NOT TO SCALE DP-17



NO DIRECT PAYMENT FOR STAINLESS STEEL BOLT AND NUTS, MASTIC BEAD, AND EPOXY COATING. SEE ITEM NO. 5060500 ON ABBOTT WASH STRUCTURE LIST. (STA: "D" 72+35)

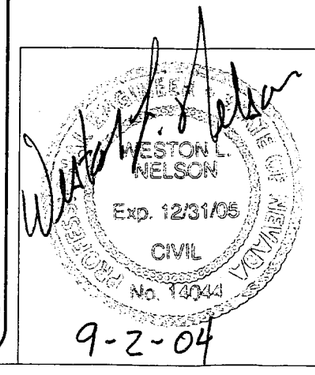
CAP DETAIL (C)

NOT TO SCALE DP-17



CONCRETE SLAB PLUG (D)

NOT TO SCALE DP-17



9-2-04

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

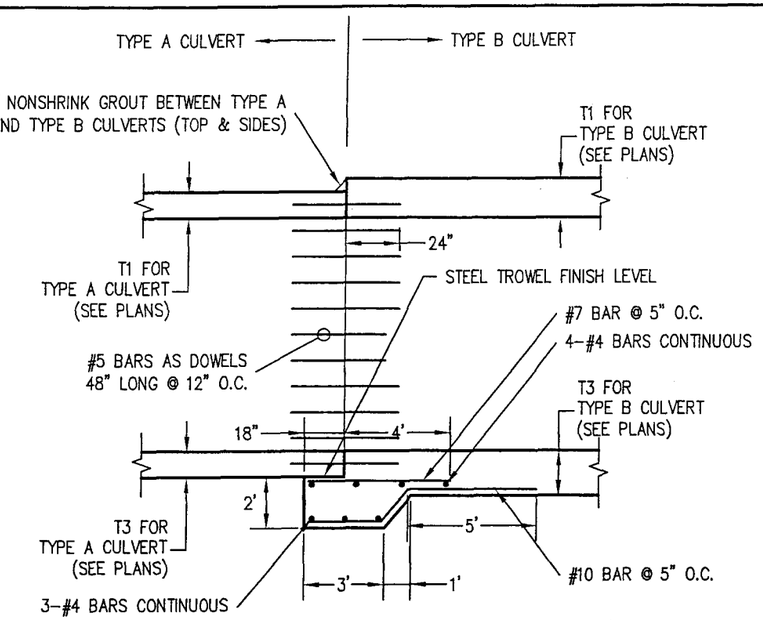
MISC. GENERAL DETAILS

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

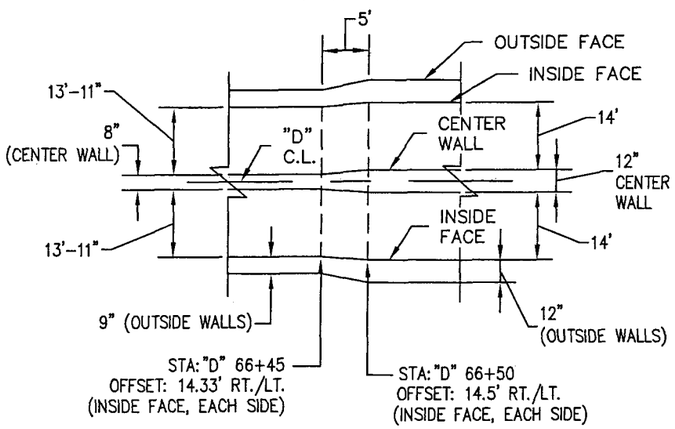
DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-18



PROFILE VIEW
NOT TO SCALE



PLAN VIEW
NOT TO SCALE

NOTE:
ONLY EXTRA STEEL REQUIRED FOR TIE IS SHOWN.
TYPICAL STEEL FOR TYPE A & TYPE B
CULVERTS IS NOT SHOWN IN THIS DETAIL

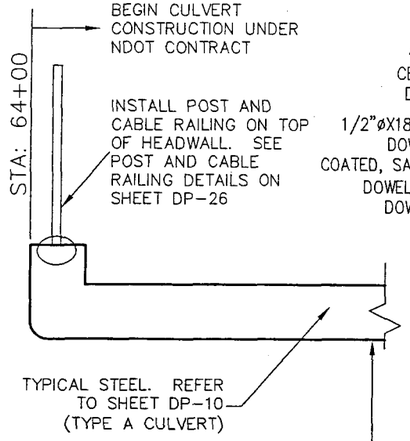
TYPE A TO B CULVERT TRANSITION & TIE

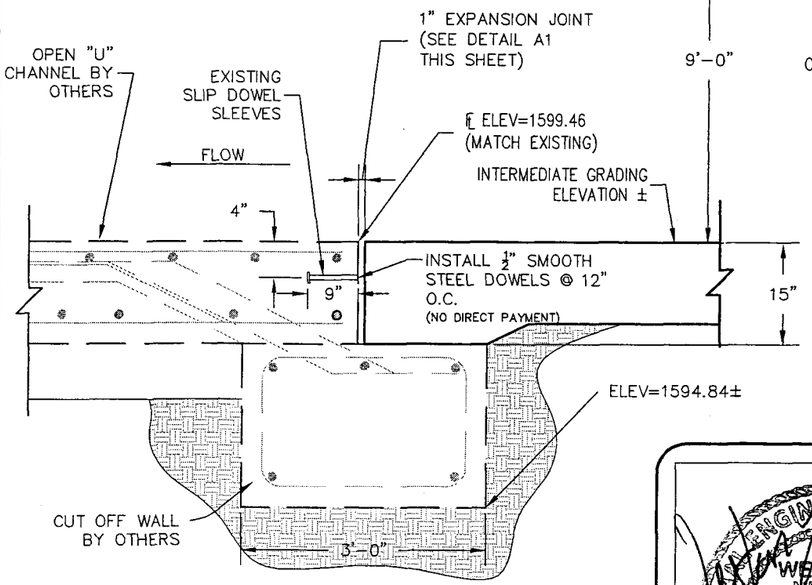
NOT TO SCALE (B) DP-18

NOTE: NO DIRECT PAYMENT FOR TRANSITION CONSTRUCTION.

① EVAZOTE
EXPANSION JOINT SEALANT:
EVAZOTE 380 E.S.P. W/H.A.L.S. & EVA- POX BONDER NO. 1, OR EQUAL, APPLIED TO BOTH FACES OF EVAZOTE & CONCRETE. BLOCK OUT DURING POUR AND INSTALL SEALANT AFTER CONCRETE PLACEMENT.

② EVASEAL
EXPANSION JOINT FILLER:
EVASEAL, OR EQUAL, AND EVA-POX BONDER NO. 2, OR EQUAL, APPLIED TO BOTH FACES OF MATERIAL AND CONCRETE. BLOCK OUT AND INSTALL FILLER AFTER CONCRETE PLACEMENT, OR POUR FRESH CONCRETE AGAINST ONE SIDE OF FILLER WITH BONDER APPLIED TO THE OTHER SIDE OF FILLER MATERIAL & CONCRETE FACE IN PLACE.

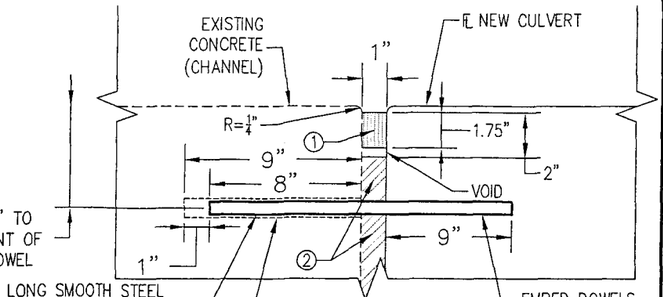




TIE TO EXISTING CHANNEL

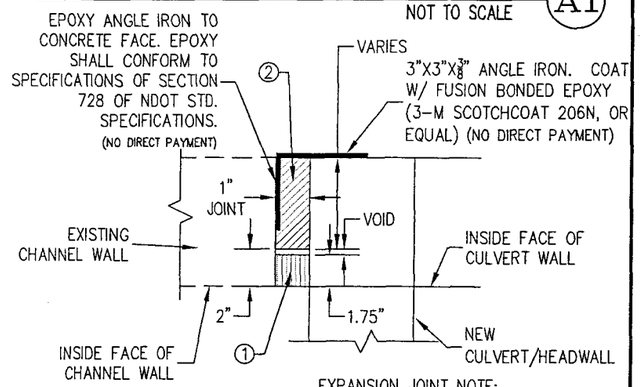
NOT TO SCALE (A) DP-18

NOTE: NO DIRECT PAYMENT FOR 1" EXPANSION JOINT OR SMOOTH STEEL DOWELS SLIP JOINT.



FLOOR EXPANSION JOINT

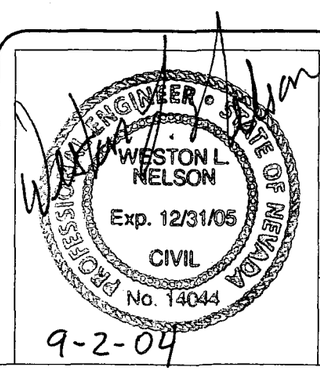
NOT TO SCALE (A1)



EXPANSION JOINT NOTE:
USE EPOXY ADHESIVE COMPOUND BONDERS NO. 1 & NO. 2, OR EQUAL, AS SPECIFIED IN NOTE ① AND ②

WALL EXPANSION JOINT (EACH SIDE)

NOT TO SCALE (A2)



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

MISC. GENERAL DETAILS

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

	STATE	PROJECT NO.	COUNTY	SHEET NO.
	NEVADA	STP-015-2(031)120	CLARK	DP-19

60 INSTALL 24" STEEL CASING IN OPEN TRENCH CONCURRENT WITH PRECAST INSTALLATION WITHIN I-15 R.O.W. REFER TO SHEET DP-21 FOR BURY DEPTH. UTILIZE CHANNEL EXCAVATION ADJACENT TO PRECAST RCB CULVERT WHERE POSSIBLE. BED AND BACKFILL PER NDOT STD. PLAN R-1.1.5 & SECTION 207 OF NDOT STD. SPECIFICATIONS.

61 POTHOLE EXISTING UTILITIES ALONG ALIGNMENT, COORDINATE ANY CONFLICTS W/ ENGINEER & C.M. (NO DIRECT PAYMENT)

62 INSTALL 14" W.L. CONCURRENT WITH RCB CULVERT CONSTRUCTION. UTILIZE CHANNEL EXCAVATION WHERE POSSIBLE. EXCAVATION, BEDDING AND BACKFILL PER NDOT STD. PLAN R-1.1.5, AND SECTION 207 OF NDOT STD SPECIFICATIONS. INSTALL 12 GUAGE COPPER LOCATING WIRE, SEE VALVE DETAIL A, SHEET DP-21. COORDINATE W/ VIRGIN VALLEY WATER DISTRICT, CONTACT PWERSON: MICHAEL WINTERS, PH. (702)346-5731.

63 INSTALL 12" REUSE FM CONCURRENT WITH RCB CULVERT CONSTRUCTION. UTILIZE CHANNEL EXCAVATION WHERE POSSIBLE. EXCAVATION, BEDDING AND BACKFILL PER NDOT STD. PLAN R-1.1.5, AND SECTION 207 OF NDOT STD SPECIFICATIONS. INSTALL 12 GUAGE COPPER LOCATING WIRE, SEE VALVE DETAIL A, SHEET DP-21. COORDINATE WITH CITY OF MESQUITE SANITAION DISTRICT. CONTACT PERSON: BILL TANNER, PH. (702) 346-5237

64 PROVIDE SKIDS FOR PIPE INSTALLATION THROUGH CASING. FILL VOID AREA BETWEEN PIPE AND CASING SOLID WITH GROUT, L=5.0', EACH END. (NO DIRECT PAYMENT)

65 INSTALL VARIOUS DUCTILE IRON FITTINGS TO MATCH HORIZONTAL AND VERTICAL ALIGNMENT, PROVIDE FITTINGS & THRUST BLOCK PER DETAIL D, SHEET DP-21. INSTALL VALVES AS SHOWN, VALVE BOXES, LOCATING WIRE, AIR RELEASE/AIR VAC, BLOWOFFS, TAPPING INTO EXISTING WATER LINE OR REUSE WATERLINE, AND OTHER INCIDENTAL WORK. (NO DIRECT PAYMENT)

66 IT MAY BE NECESSARY TO BEND PIPE @ JOINT BEFORE OR AFTER ANGLE POINTS TO MATCH BEARINGS. ALL PIPE DEFLECTIONS @ PIPE JOINTS SHALL CONFORM TO PIPE MANUFACTURERS SPECIFICATIONS.

NOTE: THE ESTIMATED ADDITIONAL EXCAVATION & BACKFILL FOR UTILITY LINES, STORM DRAINS, & MISC. STRUCTURES LOCATED OUTSIDE OF CHANNEL EXCAVATION ARE PROVIDED ON SHEET DP-01 UNDER "STRUCTURAL EXCAVATION" AND "STRUCTURAL BACKFILL."

CUT, CAP, & THRUST SEE SHEET DP-08

ABANDON IN PLACE. FILL EACH END OF ABANDONED PIPE SOLID WITH GROUT, L=5.0'. SEE SHEETS DP-04 & DP-08

NOTE:
SEE SHEET DP-20 FOR PROFILE VIEW OF NEW UTILITY CONSTRUCTION.

SEE SHEET DP-04 FOR WL TERMINATION. STA: "W" 10+88.41

SEE SHEET DP-04 FOR REUSE FM TIE AND AIR/VAC VALVE STA: "F" 9+73.50

I-15 NORTHBOUND

I-15 SOUTHBOUND

ROW

NDOT ROW

EDGE OF ASPHALT

"G1"

"D"

"0"

"F"

"W"

STA: "F" 4+41.18 END OF CASING

STA: "W" 4+97.89 END OF CASING

STA: "F" 1+95.88 END OF CASING

STA: "W" 2+52.42 END OF CASING

"F" STA: 1+00

"W" STA: 1+00

STA: "W" 1+08.57

10.45' MIN. OUTSIDE FACE TO CENTER

12.5' CENTER TO CENTER

N38°31'37"W

N38°27'26"W

N38°27'26"W

65'

45°

STA: "F" 1+80.20

24°

22½° ELL'S

18°

22½° ELL'S

24°

STA: "W" 2+40.77

90°

45° ELL

45°

STA: "F" 1+13.82

90°

56°

45°+11¼° ELLS

SEE SHEET DP-08 FOR TIE TO EXISTING 12" FM OR 14" WATER LINE

STA: "F" 5+92.64

STA: "F" 8+58.57

STA: "W" 6+54.00

STA: "W" 9+24.70

45° ELL'S (TYP)

49°

7.52'

38°

7.85'

STA: "F" 8+66.44

STA: "F" 9+60.56

STA: "W" 9+32.55

ABANDON IN PLACE EXISTING 12" FM SOUTH

INSTALL 12" GATE VALVE

90°

22°

22½° ELL

1630'

1620'

S66°52'14"W

AIR/VAC STA: "F" 9+50.35

N14°48'14"W

S88°40'39"W

10'

ID	STA	SD	SIDE	NOTE
1	70+16	30"	EAST	SEE SHEET DP-08 & 09
2	75+00	18"	EAST	SEE SHEET DP-03
3	75+28	18"	WEST	SEE SHEET DP-03
4	76+79	24"	EAST	SEE SHEET DP-04
5	77+74	24"	WEST	SEE SHEET DP-04

WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
STATE OF NEVADA
PROFESSIONAL ENGINEER
9-2-04

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

UTILITY IMPROVEMENTS PLAN VIEW

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

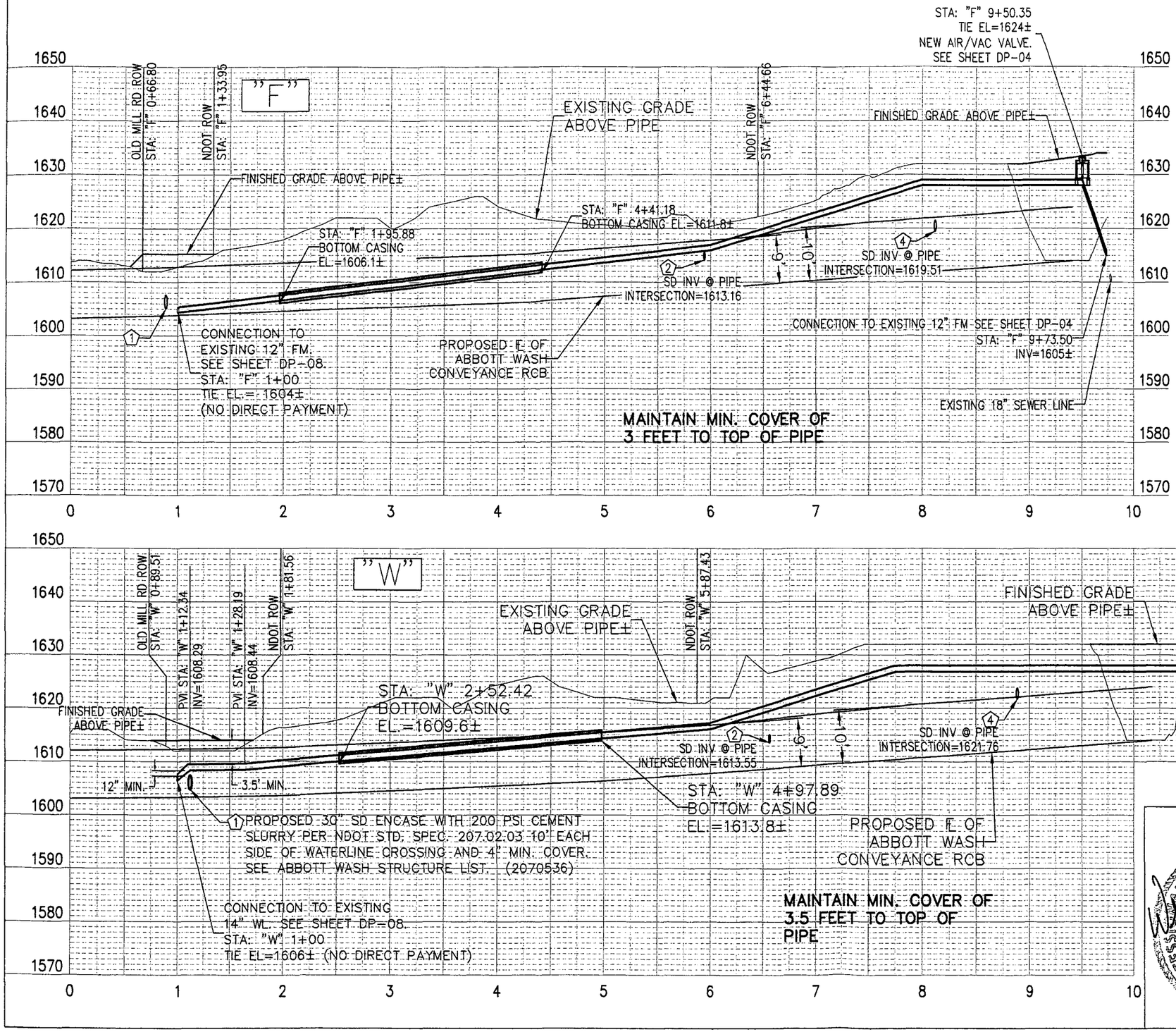
DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

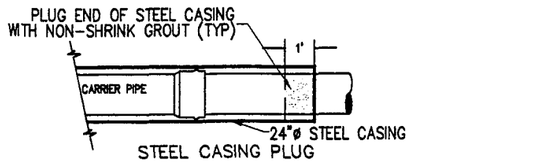
60.000000:1.000000 PLOT SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-20

TOPOGRAPHY & ELEVATIONS BASED ON NAVD 88

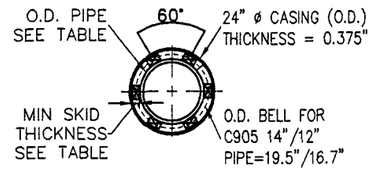
ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN
STATIONS ARE SHOWN IN FEET





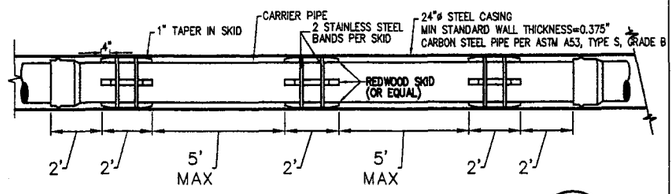
STEEL CASING PLUG

CARRIER PIPE		
SIZE	O.D.	SKID
12"	13.2"	4.5"
14"	15.3"	3.5"



TYPICAL SKID SPACING FOR 16"ø CARRIER PIPE

NOTE:
NO DIRECT PAYMENT FOR SKIDS



CASING AND SKID PLACEMENT (A)

NOT TO SCALE

NOTE: CASING CONSTRUCTION / MATERIAL SHALL CONFORM TO NDOT STANDARD SPECIFICATIONS.

NOTE: DETAIL SHOWS TYPICAL 20' LAY LENGTHS, SPACING MAY BE ADJUSTED FOR 18' LAY LENGTHS.

SEE SHEET DP-04 FOR END OF WATER LINE CONSTRUCTION.
STA: "W" 10+88.41
INV=1626.83

ID	STA	SD	SIDE	NOTE
1	70+16	30"	EAST	SEE SHEET DP-08 & 09
2	75+00	18"	EAST	SEE SHEET DP-03
4	76+79	24"	EAST	SEE SHEET DP-04

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

UTILITY IMPROVEMENTS PROFILE VIEW

STA: "F" 0+00 TO "F" 8+69.53
& STA: "W" 0+00 TO "W" 9+77.34

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

100:1.000000 PLOT SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-21

GENERAL NOTES

WRAP ALL METAL SURFACES WITH TWO LAYERS OF 6 MIL. POLYETHYLENE.

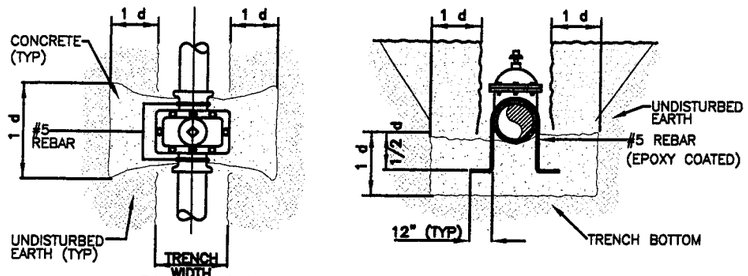
ALL CONCRETE SHALL BE TYPE V 4000 PSI MINIMUM, 28 DAYS COMPRESSIVE STRENGTH. CONCRETE IS TO BE PLACED AGAINST UNDISTURBED EARTH. TABLE TO RIGHT DENOTES MINIMUM BEARING AREA OR VOLUME OF THRUST BLOCK.

ALL VERTICAL SURFACES NOT BEARING AGAINST UNDISTURBED EARTH SHALL BE FORMED.

NO DIRECT PAYMENT FOR CONCRETE THRUSTING OR REBAR IN THRUSTING.

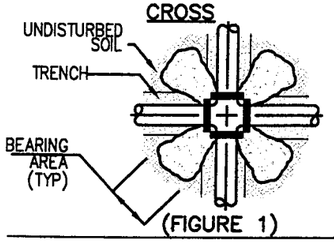
	BEARING AREA IN SQ FT						CONC/CU YDS		
PIPE ID	FIGURE 1	FIGURE 2	FIGURE 3, △ 90°	45°	22½°	11¼°	FIGURE 4, △ 45°	22½°	11¼°
4"	2	2	2	2	1	1	1.0	0.5	0.5
6"	2	3	4	2	1	1	1.5	1.0	0.5
8"	3	5	7	4	2	1	3.0	1.5	1.0
10"	4	8	11	6	3	2	4.0	2.5	1.5
12"	8	16	16	10	5	5	6.0	3.0	1.5
14"	10	20	20	12	6	6	8.0	4.5	2.5
16"	14	27	28	15	8	8	10.5	6.0	3.0
18"	13	25	35	19	10	5	13.5	7.5	3.5
20"	16	31	44	24	12	6	16.0	9.0	4.5
24"	22	44	63	34	17	9	23.5	12.5	6.5

LEGEND: d = NOMINAL PIPE SIZE



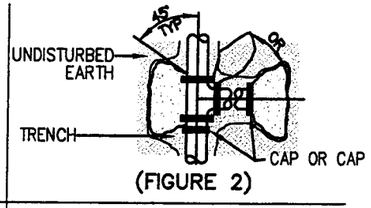
BUTTERFLY VALVES OR GATE VALVES

CROSS



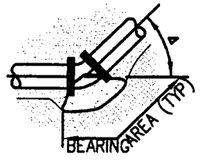
(FIGURE 1)

TEE, PLUG OR CAP



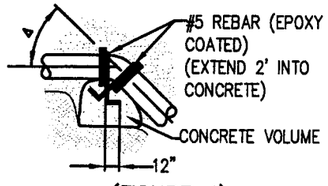
(FIGURE 2)

HORIZONTAL OR UPWARD VERTICAL BEND



(FIGURE 3)

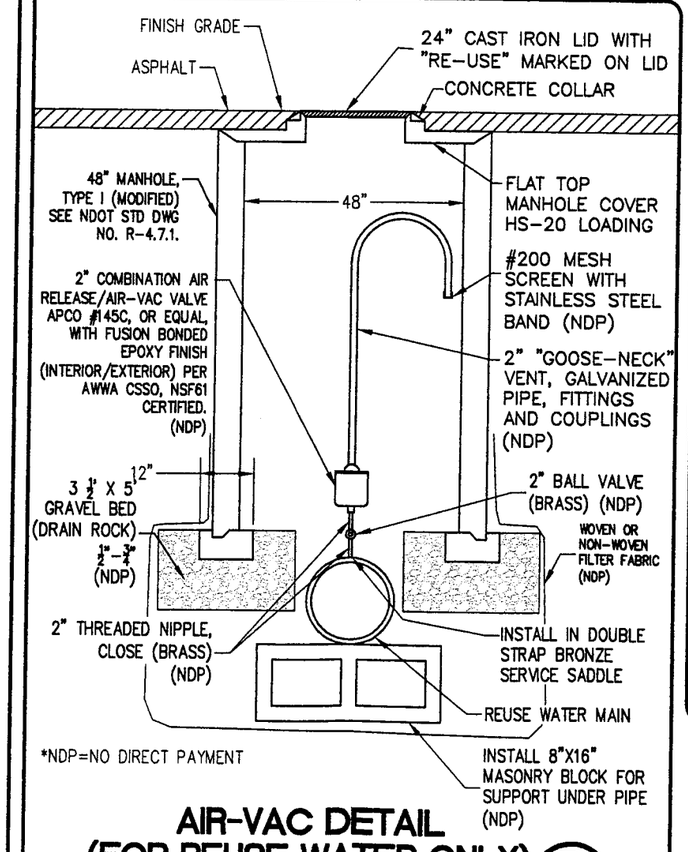
DOWNWARD VERTICAL BEND



(FIGURE 4)

THRUST BLOCK INSTALLATION (D DP-21)

NOT TO SCALE
(NO DIRECT PAYMENT)

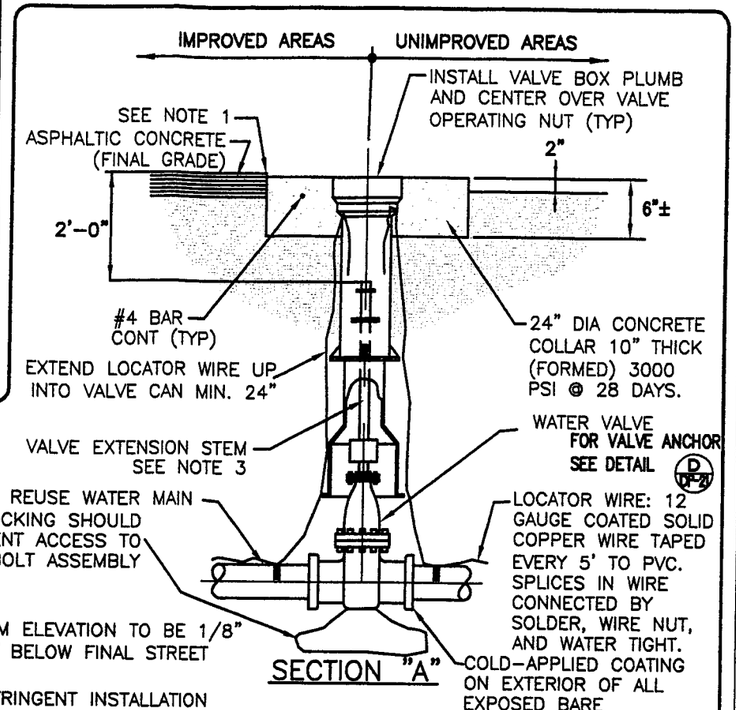


*NDP=NO DIRECT PAYMENT

AIR-VAC DETAIL (FOR REUSE WATER ONLY) (B DP-21)

NOT TO SCALE

PAY ITEM FOR MANHOLE 609 0568
AIR/VAC VALVE AND APPURTENANT FITTINGS CONSIDERED INCIDENTAL TO REUSE WATER LINE CONSTRUCTION (NO DIRECT PAYMENT)



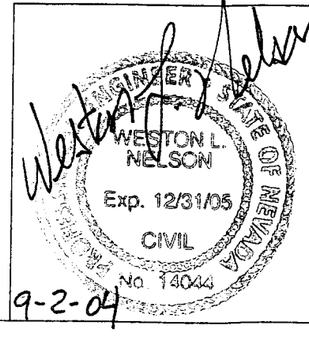
NOTES

1. FINAL RIM ELEVATION TO BE 1/8" TO 1/4" BELOW FINAL STREET GRADE.
2. MORE STRINGENT INSTALLATION REQUIREMENTS MAY BE IMPOSED BY THE ENTITY HAVING THE JURISDICTION OVER THE VALVE BOX INSTALLA- TION LOCATION.
3. A VALVE EXTENSION STEM SHALL BE PROVIDED WHERE THE DEPTH TO THE OPERATING NUT EXCEEDS FIVE (5) FEET.
4. CONTRACTOR TO FORM CONCRETE COLLAR IN UNIMPROVED AREAS WITH SONOTUBE AND REMOVE PRIOR TO BACKFILL INSTALLATION (TYP).

COORDINATE WITH VIRGIN VALLEY WATER DISTRICT. CONTACT PERSON: MICHAEL WINTERS, PH.:(7023)346-5731
OR FOR REUSE: CITY OF MESQUITE SANITATION DEPARTMENT. CONTACT PERSON: BILL TANNER, PH.:(702)346-5237

WATERLINE/REUSE WATER LINE VALVE DETAIL (A DP-21)

NOT TO SCALE
(NO DIRECT PAYMENT)



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

MISC. GENERAL DETAILS

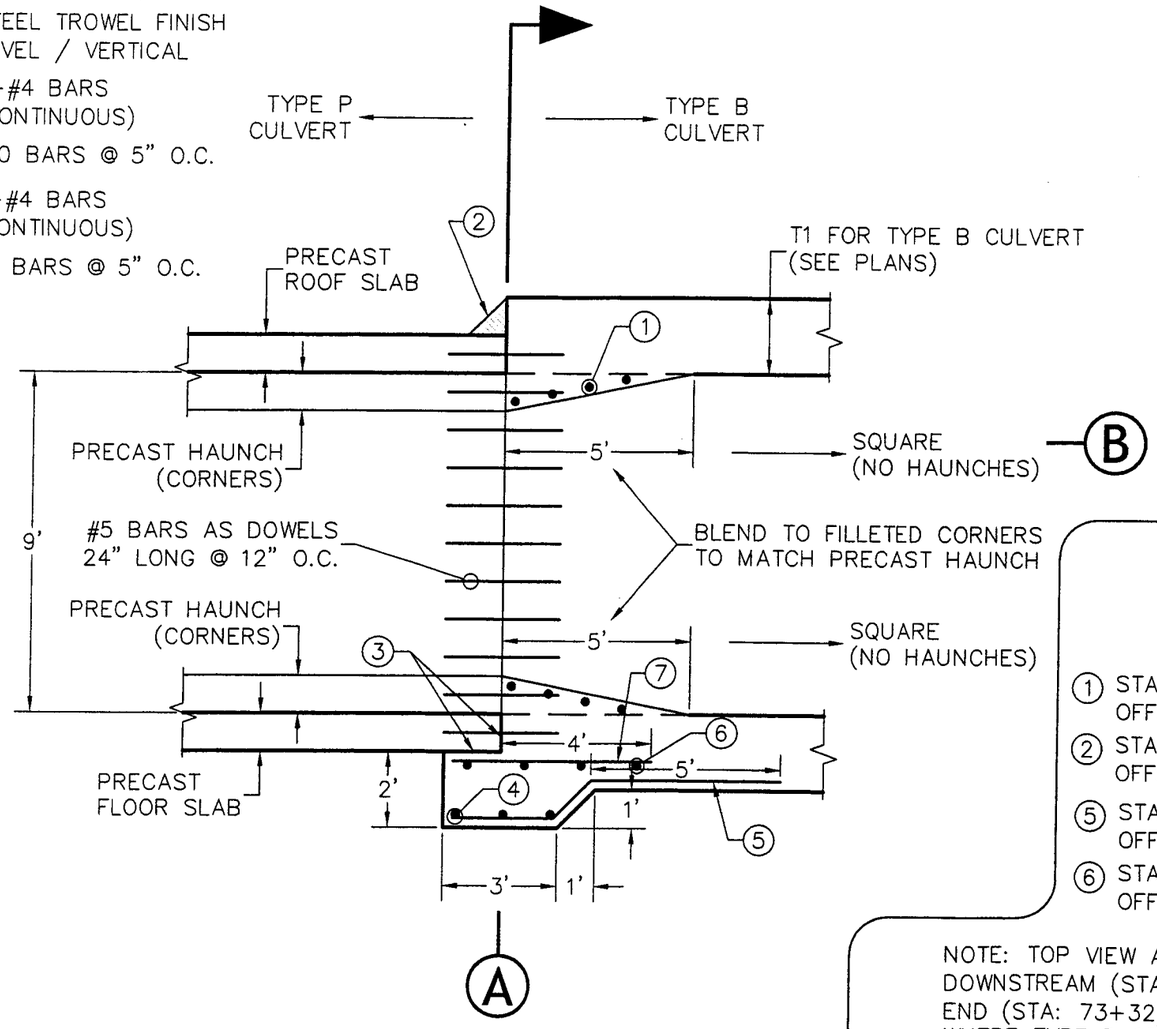
BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-22

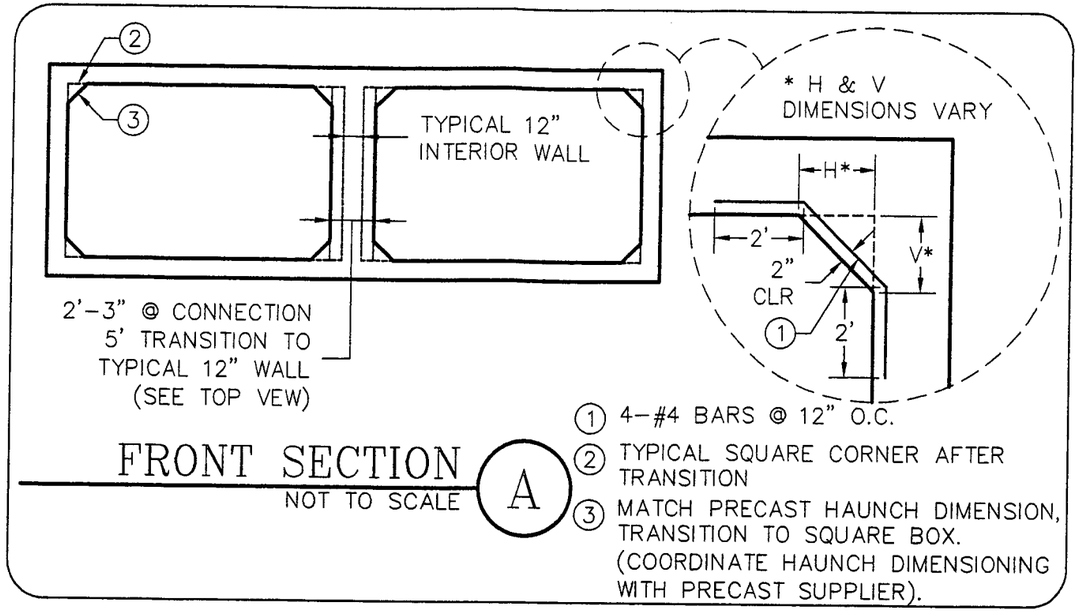
1. 4–#4 BARS @ 12" O.C. (SEE SECTION A) TYPICAL TOP AND BOTTOM
2. FILLET WITH NON SHRINK GROUT BETWEEN TYPE B & TYPE P CULVERTS (TOP & SIDES)
3. STEEL TROWEL FINISH LEVEL / VERTICAL
4. 3–#4 BARS (CONTINUOUS)
5. #10 BARS @ 5" O.C.
6. 4–#4 BARS (CONTINUOUS)
7. #7 BARS @ 5" O.C.



PROFILE VIEW OF PRECAST/CAST IN PLACE CULVERT CONNECTION

NOT TO SCALE

A DP-22

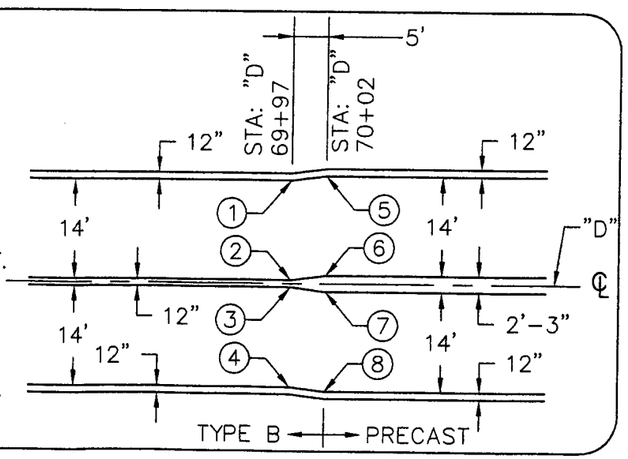


FRONT SECTION

NOT TO SCALE

A

1. 4–#4 BARS @ 12" O.C.
2. TYPICAL SQUARE CORNER AFTER TRANSITION
3. MATCH PRECAST HAUNCH DIMENSION, TRANSITION TO SQUARE BOX. (COORDINATE HAUNCH DIMENSIONING WITH PRECAST SUPPLIER).



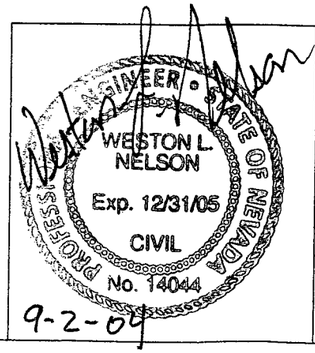
1. STA: "D" 69+97 OFFSET: 14.50' LT.
2. STA: "D" 69+97 OFFSET: 0.50' LT.
3. STA: "D" 69+97 OFFSET: 0.50' RT.
4. STA: "D" 69+97 OFFSET: 14.50' RT.
5. STA: "D" 70+02 OFFSET: 15.13' LT.
6. STA: "D" 70+02 OFFSET: 1.13' LT.
7. STA: "D" 70+02 OFFSET: 1.13' RT.
8. STA: "D" 70+02 OFFSET: 15.13' RT.

NOTE: TOP VIEW APPLICABLE FOR DOWNSTREAM (STA: 70+02). UPSTREAM END (STA: 73+32) TIES INTO CONFLUENCE WHERE TYPE B CENTER WALL WIDTH MATCHES PRECAST CENTER WIDTH THROUGH CONFLUENCE. SEE SHEET DP-15 FOR CONFLUENCE DETAIL.

PLAN VIEW

NOT TO SCALE

B



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

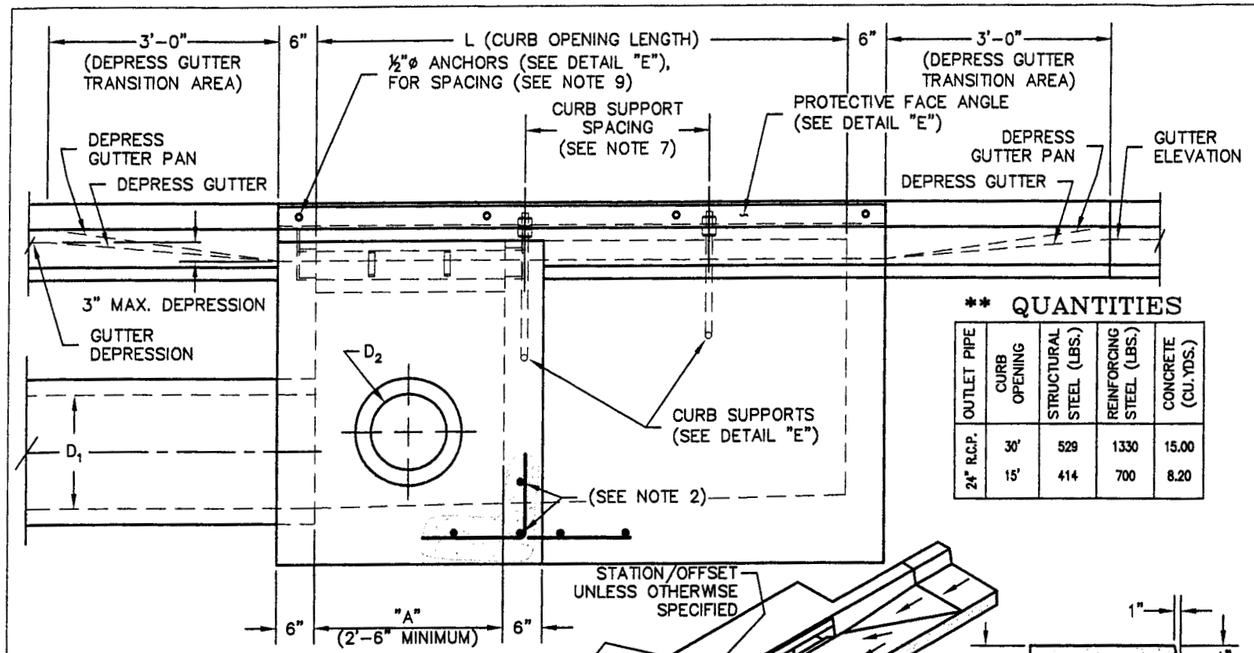
PRECAST TO CAST-IN-PLACE CONNECTION DETAILS
(NO DIRECT PAYMENT)

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

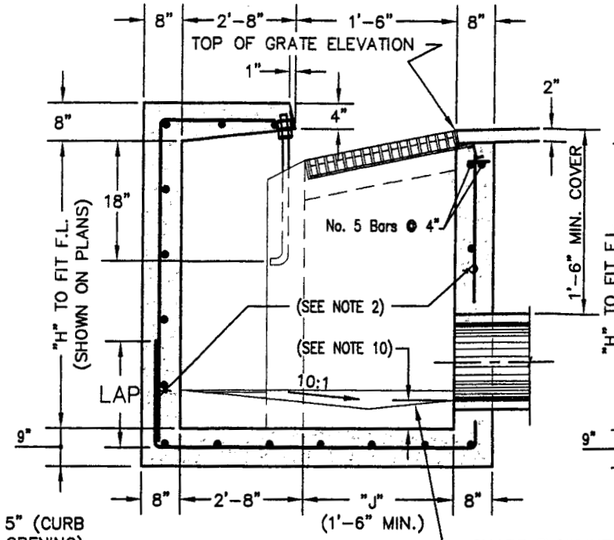
FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-23



ELEVATION

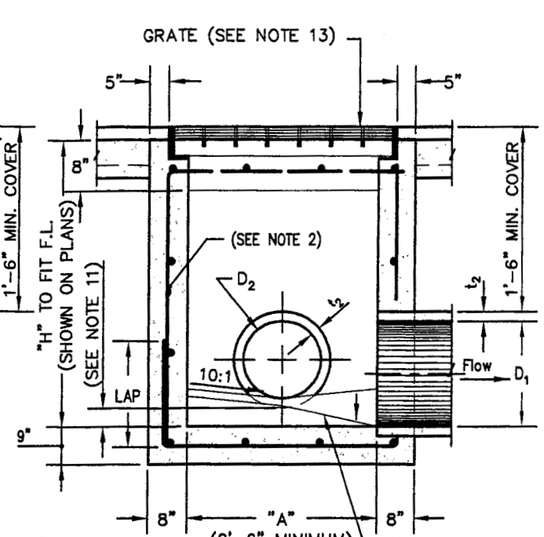
** QUANTITIES

OUTLET PIPE	CURB OPENING	STRUCTURAL STEEL (LBS.)	REINFORCING STEEL (LBS.)	CONCRETE (CU.YDS.)
24" R.C.P.	30'	529	1330	15.00
	15'	414	700	8.20



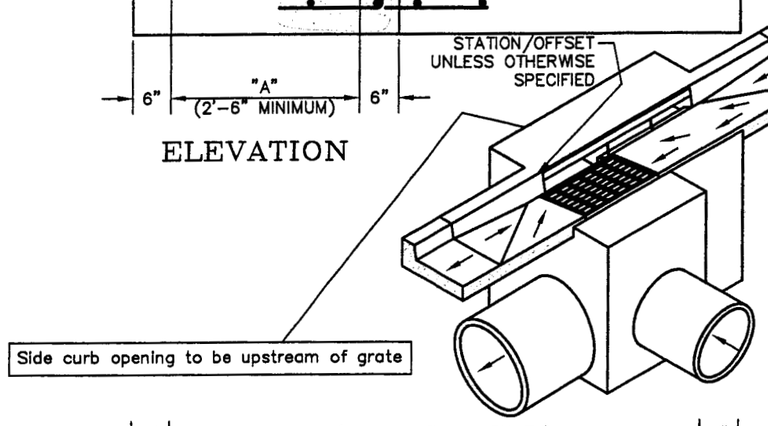
SECTION A–A

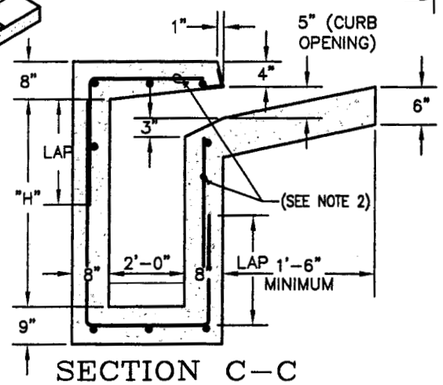
SHAPE FLOWLINE TO OUTLET



SECTION B–B

SHAPE FLOWLINE TO OUTLET



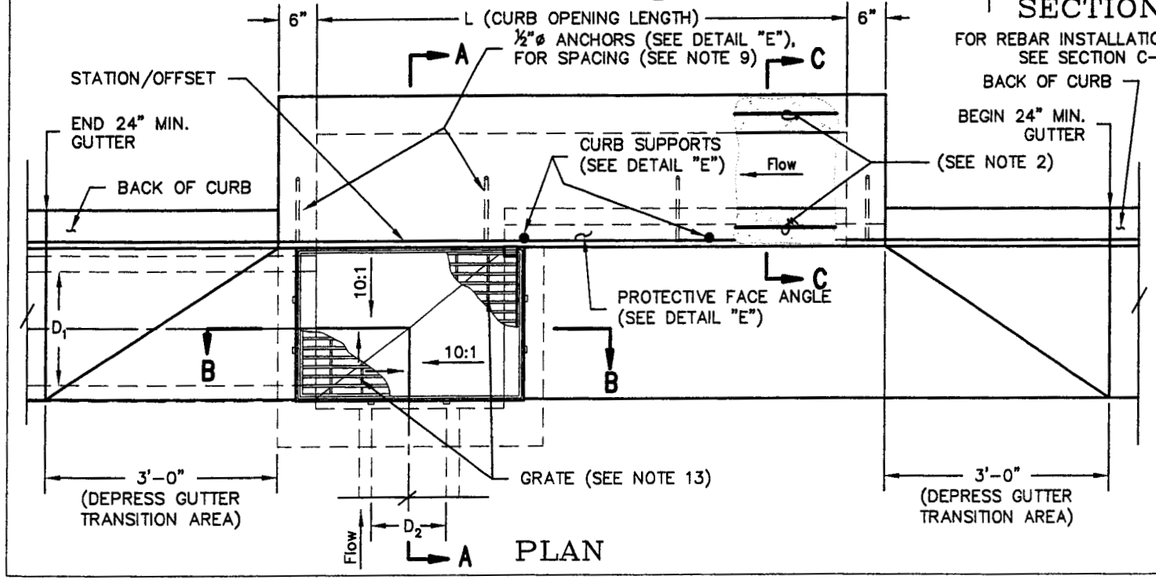


SECTION C–C

"A" / D_2 for CMP
D_2 + 6" for RCP 42" or Less
$D_2 + 2\,t_2$ for RCP 48" or More
"J" / D_1 for CMP
D_1 + 6" for RCP 24" or Less
$D_1 + 2\,t_1$ for RCP 30" or More

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS AA OR A.
2. REINFORCING STEEL SHALL BE NO.5 BARS,EXCEPT AS NOTED, WITH MAXIMUM SPACE AT 12" CENTERS, WIRED TIGHTLY AT ALL INTERSECTIONS, AND EMBEDDED AT LEAST 1 ½" CLEAR OF CONCRETE SURFACE, EXCEPT AS NOTED.
3. EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED ONE INCH.
4. CONCRETE QUANTITIES BASED ON 8" WALL THICKNESS, LAP= MINIMUM LAP = 30" FOR NO.5 BARS, EITHER PROVIDE MIN. LAP OR EXTEND BARS FULL HEIGHT. STEEL QUANTITIES BASED ON STEEL EXTENDED FULL HEIGHT.
5. FOR VALUES OF "H" AND "L" SEE STORM DRAIN SCHEDULE.
6. "H" IS THE DIFFERENCE IN ELEVATION BETWEEN THE OUT PIPE FLOW LINE AND THE NORMAL GUTTER GRADE LINE AT THE CURB FACE.
7. CURB OPENINGS LONGER THAN 7' SHALL HAVE ONE CURB SUPPORT FOR EACH 7' INCREMENT OR FRACTION THEREOF, EVENLY SPACED.
8. PIPE(S) CAN BE PLACED IN ANY WALL.
9. ANGLE ANCHORS SHALL BE EMBEDDED MIDPOINT IN EACH ENDWALL AND EVENLY SPACED (MAXIMUM SPACING OF 5').
10. FOR DROP INLET CONFIGURATIONS WITH 2 PIPES–INFLOW PIPE INVERT ELEVATION SHALL BE ≥ 0.1' ABOVE OUTFLOW PIPE INVERT ELEVATIONS.
11. CATCH BASIN FLOORS SHALL HAVE A MINIMUM SLOPE OF 10:1 FROM ALL DIRECTIONS TOWARD OUTLET PIPE. IF BASIN IS USED AS A JUNCTION, SHAPE FLOWLINE(S) TO OUTLET PIPE, AND PROVIDE A MINIMUM SLOPE OF 10:1 TO FLOWLINE(S).
12. STATION/OFFSET DISTANCE LISTED IN PLANS IS MEASURED TO THE FACE OF CURB AT THE GUTTER FLOW LINE.
13. FOR GRATE AND FRAME DETAIL A, SHEET DP-24 (MISC. DETAILS)

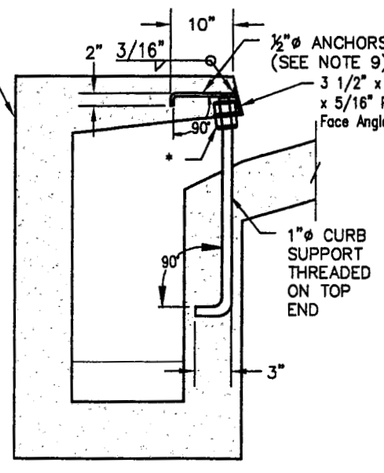


PLAN

FOR REBAR INSTALLATION SEE SECTION C–C

BACK OF CURB

BEGIN 24" MIN. GUTTER



* – Bottom Nut Tight On Last Thread.

DETAIL E

Western L. Nelson

STATE OF NEVADA
WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
PROFESSIONAL ENGINEER

9-2-04

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

MODIFIED TYPE 11 DROP INLET

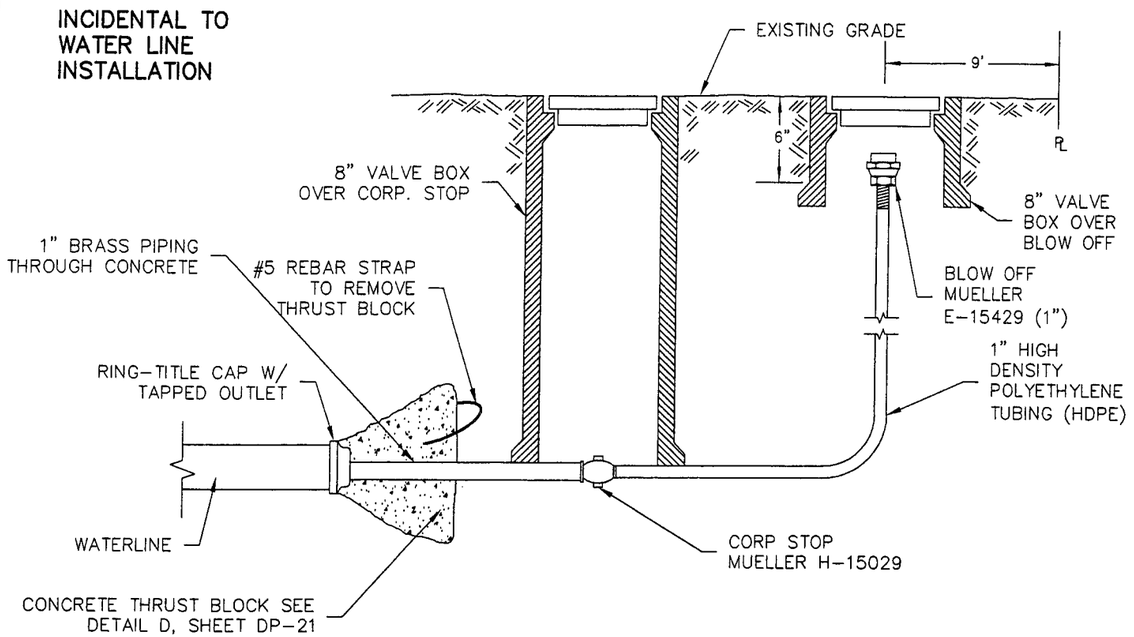
BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS–LAND SURVEYORS–LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: D.S.W
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

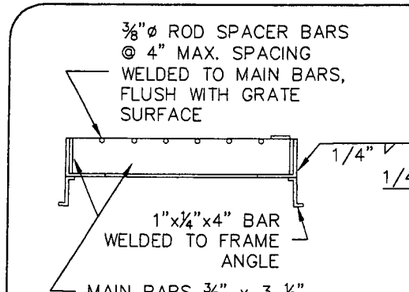
FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-24

INCIDENTAL TO WATER LINE INSTALLATION

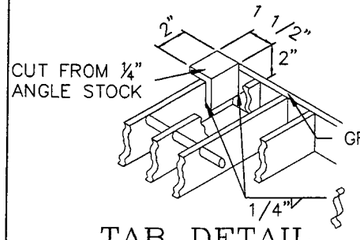


BLOW-OFF ASSEMBLY (B)

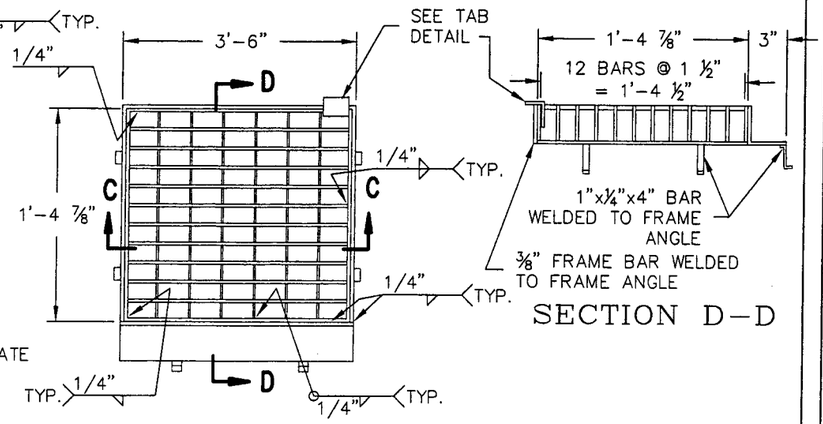
(NO DIRECT PAYMENT) NOT TO SCALE (DP-24)



SECTION C-C



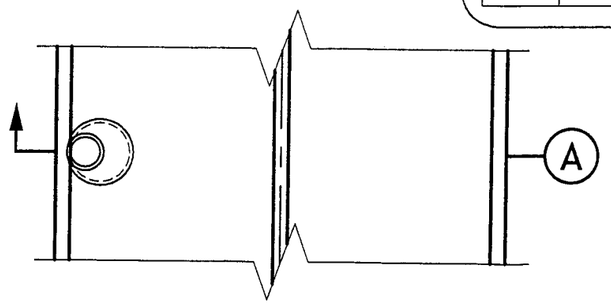
TAB DETAIL



SECTION D-D

GRATE AND FRAME DETAIL (A)

NOT TO SCALE (DP-24)

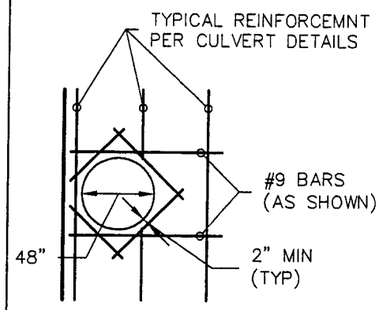


PLAN VIEW

FRAME & COVER SEE NDOT STD DETAIL R-4.7.3, IF IN UNPAVED AREA SEE DETAIL "C"

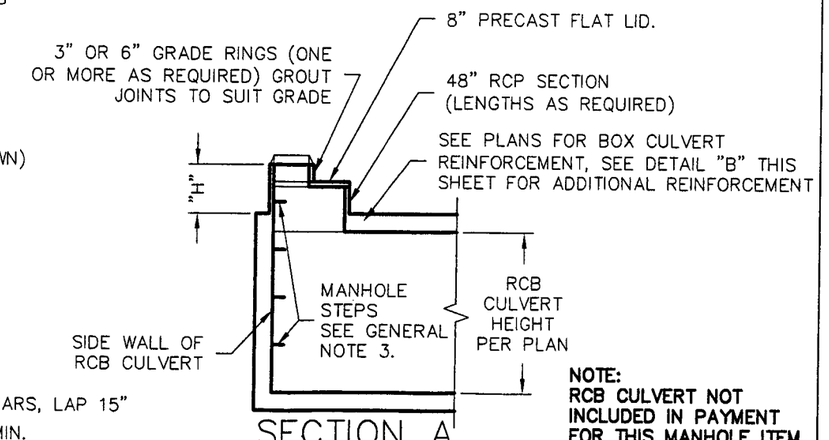
GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A.
2. FOR VALUES OF "H", SEE STORM DRAIN SCHEDULE OR STRUCTURE LIST IN CONTRACT PLANS. "H" IS THE DIRFFERENCE IN ELEVATION BETWEEN THE TOP OF BOX CULVERT TO FINISH GRADE.
3. MANHOLE STEPS SHALL CONFORM TO ASTM STANDARD SPECIFICATION C-478 WITH MAXIMUM SPACING OF 16" AND 4" CLEAR DISTANCE FROM THE MANHOLE WALL. THE STEP MUST BE A 10" MINIMUM WIDTH. EPOXY IN PLACE W/ TYPE IV EPOXY. (SEE 728.03.02) (NO DIRECT PAYMENT)
4. MANHOLE COVER SHALL BEAR ENTITY IDENTIFICATION AND SYSTEM FUNCTION (IF APPLICABLE)



DETAIL "B"

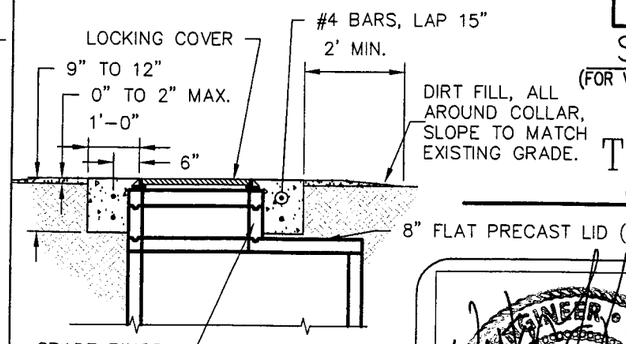
(ADDITIONAL REINFORCEMENT FOR M.H.) (NO DIRECT PAYMENT)



SECTION A

(FOR VARIABLE HEIGHT SITUATIONS)

NOTE: RCB CULVERT NOT INCLUDED IN PAYMENT FOR THIS MANHOLE ITEM.

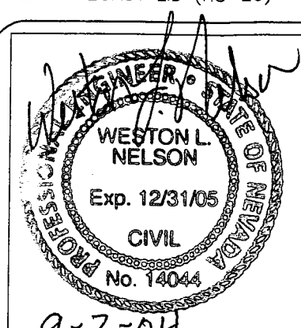


DETAIL "C"

(LOCKING MANHOLE LIDS REQUIRED)

MODIFIED TYPE 4 MANHOLE (RCB CULVERT ACCESS) (C)

NOT TO SCALE (DP-24)



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

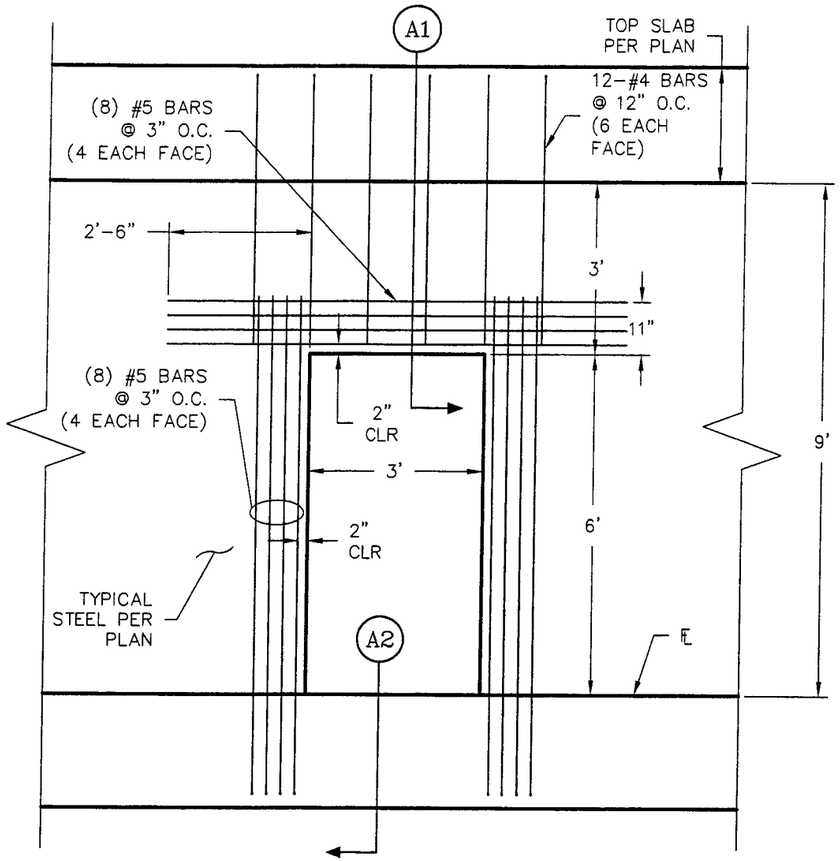
MISC. GENERAL DETAILS

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

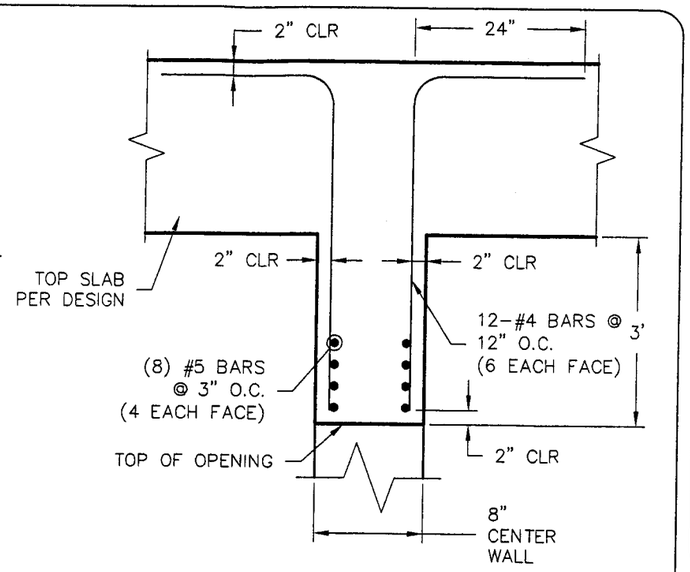
FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-25



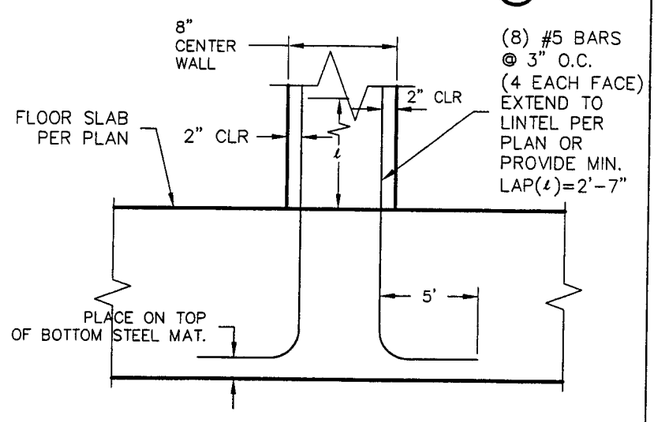
ACCESS OPENING THROUGH MULTI-BARREL CULVERT INTERIOR WALL(S) (A) DP-25

NOT TO SCALE

NOTE: ADDITIONAL STEEL SHOWN ONLY (NO DIRECT PAYMENT)

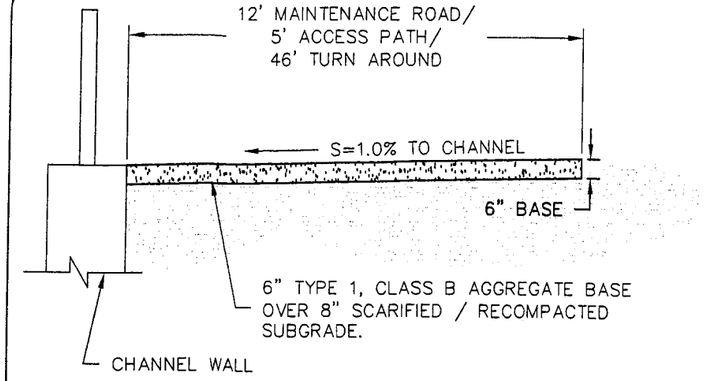


ACCESS LINTEL (A1)



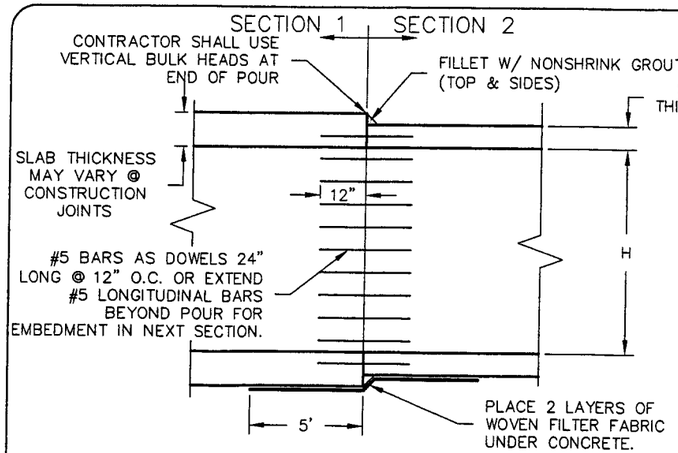
FLOOR DOWEL EXTENSION (A2)

(EACH SIDE OF OPENING)



MAINT. ROAD & ACCESS PATH (B) DP-25

NOT TO SCALE

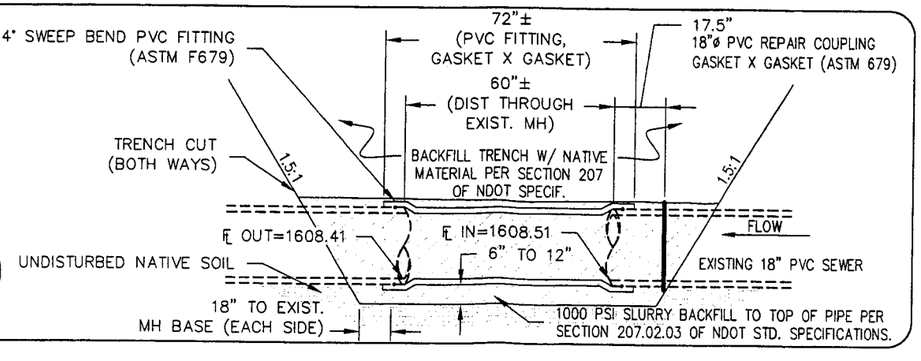


CONSTRUCTION JOINT TIE (C) DP-25

(NO DIRECT PAYMENT) NOT TO SCALE

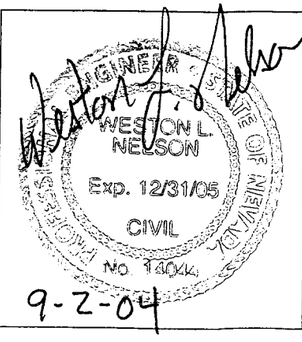
NOTE: CONSTRUCTION JOINTS AT LOCATIONS OTHER THAN SHOWN ON PLANS SHALL BE PREARRANGED WITH CONSTRUCTION MANAGER.

NOTE:
CONTRACTOR TO FIELD VERIFY INVERTS AND P.I. DEFLECTION (14°±), PRIOR TO ORDERING FITTING.



PVC SEWER FITTING (D) DP-25

NOT TO SCALE



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

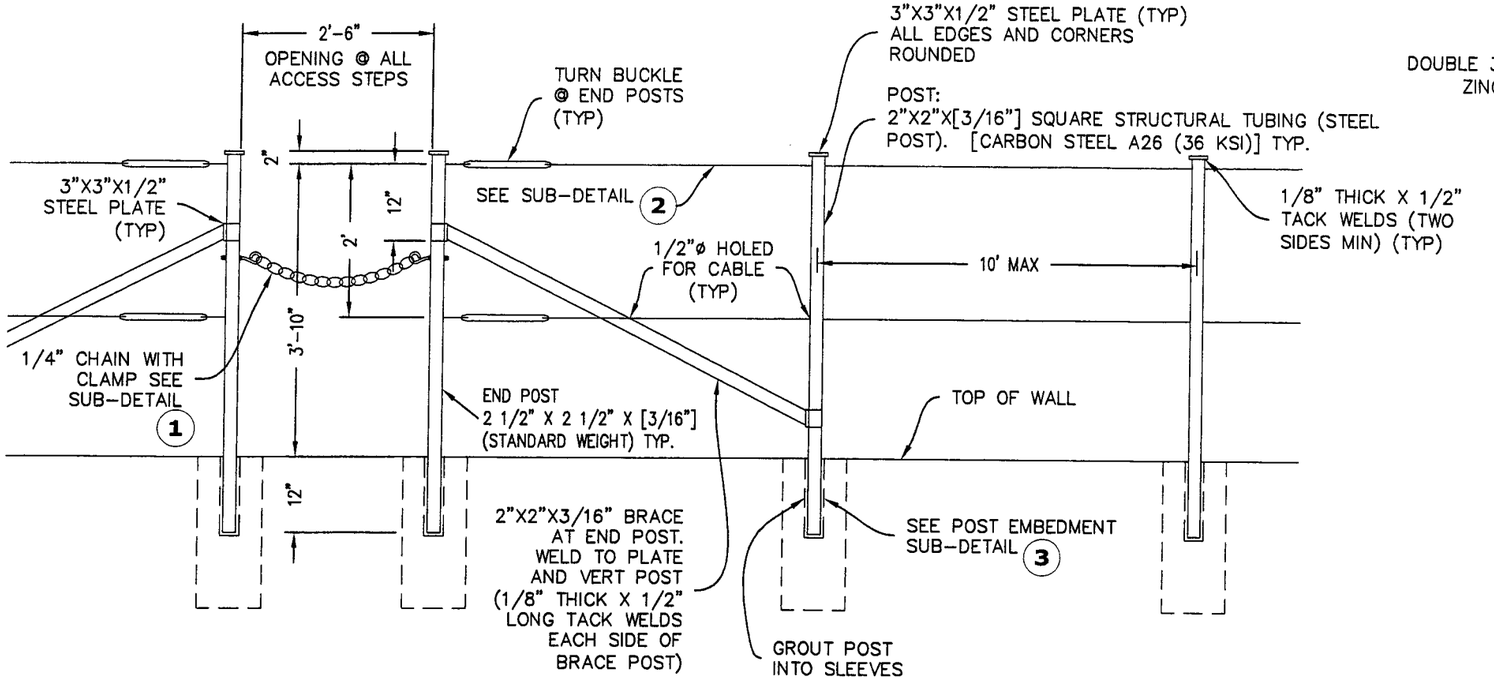
MISC. GENERAL DETAILS

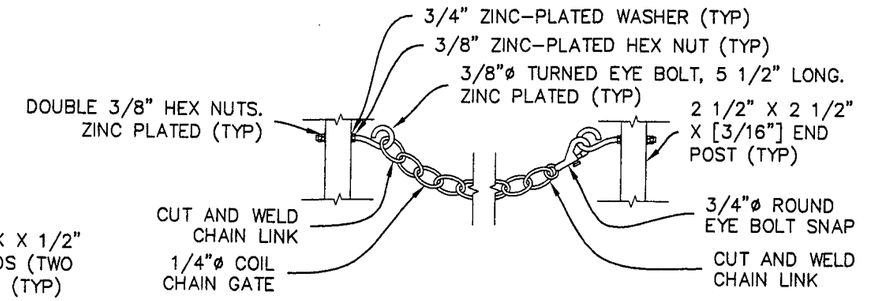
BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

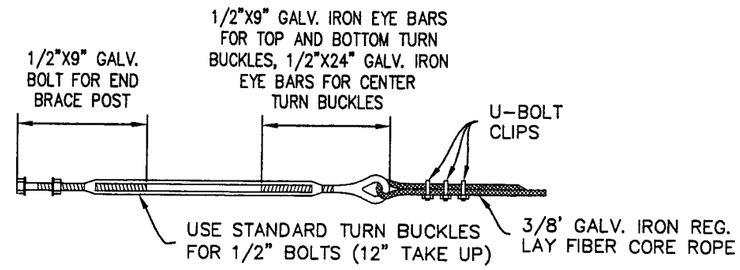
NOT TO SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-26





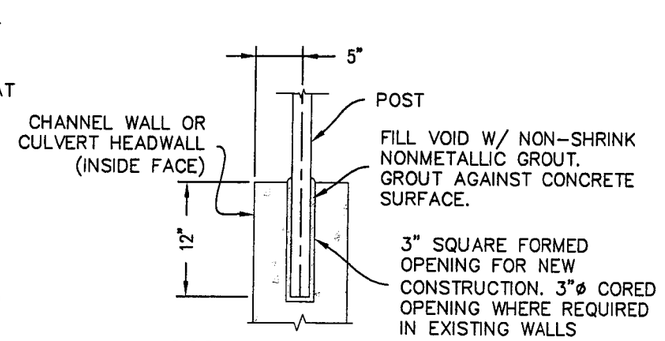
CHAIN SAFETY GATE 1
NOT TO SCALE



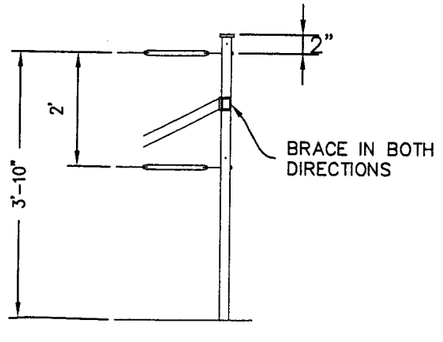
TURN BUCKLE 2
NOT TO SCALE

NOTES:

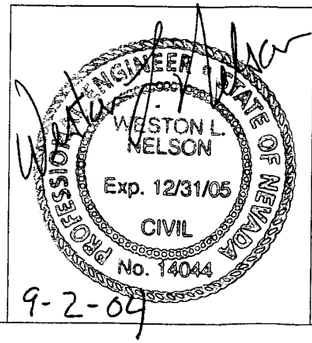
1. ALL POSTS SHALL BE SET PLUMB.
2. RAILING POSTS AND FITTINGS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
3. CHAIN SAFETY GATES SHALL BE PROVIDED AT LADDER LOCATIONS SEE SUB-DETAIL 1 (NO LADDER LOCATIONS WITH THESE IMPROVEMENTS)
4. ANGLE POST SEE SUB-DETAIL 4
5. CABLE SHALL BE STRETCHED TAUT.
6. ANY WELDING COMPLETED AFTER THE GALVANIZED COATING HAS BEEN APPLIED TO THE FABRICATED PARTS SHALL CONFORM TO AWS STANDARDS. EITHER THE GALVANIZED SURFACE SHALL BE GROUND OFF PRIOR TO ANY WELDING, OR THE WELDER SHALL WEAR PROTECTIVE CLOTHING AND BREATHER MASK PER AWS SPECIFICATIONS FOR GALVANIZED SURFACES. GALVANIZED COATING SHALL BE APPLIED/REAPPLIED TO ANY GROUND SURFACE AND/OR WELD JOINTS AFTER WELDING COMPLETE.



POST EMBEDMENT 3
NOT TO SCALE



ANGLE POST 4
NOT TO SCALE



STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

PEDESTRIAN RAIL TYPE Y

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

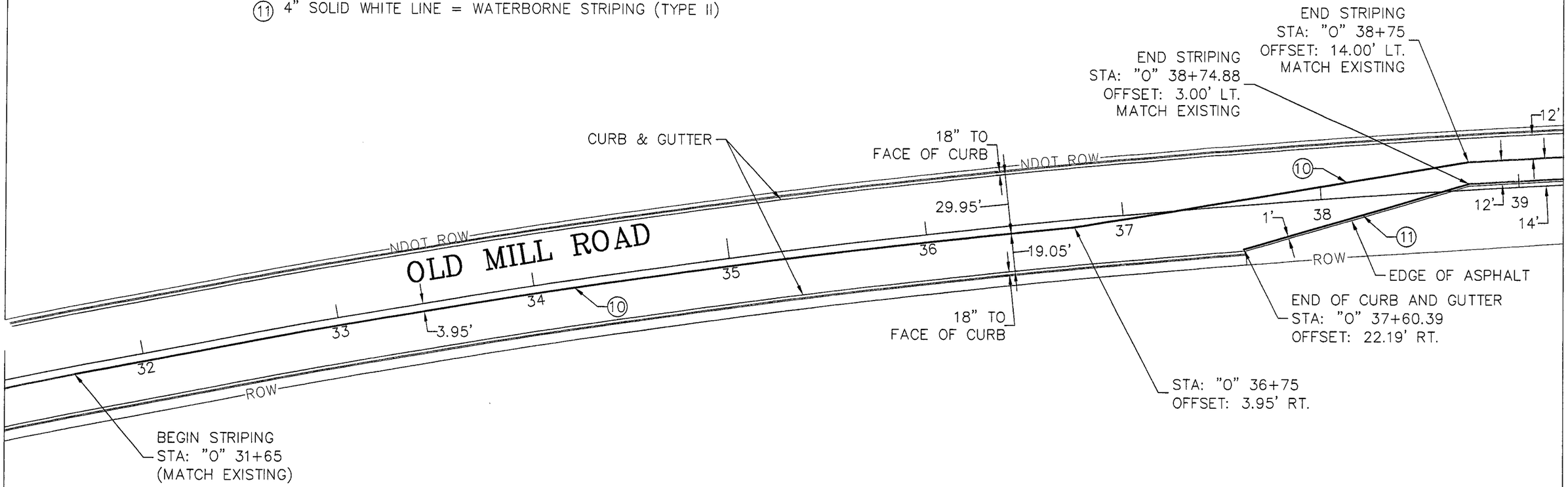
DRAWN BY: A.J.N.
CHECKED BY: W.N.
DATE: SEPT 2004

NOT TO SCALE

FED RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	STP-015-2(031)120	CLARK	DP-27

(10) DOUBLE SOLID YELLOW LINE, 4" WIDE STRIPES W/ 4" SEPARATION = WATERBORNE STRIPING (TYPE II)

(11) 4" SOLID WHITE LINE = WATERBORNE STRIPING (TYPE II)



WESTON L. NELSON
Exp. 12/31/05
CIVIL
No. 14044
STATE OF NEVADA
PROFESSIONAL ENGINEER
9-2-04

STATE OF NEVADA
DEPARTMENT OF TRASPORTATION
ABBOTT WASH DRAINAGE

OLD MILL ROAD STRIPING PLAN

STA: "O" 31+65 TO "O" 38+75

BULLOCH BROTHERS ENGINEERING INC.
CIVIL ENGINEERS-LAND SURVEYORS-LAND PLANNERS
CEDAR CITY, UT MESQUITE, NV

DRAWN BY: A.J.N.
CHECKED BY: W.N.
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50.000000:1.000000 PLOT SCALE